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OF THE
PHILADELPHIA
ACADEMY
OF
SURGERY

VOL. XXI.

1918
and
1919

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OF THE

PHILADELPHIA

ACADEMY OF SURGERY

VOLUME XXI

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PRINTED FOR THE ACADEMY
1920

NOTICE

During the year 1918 the meetings of the Academy were more or less irregular, owing to the absence of many of the Fellows on military service during the Great War. The *Transactions* for the year 1918 were not published in a separate volume, but are included in this present volume of the *Transactions* of 1919.

The Business Committee thinks it proper to state that the Academy holds itself in no way responsible for the statements, reasonings, or opinions set forth in the various papers published in its *Transactions*.

LIPPINCOTT PRESS, PHILADELPHIA

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GEORGE P. MÜLLER, M.D.

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PHILADELPHIA ACADEMY OF SURGERY

FOUNDED APRIL 21, 1879
INCORPORATED DEC. 27, 1879

OFFICERS

1879.

Temporary Chairman.....ADDINELL HEWSON
Temporary Secretary.....J. EWING MEARS
Temporary Treasurer.....WILLIAM HUNT
Temporary Recorder.....JOHN B. ROBERTS

PRESIDENT.

ELECTED		ELECTED	
1880	SAMUEL D. GROSS	1906	JOHN B. ROBERTS
1884	D. HAYES AGNEW	1908	WILLIAM J. TAYLOR
1891	WILLIAM HUNT	1910	ROBERT G. LECONTE
1895	THOMAS G. MORTON	1912	GWILYM G. DAVIS
1898	DEFOREST WILLARD	1914	JOHN H. GIBBON
1902	RICHARD H. HARTE	1916	CHARLES H. FRAZIER
1904	HENRY R. WHARTON	1918	EDWARD MARTIN

VICE-PRESIDENTS.

ELECTED		ELECTED	
1880	D. HAYES AGNEW	1904	JOHN B. ROBERTS
1880	R. J. LEVIS	1905	WILLIAM J. TAYLOR
1884	SAMUEL W. GROSS	1906	ROBERT G. LECONTE
1889	JOHN H. PACKARD	1908	G. G. DAVIS
1891	WILLIAM W. KEEN	1910	JOHN H. GIBBON
1891	J. EWING MEARS	1912	CHAS. H. FRAZIER
1898	JOHN ASHHURST, JR.	1914	EDWARD MARTIN
1900	RICHARD H. HARTE	1916	GEORGE G. ROSS
1900	HENRY R. WHARTON	1918	JOHN H. JOPSON
1902	JOHN B. DEAVER	1919	H. C. DEAVER

SECRETARY.

ELECTED		ELECTED	
1880	J. EWING MEARS	1896	WILLIAM J. TAYLOR
1885	J. HENRY C. SIMES	1905	JOHN H. GIBBON
1893	THOMAS R. NEILSON	1909	CHARLES F. MITCHELL
		1915	GEORGE P. MÜLLER

CORRESPONDING SECRETARY.

ELECTED

1880 THOMAS G. MORTON

Office abolished after 1889 by amendment to By-Laws.

TREASURER.

ELECTED

1880 WILLIAM HUNT
1891 WILLIAM G. PORTER

ELECTED

1904 JAMES P. HUTCHINSON
1911 EDWARD B. HODGE

RECORDER.

ELECTED

1880 JOHN B. ROBERTS
1881 DEFOREST WILLARD
1881 O. H. ALLIS
1884 C. B. G. DE NANCREDE

ELECTED

1884 J. EWING MEARS
1891 LEWIS W. STEINBACH
1902 JOHN H. GIBBON
1905 JOHN H. JOPSON
1915 JOHN SPEESE

LIBRARIAN.

ELECTED

1880 O. H. ALLIS

Office abolished after 1889 by amendment to By-Laws.

PATHOLOGICAL HISTOLOGIST.

ELECTED

1880 SAMUEL W. GROSS

Office abolished after 1889 by amendment to By-Laws.

COUNCIL.

ELECTED

1880 JOHN ASHHURST, JR.
1880 JOHN H. BRINTON
1894 WILLIAM BARTON HOPKINS
1895 HENRY R. WHARTON

ELECTED

1898 THOMAS R. NEILSON
1900 W. JOSEPH HEARN
1902 ROBERT G. LECONTE
1906 THOMAS R. NEILSON
1910 J. CHALMERS DACOSTA

With President, Secretary, Treasurer and Vice-President.

PUBLICATION COMMITTEE.

ELECTED

1880 JOHN H. PACKARD

ELECTED

1880 WILLIAM W. KEEN

With Recorder.

Office abolished after 1894 by amendment to By-Laws.

BUSINESS COMMITTEE.

ELECTED

1895 WILLIAM J. TAYLOR
1895 DEFOREST WILLARD
1896 RICHARD H. HARTE
1897 ROBERT G. LECONTE
1900 G. G. DAVIS
1902 JOHN H. JOPSON
1905 GEORGE G. ROSS

ELECTED

1908 FRANCIS T. STEWART
1914 JOHN SPEESE
1916 W. E. LEE
1916 MORRIS BOOTH MILLER
1917 D. B. PFEIFFER
1917 A. P. C. ASHHURST
1919 A. BRUCE GILL
1919 J. STEWART RODMAN

COMMITTEE ON SAMUEL D. GROSS PRIZE FUND AND LIBRARY.

1884–1891

D. HAYES AGNEW
SAMUEL W. GROSS
J. EWING MEARS
SAMUEL ASHHURST
WILLIAM HUNT

1892–1893

J. EWING MEARS
SAMUEL ASHHURST
WILLIAM HUNT
JOHN ASHHURST, JR.
WILLIAM W. KEEN

TRUSTEES OF THE SAMUEL D. GROSS PRIZE FUND AND LIBRARY.

1894

J. EWING MEARS
JOHN ASHHURST, JR.
WILLIAM W. KEEN

With SAMUEL ASHHURST and WILLIAM HUNT to serve with them on distribution of the prize.

1895–1899

J. EWING MEARS
JOHN ASHHURST, JR.
WILLIAM W. KEEN

1900–1901

WILLIAM W. KEEN
J. EWING MEARS
J. CHALMERS DACOSTA

1902–1904

WILLIAM J. TAYLOR
WILLIAM L. RODMAN
JOHN B. ROBERTS

1905

WILLIAM J. TAYLOR
RICHARD H. HARTE
DEFOREST WILLARD

1910

WILLIAM J. TAYLOR
RICHARD H. HARTE
JOHN H. GIBBON

1915

WILLIAM J. TAYLOR
JOHN H. JOPSON
EDWARD B. HODGE

ACTIVE FELLOWS OF THE PHILADELPHIA ACADEMY OF SURGERY

†Allis, Oscar H., M.D., 1604 Spruce Street. Consulting Surgeon to the Presbyterian Hospital.

1910. *Alexander, Emory G., M.D., 1627 Oxford Street. Surgeon to St. Christopher's Hospital for Children; Associate Surgeon to the Episcopal Hospital; Clinical Professor of Surgery in the Woman's Medical College of Pennsylvania; and Demonstrator of Fracture Dressings in the Jefferson Medical College; Assistant Surgeon to the Kensington Hospital for Women.

1905. Allen, Francis Olcott, Jr., M.D., 2216 Walnut Street. Surgeon to the Presbyterian and the Children's Hospitals; Assistant Surgeon to the Bryn Mawr Hospital; Surgeon to the Out-patient Department of the Pennsylvania Hospital.

1906. Ashhurst, Astley P. C., M.D., 1629 Spruce Street. Instructor in Surgery in the University of Pennsylvania; Surgeon to the Episcopal Hospital and to the Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases.

1917. Baldwin, James Harvey, M.D., 1426 Pine Street. Surgeon to the Methodist Hospital.

1915. Billings, Arthur E., M.D., 1703 Spruce Street. Assistant Surgeon to Bryn Mawr Hospital; Assistant Out-patient Surgeon to Pennsylvania Hospital; Chief Clinical Assistant in Surgical Department B. of Jefferson Hospital; Instructor in Surgery, Jefferson Medical College.

1898. Boger, John A., M.D., 2213 North Broad Street. Surgeon to the St. Mary's Hospital; Surgeon to the Stetson Hospital; Surgeon to the Dispensary of the Episcopal Hospital.

1919. Brown, Henry P., Jr., M.D., 1822 Pine Street. Instructor in Surgery, University of Pennsylvania; Assistant Instructor in Surgical Pathology, University of Pennsylvania; Chief Surgeon in Dispensary and Assistant in Children's Hospital and in the Presbyterian Hospital; Surgeon in Dispensary, Pennsylvania Hospital.

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† Original Fellows.
* Figures denote year elected to membership.

1905. Brooks, Macy, M.D., 1321 Spruce Street. Assistant Genito-urinary Surgeon to the Philadelphia General Hospital.

1907. Carmany, Harry S., M.D., 366 Green Lane, Roxborough, Pa. Surgeon to St. Timothy's Hospital, Roxborough; Associate Surgeon of the Episcopal Hospital; Surgeon to the Dispensary of the Episcopal Hospital.

1909. Carnett, John B., M.D., 123 South 20th Street. Associate in Surgery in the University of Pennsylvania; Assistant Surgeon to the University and the Philadelphia General Hospitals; Surgeon to the Chestnut Hill Hospital; Consulting Surgeon to the Henry Phipps Institute, to the Phoenixville Hospital, and to the Eastern Pennsylvania Institution for the Feeble-minded and Epileptic.

1916. Clark, John G., M.D., 2017 Walnut Street. Professor of Gynecology in the University of Pennsylvania; Gynecologist-in-Chief to the University Hospital; Consultant to the Women's College Hospital, Bryn Mawr, Chestnut Hill, Abington, and Jewish Hospitals.

1919. Crossan, Edward T., M.D., 5324 Wayne Avenue. Associate Surgeon to the Episcopal Hospital; Dispensary Assistant, Orthopædic Hospital; Assistant Instructor in Surgery, University of Pennsylvania.

1896. DaCosta, John Chalmers, M.D., 2045 Walnut Street. Professor of the Principles of Surgery and of Clinical Surgery in the Jefferson Medical College; Surgeon to the Philadelphia General and to St. Joseph's Hospitals.

1896. ‡Davis, Gwilym G., M.D., University of Pennsylvania, Goett. M.R.C.S., 1814 Spruce Street. Professor of Orthopædic Surgery in the University of Pennsylvania; Chief Surgeon to the Widener Memorial Industrial School; Surgeon to the Orthopædic Hospital; Consulting Surgeon to St. Joseph's Hospital.

1898. Deaver, Henry C., M.D., 1701 Spruce Street. Professor of Surgery in the Woman's Medical College of Pennsylvania; Surgeon to the Episcopal Hospital, and to the Children's Hospital of the Mary J. Drexel Home; Surgeon-in-Chief to the Kensington Hospital for Women.

‡ Deceased.

1890. Deaver, John B., M.D., 1634 Walnut Street. John Rea Barton Professor of Surgery, University of Pennsylvania; Visiting Surgeon to Hospital of the University of Pennsylvania; Surgeon-in-Chief to the Lankenau Hospital.

1908. Despard, Duncan Lee, M.D., 1806 Pine Street. Surgeon to the Abington Memorial Hospital; Assistant Surgeon to the Jefferson Medical College Hospital; Demonstrator of Clinical Surgery in the Jefferson Medical College; Associate in Gynecology in the Philadelphia Polyclinic Hospital.

1916. Dorrance, G. M., M.D., 2025 Walnut Street. Professor of Maxillo-facial Surgery, Thomas Evans Institute of University of Pennsylvania; Surgeon to St. Agnes Hospital.

1915. §Dickson, Frank D., M.D., St. Regis Apartments, Kansas City, Mo.

1884. Dulles, Charles Winslot, M.D., 4101 Walnut Street. Consulting Surgeon of the Rush Hospital.

1909. Elmer, Walter G., M.D., 1801 Pine Street. Instructor in Orthopædic Surgery in the University of Pennsylvania; Assistant Orthopædic Surgeon to the Jewish Hospital; Surgeon to the Pennsylvania Training School for Children.

1898. Frazier, Charles H., M.D., 1724 Spruce Street. Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to the University Hospital.

1899. Gibbon, John H., M.D., 1608 Spruce Street. Professor of Surgery in the Jefferson Medical College; Surgeon to the Pennsylvania and Bryn Mawr Hospitals.

1914. Gill, A. Bruce, M.D., The Lenox, 13th and Spruce Streets. Surgeon to the Orthopædic Hospital and Infirmary for Nervous Diseases; Orthopædic Surgeon to the Episcopal Hospital; Orthopædic Surgeon to the Presbyterian Hospital; Assistant Surgeon to the Widener Memorial School for Crippled Children; Consulting Orthopædic Surgeon to St. Edmond's Home for Crippled Children.

1914. §Ginsburg, Nathaniel, M.D., 2587 Woodward Avenue, Detroit, Michigan.

1902. Girvin, John H., M.D., 2120 Walnut Street. Gynecologist to the Presbyterian Hospital; Instructor in Obstetrics in the University of Pennsylvania.

§ Non-resident Fellows.

1892. HARTE, RICHARD H., M.D., C.M.G., 1503 Spruce Street. Emeritus Surgeon to the Pennsylvania Hospital; Consulting Surgeon to St. Mary's, St. Timothy's, Bryn Mawr, and Abington Hospitals.

1913. HEARN, WILLIAM P., M.D., 334 South 42nd Street. Surgeon to Philadelphia General Hospital; Assistant Surgeon to Jefferson Hospital.

1890. HEWSON, ADDINELL, M.D., 2120 Spruce Street. Professor of Anatomy in the Philadelphia Polyclinic and College for Graduates in Medicine; Professor of Anatomy and Histology in the Temple University; Surgeon to St. Timothy's Hospital, Roxborough.

1916. HIRST, BARTON COOKE, M.D., 1821 Spruce Street. Professor of Obstetrics, University of Pennsylvania.

1905. HODGE, EDWARD B., M.D., 346 South 16th Street. Surgeon to the Presbyterian and the Children's Hospitals; Surgeon to the Out-patient Department of the Pennsylvania Hospital; Associate Surgeon to the Widener Memorial School for Crippled Children.

1898. HUTCHINSON, JAMES P., M.D., 133 South 22nd Street. Surgeon to the Pennsylvania, the Methodist, the Children's, St. Timothy's, and the Bryn Mawr Hospitals; Adjunct Professor of Surgery in the University of Pennsylvania.

1915. IVY, ROBERT H., M.D., 114 South 19th Street. Professor of Clinical Maxillo-facial Surgery, University of Pennsylvania; Oral Surgeon, Philadelphia General Hospital; Consultant in Maxillo-facial Surgery, Walter Reed General Hospital, Washington, D. C.

1915. JONES, JOHN F. X., M.D., 1915 Spruce Street. Surgeon to the St. Joseph's Hospital.

1900. JOPSON, JOHN H., M.D., 1824 Pine Street. Professor of Surgery in the Philadelphia Polyclinic; Associate in Surgery in the University of Pennsylvania; Surgeon to the Presbyterian and the Children's Hospitals.

†KEEN, WILLIAM W., M.D., 1729 Chestnut Street. Emeritus Professor of the Principles of Surgery, and of Clinical Surgery in the Jefferson Medical College; Membre Correspondant Etranger de la Societe de Chirurgie de Paris; Honorary Member of the Societe Belge de Chirurgie and of the Clinical Society of London.

† Original Fellows.

1914. KEENE, F. E., M.D., 2017 Walnut Street. Instructor in Gynecology in the University of Pennsylvania; Assistant Gynecologist to the University Hospital; Gynecologist to the Chestnut Hill Hospital.

1910. KELLY, JAMES A., M.D., 1510 North 17th Street. Visiting Surgeon to St. Mary's and St. Timothy's Hospitals; Associate in Surgery in the Philadelphia Polyclinic and College for Graduates in Medicine; Assistant Visiting Surgeon to St. Joseph's Hospital.

1913. KLOPP, EDWARD J., M.D., 1223 Spruce Street. Instructor in Surgery in the Jefferson Medical College; Assistant Surgeon to the Germantown Hospital; Chief Clinical Assistant in the Surgical Department of the Jefferson Hospital; Assistant Surgeon to the Out-patient Department of the Pennsylvania Hospital.

1916. §LANDON, L. H., M.D., Carnegie Steel Company, Pittsburgh, Pa.

1914. LAWS, GEORGE M., M.D., 2033 Locust Street. Associate in Surgery, University of Pennsylvania; Chief Surgeon Out-patient Department, University Hospital; Assistant Surgeon, Philadelphia General and American Stomach Hospitals; Assistant in Gynecology, Presbyterian Hospital.

1895. LECONTE, ROBERT G., M.D., 1530 Locust Street. Surgeon to the Pennsylvania and the Bryn Mawr Hospitals; Consulting Surgeon to the Germantown and Gynecean Hospitals.

1910. LEE, WALTER ESTELL, M.D., 905 Pine Street. Surgeon to the Germantown Hospital; Surgeon to the Children's Hospital; Assistant Surgeon to the Pennsylvania Hospital; Assistant Surgeon to the Bryn Mawr Hospital; Consulting Surgeon to Henry Phipp's Institute; Consulting Surgeon to Pennsylvania State Department of Health; Associate Professor of Surgery, University of Pennsylvania Graduate School of Medicine.

1899. LOUX, HIRAM R., M.D., Medical Arts Building. Professor of Genito-urinary Surgery in the Jefferson Medical College; Surgeon to the Philadelphia General Hospital.

1900. MARTIN, EDWARD, M.D., 34th and Spruce Streets. Commissioner of Health, State of Pennsylvania.

1919. MCKNIGHT, H. A., M.D., 241 South 13th Street. Instructor of Surgery Post Graduate School, University of Pennsylvania; Surgeon to the Dispensary of the Medico-Chirurgical Hospital; Chief of the Surgical Dispensary of St. Mary's Hospital; Assistant Surgeon to St. Mary's Hospital.

1917. MENCKE, J. BERNHARD, M.D., 1816 Spruce Street. Assistant Surgeon to the Out-patient Department of the Lankenau Hospital; Assistant Surgeon to the Stetson Hospital.

1915. MERRILL, WILLIAM JACKSON, M.D., Medical Arts Building, 16th and Walnut Streets. Instructor in Orthopædic Surgery, University of Pennsylvania; Assistant Orthopædic Surgeon, University Hospital; Orthopædic Surgeon to the Children's Hospital, Children's Seashore House, and Howard Hospital; Consulting Orthopædic Surgeon to the Germantown Hospital.

1907. MILLER, MORRIS BOOTH, M.D., 2117 Pine Street. Professor of Surgery in the Philadelphia Polyclinic; Surgeon to the Douglass Memorial Hospital; Assistant Surgeon to the Philadelphia General Hospital.

1904. MITCHELL, CHARLES F., M.D., 332 North 15th Street. Surgeon to the Pennsylvania, Germantown, and Bryn Mawr Hospitals.

1919. MONTGOMERY, E. E., M.D., 1426 Spruce Street. Professor of Gynecology, Jefferson Medical College and Gynecologist to the Jefferson and St. Joseph's Hospitals.

1906. MÜLLER, GEORGE P., M.D., 1729 Pine Street. Associate in Surgery in the University of Pennsylvania; Assistant Surgeon to the University Hospital; Professor of Surgery in the Philadelphia Polyclinic; Surgeon to St. Agnes' Hospital; Consulting Surgeon to the Chester County Hospital.

1902. MUTSCHLER, LOUIS H., M.D., 1625 Spruce Street. Surgeon to the Episcopal Hospital; Associate Surgeon to the Orthopædic Hospital.

1905. NASSAU, CHARLES F., M.D., 1710 Locust Street. Assistant Professor of Surgery in the Jefferson Medical College; Chief Surgeon to the Frankford Hospital; Surgeon to St. Joseph's Hospital; Assistant Surgeon to the Jefferson Hospital.

1890. NEILSON, THOMAS R., M.D., 1937 Chestnut Street. Surgeon to the Episcopal Hospital, and to St. Christopher's Hospital for Children; Professor of Genito-urinary Surgery in the University of Pennsylvania.

1906. §NORRIS, HENRY, M.D., Rutherfordton, N. C. Surgeon to the Rutherford Hospital.

1917. NORRIS, R. C., M.D., 500 North 20th Street. Assistant Professor of Obstetrics, University of Pennsylvania; Professor of Obstetrics, Post Graduate School of Medicine, University of Pennsylvania; Physician-in-Charge, Preston Retreat; Gynecologist and Obstetrician, Methodist Hospital; Consulting Gynecologist, Norristown Hospital for the Insane; Consulting Obstetrician, Germantown Hospital.

1915. OWEN, HUBLEY R., M.D., 2046 Pine Street. Surgeon to the Philadelphia General Hospital; Assistant Surgeon to the Orthopædic Hospital; Chief Surgeon of the Bureaus of Police and Fire, Philadelphia.

1912. PFEIFFER, DAMON B., M.D., 2028 Pine Street. Instructor in Surgery, University of Pennsylvania; Assistant Surgeon, University Hospital; Pathologist to the Lankenau Hospital; Assistant Surgeon to the Presbyterian Hospital.

1919. PIPER, EDMUND G., M.D., 1936 Spruce Street. Instructor in Obstetrics in University of Pennsylvania; Assistant Professor, University of Pennsylvania Post Graduate School; Assistant Obstetrician of University Hospital; Assistant Obstetrician and Gynecologist of Philadelphia General Hospital; Assistant Obstetrician, Maternity Hospital.

1916. RANDALL, ALEXANDER, M.D., 1309 Medical Arts Building, 16th and Walnut Streets. Assistant Instructor, Genito-urinary Surgery, University of Pennsylvania; Urologist to Chestnut Hill Hospital; Assistant Urologist, University Hospital; Assistant Urologist, Philadelphia General Hospital; Consulting Urologist, Germantown Hospital.

1890. ROBERTS, JOHN B., M.D., 313 South 17th Street. Professor of Surgery in the University of Pennsylvania Graduate School of Medicine.

1898. ROBINSON, J. WIER, M.D., 326 South 16th Street.

1913. RODMAN, JOHN STEWART, M.D., Medical Arts Building, 16th and Walnut Streets. Associate Professor of Surgery, Graduate School of Medicine, University of Pennsylvania; Associate Surgeon to the Presbyterian and Bryn Mawr Hospitals.

1900. ROSS, GEORGE G., M.D., 1721 Spruce Street. Assistant Surgeon to the Lankenau Hospital and Surgeon to the Out-patient Department of the same; Surgeon to the Germantown Hospital; Surgeon to the Stetson Hospital; Instructor in Surgery in the University of Pennsylvania.

1913. RUGH, J. TORRANCE, M.D., 1616 Spruce Street. Orthopædic Surgeon of Jefferson Medical College; Clinical Professor of Orthopædic Surgery in the Women's Medical College of Pennsylvania; Orthopædic Surgeon to the Methodist and the Philadelphia General Hospitals.

1894. SHOEMAKER, GEORGE ERETY, M.D., 1906 Chestnut Street. Gynecologist to the Presbyterian Hospital and to the Pennsylvania Epileptic Hospital and Colony Farm.

1903. SITER, E. HOLLINGSWORTH, M.D., 1818 South Rittenhouse Square. Instructor in Genito-urinary Diseases in the University of Pennsylvania; Genito-urinary Surgeon to the Philadelphia General Hospital; Surgeon-in-Charge of the Genito-urinary Dispensary of the University Hospital; Consulting Genito-urinary Surgeon to the Eastern Penitentiary, and to the Philadelphia County Prison.

1913. SKILLERN, PENN GASKELL, JR., M.D., 241 South 13th Street. Associate Professor of Surgery in the University of Pennsylvania Graduate School; Surgeon to the Douglass Hospital.

1909. SPEESE, JOHN M., M.D., 2206 Locust Street. Instructor in Surgery and Surgical Pathology in the University of Pennsylvania; Associate of Surgery in the Philadelphia Polyclinic; Surgeon to the Children's Hospital; Assistant Surgeon to the Presbyterian and Polyclinic Hospitals.

1898. SPELLISSY, JOSEPH M., M.D., 317 South 15th Street. Visiting Surgeon to St. Joseph's and to the Methodist Episcopal Hospitals; Assistant Surgeon to the Orthopædic Department of the University Hospital.

1911. STELLWAGEN, THOMAS C., JR., M.D., 1831 Chestnut Street. Chief Clinical Assistant in the Out-patient Surgical Department of the Jefferson Medical College Hospital.

1903. ‡STEWART, FRANCIS T., M.D., 311 South 12th Street. Professor of Clinical Surgery in the Jefferson Medical College; Surgeon to the Germantown Hospital; Surgeon to the Pennsylvania Hospital.

1919. SWARTLEY, WILLIAM B., M.D., Pelham Court, Germantown, Pa.

1908. SWEET, J. EDWIN, M.D., 301 St. Mark's Square. Professor of Surgical Research, University of Pennsylvania.

1890. TAYLOR, WILLIAM J., M.D., 1825 Pine Street. Surgeon to the St. Agnes and to the Orthopædic Hospitals; Consulting Surgeon to the West Philadelphia Hospital for Women.

1911. THOMAS, B. A., M.D., 116 South 19th Street. Professor of Urology, Graduate School of Medicine, University of Pennsylvania; Genito-urinary Surgeon, Presbyterian Hospital.

1911. THOMAS, THOMAS TURNER, M.D., 2005 Chestnut Street. Associate Professor of Applied Anatomy, and Associate in Surgery in the University of Pennsylvania; Surgeon to the Philadelphia General Hospital; Assistant Surgeon to the University Hospital.

1915. THOMAS, W. HERSEY, M.D., 1445 North 17th Street. Professor of Genito-urinary Surgery in Temple University; Visiting Genito-urinary Surgeon to Samaritan and Garretson Hospitals.

1892. WHARTON, HENRY R., M.D., 1725 Spruce Street. Surgeon to the Presbyterian and the Children's Hospitals; Surgeon to Girard College; Consulting Surgeon to the Bryn Mawr Hospital, the Chestnut Hill Hospital, St. Christopher's Hospital for Children, the Pennsylvania Institution for the Deaf and Dumb, and the Pennsylvania Institution for the Blind.

1902. WHITING, A. D., M.D., 1523 Spruce Street. Surgeon to the Germantown Hospital; Assistant Surgeon to the Lankenau Hospital; Assistant Surgeon to the University Hospital; Instructor in Surgery in the University of Pennsylvania.

1919. WILLARD, DEFOREST P., M.D., 2108 Walnut Street. Instructor of Orthopædic Surgery, University of Pennsylvania; Assistant Surgeon at the Orthopædic Hospital and Infirmary for Nervous Diseases; Orthopædic Surgeon to the Home of the Merciful Saviour for Crippled Children; Consulting Orthopædic Surgeon to the North American Seashore Home for Tubercular Children.

1890. ‡WILSON, H. AUGUSTUS, M.D., 1611 Spruce Street.

1898. WOOD, ALFRED C., M.D., 2035 Walnut Street. Assistant Professor of Surgery in the University of Pennsylvania; Surgeon to the University Hospital; Surgeon to the Philadelphia General, St. Timothy's, and the Howard Hospitals.

1902. YOUNG, JAMES K., M.D., 222 South 16th Street. Professor of Orthopædic Surgery, University of Pennsylvania, Graduate School of Medicine; Orthopædic Surgeon to the Polyclinic Hospital; Consulting Orthopædic Surgeon to the Women's Hospital of Philadelphia; Visiting Chief on the Orthopædic Staff of the Philadelphia General Hospital.

LIST OF FELLOWS WHO HAVE DELIVERED THE ANNUAL ADDRESS

1881. S. D. Gross.
1882. D. Hayes Agnew.
1883. William Hunt.
1884. John H. Brinton.
1885. John H. Packard.
1886. R. J. Levis.
1887. J. Ewing Mears.
1888. C. B. G. de Nancrede.
1889. John B. Roberts.
1890. De Forest Willard.
1891. William G. Porter.
1892. T. G. Morton.
1893. C. W. Dulles.
1894. W. B. Hopkins.
1895. John B. Deaver.
1896. James M. Barton.
1897. Thomas R. Neilson.
1898. O. H. Allis.
1899. William J. Taylor.
1900. None.
1901. H. R. Wharton.
1902. J. M. Spellissy.
1903. R. G. LeConte.
1904. G. G. Davis.
1905. J. Chalmers DaCosta.
1906. Richard H. Harte.
1907. Edward Martin.
1908. Charles H. Frazier.
1909. John H. Gibbon.
1910. Astley P. C. Ashhurst.
1911. John H. Jopson.
1912. George G. Ross.
1913. Wm. L. Rodman.
1914. Alfred C. Wood.
1915. Francis T. Stewart.
1916. Edward B. Hodge.
1917. J. Edwin Sweet.
1918. None.
1919. None.
1920. John G. Clarke.

WINNERS OF THE SAMUEL D. GROSS PRIZE

1895 "Inquiry into the Difficulties Encountered in the Reduction of Dislocations of the Hip."—Dr. Oscar H. Allis, Philadelphia, Pa.

1902 "The Treatment of Certain Malignant Growths by Excision of the External Carotids."—Dr. Robert H. W. Dawbarn, New York, N. Y.

1905 "The Biology of the Micro-organisms of Actinomycosis." —Dr. James Homer Wright, Boston, Mass.

1910 "An Anatomical and Surgical Study of Fractures of the Lower End of the Humerus."—Dr. Astley Paston Cooper Ashhurst, Philadelphia, Pa.

1915 "Surgery in the Treatment of Hodgkin's Disease."—Dr. John Lawrence Yates, Milwaukee, Wis.

HONORARY FELLOWS

ELECTED.		DIED.
1881	Sir James Paget, London, England	December 30, 1899.
1881	Theodore Billroth, Vienna, Austria	January 5, 1894.
1881	Bernhard von Langenbeck, Berlin, Germany	September 30, 1887.
1881	Willard Parker, New York, N. Y.	April 25, 1884.
1881	Lewis A. Sayre, New York, N. Y.	1900 or 1901.
1881	Moses Gunn, Chicago, Illinois	November 4, 1887.
1881	John T. Hodgen, St. Louis, Mo.	April 28, 1882.
1881	W. W. Dawson, Cincinnati, Ohio	February 16, 1893.
1881	T. G. Richardson, New Orleans, La.	May 26, 1892.
1881	J. Collins Warren, Boston, Massachusetts.	
1881	W. T. Briggs, Nashville, Tennessee	June 13, 1894.
1881	Christopher Johnston, Baltimore, Md.	October 11, 1891.
1881	D. W. Yandell, Louisville, Ky.	May 2, 1898.
1898	Maurice H. Richardson, Boston, Mass.	July 31, 1912.
1898	George M. Sternberg, Washington, D. C.	November 3, 1915.
1898	Charles B. McBurney, New York, N. Y.	November 7, 1913.
1898	Nicholas Senn, Chicago, Illinois	January 2, 1908.
1898	Theodore Prewitt, St. Louis, Mo.	October 17, 1904.
1898	L. McLane Tiffany, Baltimore, Md.	October 23, 1916.
1898	Nathaniel P. Dandridge, Cincinnati, Ohio.	1911 or 1912.
1898	Roswell Park, Buffalo, N. Y.	February 15, 1914.
1898	Robert F. Weir, New York, N. Y.	
1898	Frederick S. Dennis, New York, N. Y.	

ELECTED.		DIED.
1900	W. H. A. Jacobson, London, England.	
1900	Theodore Kocher, Berne, Switzerland....	July 27, 1917.
1900	Vincenz Czerny, Heidelberg, Germany....	October 3, 1916.
1906	William J. Mayo, Rochester, Minn.	
1906	Dudley P. Allen, Cleveland, Ohio.....	January 6, 1915.
1906	Robert Abbe, New York, N. Y.	
1906	C. B. G. deNancrede, Ann Harbor, Mich.	
1907	John C. Munro, Boston, Mass.	December 6, 1910.
1908	J. Ewing Mears, Philadelphia, Pa.	May 28, 1919.
1909	Lewis Stephen Pilcher, Brooklyn, N. Y.	
1916	W. W. Keen, Philadelphia, Pa.	

FELLOWS OF THE ACADEMY WHO WERE IN THE WAR SERVICE

Lieutenant-colonel Edward B. Hodge, M.C., U.S.A.

Lieutenant-colonel John H. Jopson, M.C., U.S.A.

Lieutenant-colonel Damon B. Pfeiffer, M.C., U.S.A.

Major John Speese, M.C., U.S.A.

Major J. Stewart Rodman, M.C., U.S.A.

Major Henry P. Brown, M.C., U.S.A.

Major George M. Laws, M.C., U.S.A.

Major William W. Keen, M.R.C., U.S.A.

Colonel Astley P. C. Ashhurst, M.C., U.S.A.

Lieutenant-colonel William J. Taylor, M.C., U.S.A.

Major DeForest P. Willard, M.C., U.S.A.

Major Walter Estell Lee, M.C., U.S.A.

Captain Hubley R. Owen, M.C., U.S.A.

Captain Edward T. Crossan, M.C., U.S.A.

Lieutenant-colonel E. Hollingsworth Siter, M.C., U.S.A.

Lieutenant-colonel Charles H. Frazier, M.C., U.S.A.

Major Henry C. Norris, M.C., U.S.A.

Lieutenant-colonel Emory G. Alexander, M.C., U.S.A.

Captain James H. Baldwin, M.C., U.S.A.

Commander George G. Ross, M.C., U.S.N.R.F.

Major Alexander Randall, M.C., U.S.A.

Captain Howard A. McKnight, M.C., U.S.A.

Major Charles F. Nassau, M.C., U.S.A.

Lieutenant-colonel J. B. Carnett, M.C., U.S.A.

Lieutenant-colonel Charles F. Mitchell, M.C., U.S.A.

Major G. M. Dorrance, M.C., U.S.A.

Lieutenant-colonel Edmund B. Piper, M.C., U.S.A.

First Lieutenant William B. Swartley, M.C., U.S.A.

Captain Walter G. Elmer, M.C., U.S.A.

Major L. H. Landon, M.C., U.S.A.

Lieutenant-colonel J. E. Sweet, M.C., U.S.A.

Major W. Hersey Thomas, M.C., U.S.A.

Major George P. Müller, M.C., U.S.A.

Lieutenant-colonel Robert H. Ivy, M.C., U.S.A.

Lieutenant P. G. Skillern, Jr., M.C., U.S.N.R.F.

Lieutenant-colonel James T. Rugh, M.C., U.S.A.

Captain William Jackson Merrill, M.C., U.S.A.

Commander J. Chalmers DaCosta, M.C., U.S.A.

Major Harry S. Carmany, M.C., U.S.A.

Major Hiram R. Loux, M.C., U.S.A.

Lieutenant-colonel Richard H. Harte, M.C., U.S.A.

Colonel John H. Gibbon, M.C., U.S.A.

Lieutenant-colonel Edward Martin, M.C., U.S.A.

Major John B. Deaver, M.R.C., U.S.A.

Lieutenant B. A. Thomas, U.S.N.R.F.

Major Thomas C. Stellwagen, M.C., U.S.A.

Senior Lieutenant John F. X. Jones, M.C., U.S.A.

Commander Morris Booth Miller, M.C., U.S.N.R.F.

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TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

STATED MEETING, HELD JANUARY 7, 1918

The President, DR. CHARLES H. FRAZIER, in the Chair

THE DANGER OF THE PERNICIOUS BOND SPLINT IN CARPAL FRACTURES OF THE RADIUS

DR. JOHN B. ROBERTS said that successful treatment of the usual fractures near the carpal end of the radius demands: (1) Free separation of the basal from the shaft fragment, whether impacted or entangled. (2) Forcible reduction until the normal arch of the palmar surface of the radius near the wrist is restored. (3) Retention of this concave anterior surface of the carpal fifth of the radius. (4) A flexed wrist-joint during convalescence and abstinence from the use of a flat splint for support, on the palmar aspect of the forearm and hand, aid greatly in preventing displacement of the carpal piece after its reduction. This is particularly the case in comminution of the lower fragment.

In his opinion "Bond's splint," so much used in Philadelphia, is an anachronism and should be discarded from use as a dressing for these fractures.

(*a*) Some of them need no other dressing after reduction than flexion of the wrist-joint maintained by a rigid material.

(*b*) Others require a straight strip of wood or metal on the dorsal surface from mid-forearm to metacarpal-phalangeal joint or a convex incompressible splint of cork, wood, metal, or hardened plastic material to support the arch in the anterior surface of the lower fifth of the radius.

(*c*) Still others, because of severity of the vulnerating force or brittleness of bone, do better by being encased in a Levis splint of swedged copper on the palmar surface of the forearm and palm of hand, or else a molded gypsum gauze splint covering the dorsum of the forearm and hand, applied before the plaster of Paris is set. Both of these dressings should keep the wrist flexed during their use because the extensor tendons have a tendency to hold the fragments in place. These conformed dressings usually are not needed for more than three or four weeks, even in severe injuries.

In illustration of these statements he described a case in which the original fracture, not originally under his care, had been apparently a comminuted and backward displaced fracture of the lower end of the bone. A Bond splint had been applied with a pad of gauze under the lower end of the radius with the idea of holding the fracture in adjustment. When seen by him three weeks after injury, there was marked prominence of the head of the

ulna at the back of the wrist and some displacement of the carpal fragment forward. The patient was suffering great pain until he removed the dressing and substituted a gypsum gauze retentive apparatus until he could persuade her to take ether and allow him to reconstruct the lower end of the bone. She delayed this operation for about three weeks. He then, under ether, pushed the lower fragment upward so as to bring it into proper apposition with the shaft. The deformity due to the apparent dislocation of the head of the ulna disappeared.

This confirmed his opinion that the lower fragment of the radius, because of the use of the Bond splint and a possible mal-adjustment during the first three weeks after injury, had been displaced forward without rupture of the radio-ulnar ligaments. This gave the appearance of a radio-ulnar dislocation.

He had seen fractures with backward displacement treated with the Bond splint in which the displacement had apparently been reproduced by the support not being properly obtained under the arch on the palmar surface of the lower part of the shaft. He thought that in the case now reported the pad of the Bond splint, which goes in the palm of the hand, probably caused the secondary deformity by reason of causing motion at the seat of fracture instead of at the wrist-joint. This is his explanation of the change during the Bond splint treatment from a backward displacement to an anterior displacement of the carpal fragment. He believed the Bond splint to be a dangerous form of splint for fractures of the base of the radius. It should be discarded from the surgeon's outfit.

Dr. Joseph M. Spellissy thought that the Bond splint, which Doctor Roberts condemned, could be used with great advantage if it were properly padded. The arch of the wrist needs to be preserved. Of course, if the Bond splint is used without building up, the hand is thrown into the wrong position, aggravating the deformity. Oakum can be used to advantage for padding, since it is soft but can be molded into shape and is better than gauze. If the fracture be reduced over the knee and the hand put in the proper position, it has the grasp needed, the oakum fills up the space and if necessary repeated dressings can be inserted under the lint used to cover the oakum. The splint takes up very much less room and is less expensive than the more elaborate forms.

IMPASSABLE TRAUMATIC STRICTURE OF THE DEEP URETHRA

Dr. T. Turner Thomas gave the history of a man, thirty-eight years old, who was admitted to the University Hospital October 29, 1917. Has always been strong and healthy. January 19, 1917, while at work in the mines, was squeezed in the pelvic region between two cars. After being in a hospital for thirteen days following the injury, he was operated on but does not know the purpose of this operation, except that a rubber drainage tube was passed from one groin to the other, evidently above and in front of the bladder. He says that he could void urine before the operation by the normal

route fairly well. The tube was removed a week after operation, but on the following day urine escaped from both openings in the groins and ceased to pass by the urethra. The opening in the right groin closed and has remained closed since, but that in the left groin has drained urine periodically since but has not in the last two weeks.

A second operation was performed March 1st, its purpose being to cause closure of the urinary sinus in the left groin and the re-establishment of urination by the urethra. The bladder was opened suprapubically and the urethra through the perineum, a tube being passed from one opening to the other. This was removed eighteen days later under an anæsthetic. Urine passed through the urethra two or three times after this, then ceasing and soon making a new opening for itself in the right buttock. The urine afterward escaped by this opening and that in the left groin.

In July a third operation was performed for the purpose of re-establishing normal urination, only a median perineal incision being made. This attempt also met with failure. At the time of admission to the University Hospital he had for some time been urinating only through the opening in the right buttock and seemed to have good control. He did not soil his clothing and could get to the toilet in time, although he sometimes had to hurry. He voided about every two hours.

Operation was performed at the University Hospital, December 6, 1917. A suprapubic incision was first made, considerable difficulty being experienced in deciding that the bladder had been opened because of its small size, its displacement to the right, and the fact that no prostate or urethral orifice could be detected. A probe passed into the urinary sinus in the right buttock failed to reach far enough to be felt by the finger in the bladder and probably did not get to the bladder or urethra. A No. 26 F. sound introduced by the meatus passed to about the anterior layer of the triangular ligament, a No. 20 a little farther, but it could not be felt by the finger in the bladder. An incision about an inch long was then made in the midline of the perineum to the end of the sound, thus opening the urethra. There seemed to be at least an inch between the end of the sound and the finger in the bladder which was trying to feel the sound through the intervening tissues. With no guide on the inside to indicate the former position of the internal urethral orifice, now probably replaced or closed by cicatricial tissue, the re-establishment of the obliterated portion of the urethra presented difficulty. It was decided to force the end of the sound onward into the bladder and later to maintain the track thus made if possible. For a small distance the sound seemed to be opening up a contracted urethra but for the greater part seemed to be making a new path for itself. The finger could not reach to where the sound came through the mucous membrane, but at this stage and in passing other instruments afterward an assistant by his finger in the rectum determined that the rectal wall had not been penetrated. The sound was then withdrawn and a grooved staff introduced into the badder, on which as a guide a long-bladed bistoury, with its edge turned downward and

to the right, was passed along into the bladder, thus increasing the calibre of the new opening. A No. 26 metal catheter was then passed and its outer end fastened to the penis, to preserve as far as possible the normal shape and curve of the urethra. The lower part of the suprapubic opening was closed by two silkworm-gut sutures, in the upper part a rubber tube being introduced and fixed by suture. The considerable oozing was controlled by gauze packing, and the perineal opening was also thus packed.

The patient had one chill with a moderate rise in temperature after operation, but aside from this did remarkably well. The suprapubic drainage tube was removed in one week and the urine ceased to escape from it in about two weeks and from the perineal wound in about three weeks. The metal catheter was removed twenty-nine days after operation. It was immediately afterward reintroduced and this was followed by a No. 28 F. and a No. 29 F. sound, showing that the new urethra was easy to follow with such instruments. On the next day Nos. 26, 28 and 30 were passed, the last with considerable distress. These were passed daily for about two weeks and then every two days until the patient was discharged from the hospital December 26, 1917. He left the city soon afterwards and has not been seen since, but he promised to have the No. 30 F. sound passed regularly, twice a week for a time and less frequently later.

BILATERAL RENAL CALCULI WITH ENTEROVESICAL FISTULA

Dr. Arthur E. Billings recited the history of a man, aged forty years, who, since 1906, has had occasional pain in his back, at times with frequent micturition. Since childhood he has complained of an "irritable bladder." In the autumn of 1909 he had a severe kidney attack and, after being confined to bed for three or four days, developed severe abdominal pain, persistent vomiting, and absolute constipation, which was diagnosed as intestinal obstruction by his physician and consulting surgeon. He was relieved of this without operation. Soon after this he expelled gas and he thought a slight amount of fecal matter from his bladder. In 1913 he had another renal attack and was in bed for several weeks; after this he had a cystoscopic examination by his physician and was told that he had ulcers in the bladder, which were probably tuberculous and that one of the ulcers communicated with the bowel. He was admitted to the Pennsylvania Hospital September 25, 1916, with a temperature varying between 101 and normal, for six days, and a moderate leucocytosis. In the meantime he was skiagraphed and large stones were revealed in both kidneys with the bladder and ureters negative. At this time there was tenderness over both kidneys, both were palpable, and the left seemed definitely enlarged, where his pain and tenderness were greatest. A phenolphthalein elimination test showed 13 per cent. for the first hour and 12 per cent. for the second hour. Cultures of his urine showed colon bacilli and Bacillus pyocyaneus. A cystoscopic examination and ureteral catheterization was not done because it did not seem wise under the condition. Wassermann examination was negative. Elimination was

encouraged and favored in every way. Supportive and local treatment, consisting of irrigation, etc., was instituted, and benzoic acid was given as a urinary antiseptic, because his urine was persistently alkaline and loaded with phosphates and urates. His lowest point in urinary elimination was 20 ounces in twenty-four hours. On November 16th, his general condition had greatly improved, temperature had been normal for three weeks, leucocytes had dropped from about 24,000 to normal, and his average urinary output was above 60 ounces for twenty-four hours, with considerably less pyuria.

Operation.—Under morphia and atropine and nitrous oxide-oxygen anæsthesia the left kidney was exposed through the usual costo-ilial incision. It was very adherent, but was delivered and the cortex split longitudinally, the stones were removed and the wound in the kidney was closed with catgut mattress sutures. The kidney pouch was drained. There was a moderate amount of urinary drainage for the first fifteen or eighteen days. He made an uneventful recovery and was discharged December 12, 1916. He was re-admitted January 26, 1917, after having gained considerable weight and generally improved.

Second Operation (February 1st).—Under morphia and atropine and nitrous-oxygen anæsthesia the right kidney was exposed in the same manner as the left and it also was very adherent and there was considerable bleeding both from the adhesions and the incision of the kidney, which was also longitudinal through the cortex. The stones were removed, the kidney was closed and the bleeding controlled with catgut mattress sutures. The pouch was drained as on the left side with a rubber covered gauze drain. On the fourth day after operation his abdomen became greatly distended, with persistent vomiting, and evidences of a mass in the right lower quadrant and the suprapubic region were discovered. At the end of twenty-four hours he had expelled gas and was a little improved. During this twenty-four hours his urinary output was about 50 ounces. On the sixth day he was much improved, the mass disappeared and the situation cleared up with the several bowel movements. On the eighth day he had quite a discharge (2 or 3 ounces) of fæces with a lot of gas from his bladder. This persisted for two or three days, his bladder was irrigated sixth hourly and a continuous catheter kept just within the bladder for a few days and 5 per cent. silver iodide emulsion instilled twice daily. Aside from this his recovery was uneventful and he was discharged March 23, 1917, both wounds having healed and being in good condition.

There was no gross clinical evidence at the time of operation of tuberculosis in either kidney. At this writing he has a slight pyuria, but has not had any further fecal discharge from his bladder, although he thought shortly after leaving the hospital, while acutely constipated, that he passed gas from the bladder. His general health is greatly improved and he has added considerable weight (about 20 pounds).

Dr. B. A. Thomas, supplementing what Doctor Billings had said, re-

ported another case of bilateral renal calculi with also bilateral urethral calculi. The case is that of a boy aged twenty-three years, who, his mother said, had passed two stones from the urethra at the age of two years and during his early life he had two attacks of illness which were diagnosed appendicitis. The immediate history of the case is that eight weeks prior to the time he was seen by Doctor Thomas, which was last summer, after having joined the Army, he was seized with a violent attack of left-sided renal colic. That is the side which shows one stone in the lower left ureter. This attack lasted for four weeks, after which he was entirely free from pain until five days prior to the time he saw him when again he had an attack and was admitted to the Polyclinic Hospital. At that time he had considerable suppression of urine; he was extremely toxic. Cystoscopic examination was made and indigocarmine was found to be eliminated on the right side, not until twenty-five minutes. This is the side in which there were the three or four stones. On the left side there was no elimination for that length of time. A urethral catheter was obstructed on the left side at a distance of 10 cm. The patient was losing ground, and was very toxic. It was decided to do only a nephrotomy on the left side which was the side in which there was no function. This was done, but four days later, although for two days there seemed to be improvement, he died, apparently from suppression of the urine. The stones removed were stuck so tightly to the kidney tissue that it seemed almost as if they would break in removing them. Possibly this boy had had renal calculi from the time he was two years of age.

BULLET REMOVED FROM LEFT LUNG

Dr. George P. Müller reported the history of a man, aged thirty years, who was admitted to the Polyclinic Hospital October 23, 1917, suffering from a gunshot wound of the left lung. There was a wound of entrance but not of exit. There was some dyspnœa, but no other symptoms, and the physical signs were those of moderate hæmothorax. The patient was not very much shocked, and was rather under the influence of alcohol.

On the following day the X-ray examination revealed the bullet to be in the lower lobe of the right lung. On the same day he developed delirium tremens and was quite ill for about one week, by which time he was suffering from dyspnœa from the increasing effusion in the chest. There was also marked aphonia, but this could not have been caused by any injury from the bullet. There was also a great deal of pain at the suprasternal notch.

Operation was done under ether anæsthesia (open method), October 31, 1917. A long incision was made over the fourth rib and about four inches of this resected. After cutting through the intercostal membrane the pleura was separated up and down for a little distance and then opened, and then the cavity was found to contain 600 c.c. of bloody and serous fluid. The lung was adherent to the diaphragm and was separated from this adhesion with difficulty. The bullet was felt in the lower lobe and the lung was

brought up into the wound and, by squeezing, the bullet made prominent. A small incision over it allowed it to be popped out. The lung was dropped back into the cavity and the pleura, muscles, and skin sutured.

A beginning was made to dry out the cavity, but, as the patient did not do well, this was abandoned. It was not possible to entirely suture the pleura. The patient stood the operation well and, although at times was rather dyspnœic, this was controlled by drawing the lung into the wound and steadying the mediastinum. The patient made an excellent recovery and six days after operation was up and about the ward.

A FAT-FASCIA-BONE TRANSPLANT FOR DEFECT OF SKULL

Dr. Penn G. Skillern, Jr., reported the following case:

J. V., male, white, aged thirty-two, tiler, was admitted to Polyclinic Hospital (Case Record No. 32216—service of Dr. George P. Müller) on October 26, 1917. Discharged improved on January 15, 1918.

History of Present Condition.—Eighteen months ago—on May 7, 1916—the patient suffered a gunshot wound of head. Immediately upon being shot he had convulsions on left side, involving arm and leg; he then fell upon the floor. The bullet entered the right frontoparietal region and passed backward and downward toward the right occipital bone, against which it lodged: it had not been removed. Three months after the injury—in August, 1916—the first operation was performed: the wound was "cleaned out." The paralysis did not improve after this operation and convulsions continued. Three months after the first operation (six months after the injury)—in November, 1916—the second operation was performed: "a piece of bone was removed." After this operation the convulsions disappeared and the patient began to move the left leg.

Physical examination reveals a trephine opening in the right frontoparietal region, which opening is partially filled in around the edge. There is hemiplegia of the left side, excluding the face. There is an intention tremor—the limbs can be moved if the patient contracts other muscles first, and when the limbs move they exhibit marked tremor. The reflexes are exaggerated, including the deltoid, biceps and wrists, knee-jerks and Babinski: ankle-clonus is present. The flexors of the fingers are somewhat contracted.

The skiagram (Fig. 1) showed the bullet to right of and just above the external occipital protuberance and very close to it, resting upon the tentorium cerebelli. The wound of entrance is revealed as an irregularly circular defect in the right frontoparietal region, over the upper portion of the fissure of Rolando: seen through this defect is a cluster of spicules of bone, apparently carried into the brain by the bullet.

The patient wanted something done in an operative way for the following reasons: Up to the time of the receipt of the injury he had been a vigorous, able-bodied man who worked hard at his trade (tiler). With the exception of the left-sided hemiplegia he still retained these pristine physical qualities and brooded over his inability to work. He therefore wanted an attempt

made to restore the usefulness of his limbs. He also complained that every time he moved his head he experienced in the back of his neck a creaking sensation, as of two pieces of leather being rubbed together. So, too, the defect in the skull, which he could plainly feel, preyed upon his mind and gave him a sense of insecurity.

A study of these propositions from a surgical standpoint did not offer, in the first instance, much hope in the restoration of the usefulness of the limbs. The hemiplegia was doubtless due to destruction of motor cells in the precentral gyrus with subsequent cicatrix formation in the path of the bullet. The only hope in this direction lay in freeing the brain from scar-tension, by removing the dural scar and as much as feasible of the scar-tissue formation that had filled in the path of the bullet. As to the removal of the bullet, such a procedure from a practical surgical standpoint had no indication: it was merely to gratify the patient's wish and relieve him of the paræsthesia of which he complained that this step was contemplated. As to closure of the skull defect, no objections could be found why this should not be accomplished.

Accordingly, the bullet was removed on November 13, 1917, through an osteoplastic flap. The wound healed uneventfully, and the patient no longer complained of his "leather" paræsthesia. Examination of O.S. after operation showed the vision the same as that in O.D.: the patient did not lose the sight in his left eye, as was predicted by an eminent neurologist in case the bullet were removed.

The second operation was performed twenty-four days after the first—December 7, 1917. As this operation is believed to present a more or less original method of closing a skull defect—original in the preservation of the connection of the deep fascia and fat with the bonegraft—the following details have been extracted from the history sheet.

Horseshoe flap of scalp with base below raised, exposing trephine skull defect and adjacent bone. Scar-tissue raised from brain and freed from edge of skull defect. Brain opposite latter more or less disorganized—surface flattened, no convolutions visible. A dense body was palpated in the brain: this was removed and proved a fragment of bone twice the size of a grain of rice. There was some bleeding—arterial spurts and venous oozing—from the median portion of the wound, but this was controlled by packing. The superior sagittal sinus was not opened. The wound was now packed and temporarily closed with a silkworm-gut suture, preparatory to removing the graft from the tibia.

The upper broad subcutaneous surface of the left tibia close to the tibial tubercle was exposed and cleansed with iodine. A goblet-shaped incision was made over this area, and the skin with a thin layer of subcutaneous fat was reflected. The fat, still attached to the deep fascia and periosteum (including tendinous insertions of sartorius and gracilis muscles), was cut wider than the button of bone to be removed, the excess of soft tissue was gathered into the mouth of a 1½-inch trephine, and the button of bone was re-

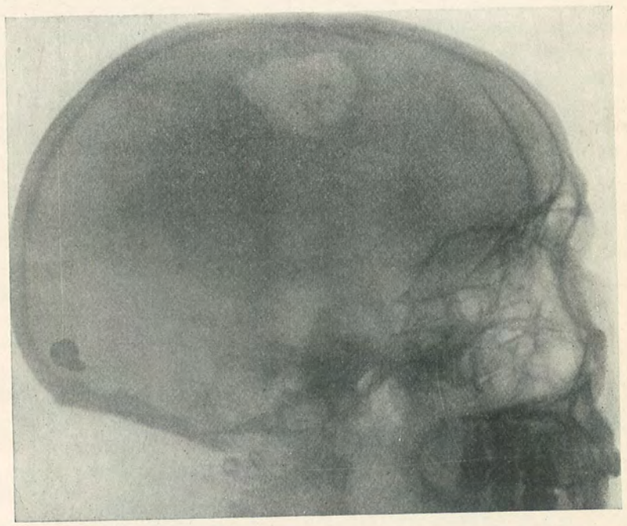


FIG. 1.—Preoperative skiagram orientating bullet in posterior cranial fossa and showing defect in frontoparietal region. Note spicules of bone in brain as seen through the defect—these spicules were carried into the brain by the bullet in its course.

moved. The medullary tissue and endosteum were scraped away from the graft. The leg wound was closed.

Going back to the skull, the silkworm-gut suture was removed, as well as the packing. The fat-fascia-bone graft was inverted, so that its medullary surface lay uppermost (*i.e.*, toward the scalp) and its fat surface most deeply (*i.e.*, against the brain). Six interrupted sutures of chromic gut No. 00 were applied so as to secure the edge of deep fascia and periosteum to that of the dura: these sutures were left long. The edge of the skull defect was freshened and drilled in two places at opposite poles, and the graft was drilled in similar manner: sutures of No. 2 chromic gut were threaded in these holes. The gauze packing inserted to control hemorrhage was now removed, and the graft inserted with fat resting against the brain. The retention dural sutures were tied first, and the two retention bone sutures were tied next. The graft fitted snugly in position, there being left a small slit between the graft and the skull defect anteriorly and a smaller one between the graft and the skull defect posteriorly. The scalp flap was now replaced and sutured with interrupted sutures of silkworm-gut. At the close of the operation the patient's pupils were contracted (1-16-inch) and reacted to light; they were of equal size.

Postoperative Note (January 15, 1918).—It is now nearly six weeks after the second operation. The bone graft has incorporated itself with the skull. As to motor improvement the patient can move his left arm through a wider range, and the intention tremor has disappeared. The finer movements of the fingers have not returned yet. He is able to move his left leg to limited extent and can walk with a cane.

The advantages of the combined fat-fascia-bone graft in this case are obvious. Fat is the tissue best adapted for contacting with the brain substance and serves the double purpose of controlling hemorrhage from the latter primarily and later of preventing adhesions between the cortex of the brain and the sutured duraplasty area. The deep fascia and periosteum are tissues homologous with the dura in structure and in function. The endosteum and medullary substance were removed from the graft to prevent bone formation beneath the scalp. By maintaining these three layers of tissue still connected and in normal relationship with one another favorable conditions of nutrition could be early and readily established.

The following extract, culled from the literature of war surgery, is of interest in connection with this case:

C. Villandre, writing upon the repair of cranial defects (*Presse méd.*, 1917, 300), has, during ten months, personally operated upon 106 cases of loss of cranial substance. The procedures employed were: (1) cartilaginous cranioplasty; (2) osteoperiosteal grafts taken from the tibia; (3) sterilized bone plaques; (4) paste composed of carbonate and phosphate of lime for small breaches.

The statistical results of the four procedures are as follows: Osteoperiosteal grafts, 32 successes in 32 cases, or 100 per cent.; cartilaginous cranio-

plasty, 46 successes in 48 cases, or 96.8 per cent.; sterilized bone plaques, 18 successes in 22 cases, or 81.8 per cent.; lime paste, 2 successes in 4 cases, or 50 per cent.

A graft of living substance—bone or cartilage—removed from the patient himself and at a distance from the site of the loss of substance, is therefore the most practical and the surest method of repairing a loss of cranial substance.

As regards the question of ablating portions of the altered cerebral cortex we cite from the following not dissimilar case of Kalb *(Deutsche med. Wchnschr.*, 1917, No. 5), which was that of a boy fourteen years old who for ten years had been epileptic. There was a history of infantile cerebral paralysis. In the pre- and postcentral gyri there were numerous brown-red patches of infiltration containing in certain parts small cysts.

"As complete extirpation of the altered zone would have resulted almost certainly in total paralysis of the right limb, I dissected out from the altered parts small islets varying in size from a lentil to a pea and for a depth of 5 mm. About a dozen such were removed, constituting about two-thirds of the altered parts of the grey matter. Islets of normal cortex remained. There was some language disturbance following operation, but after a week this as well as the limb paralysis improved. After four weeks the patient could walk with the aid of a cane. After one year and a half psychic phenomena have disappeared; the general intelligence is better and the patient can walk for some hours."

Dr. Charles H. Frazier remarked that cranioplasty was one of the most popular topics of discussion in the surgery of the war zone. Many articles are to be found in literature bearing upon this subject. The points which are of principal interest to the surgeons of the war zone to-day seem to be (1) as to whether the defect should be repaired; (2) when it should be repaired; (3) how it should be repaired.

Whether the defect should be repaired depends to a large measure upon its size. Apparently there is a unanimity of opinion that if the defect be large it should be repaired. Many patients so afflicted have a great many subjective phenomena, as in the case just reported by Skillern, which they attribute to the presence of the defect. There are a few surgeons and a few neurologists who are disposed to believe that in epilepsy it is wiser to leave the defect alone, on the ground that anything which tends to increase intracranial pressure acts as a predisposing factor. This phase of the subject is too large to dwell upon here. Suffice it to say that there are two schools, one which believes that epilepsy is due to increased intracranial pressure, the other that increased intracranial pressure is an accompaniment but not the cause of the seizures.

Regarding the time at which defects should be repaired, there seems to be an almost unanimity of opinion that operation should not be done until at least eight weeks after the wound has entirely healed. In the speaker's opinion it should not be done for six or eight months after the accident because the incidence of infection is too great when the operation is performed sooner, that is in case of gunshot wounds that were, as most of them are, the seat of infection.

As to how it should be done—this is a matter of comparative simplicity. The repair of defects with bone or cartilaginous grafts is one of the simplest of surgical procedures. He had had a number of cases in his clinic at the University Hospital, and in these he had practised a modification of the technic of the so-called König-Müller operation. The graft is removed from the parieto-occipital region and is composed of the pericranium and outer table of the skull—not the entire thickness of the skull nor the pericranium alone; it is necessary to remove only a thin shell of bone. The graft is transferred to the defect, the margins of which have been previously freshened, dura freed from the margins and in some instances removed. In the course of six or eight weeks one finds consolidation at the site of the defect complete.

With regard to the technic which seems to be popular in the war zone, particularly with the French surgeons, cartilage is used rather than bone. Cartilage does not become absorbed, it does not shrink, it maintains its vitality and merely changes its residence from one part of the body to another. The supply is secured from the cartilage of the ribs. Some surgeons have taken bone grafts from the tibia or scapula, some from the scapula of the lower animals; some have used the König-Müller operation, some of the skulls of those that have been killed in action, others foreign material such as ivory and silver plates.

The points that have been emphasized in the technic are the following: In the first place the graft should be autoplastic rather than homoplastic or heteroplastic. His results with the bone graft justify the employment of bone, although cartilage may be more readily obtained and answers the purpose quite as well. The defect must be carefully prepared—this includes freshening of the margins, the freeing of the dura from its adherence to these margins. When the dura is incorporated in a thick scar and the latter is adherent to the cortex, he excises it, scar and dura together. The graft should be laid in the defect with its smooth surface toward the brain. Usually he has fixed it in place with a few interrupted sutures through the pericranium. Some surgeons place the margins of the graft between the dura and the bony margins of the defect, some make a trellis-work with catgut sutures passing across the defect. Hæmostasis is regarded as a *sine qua non*, and if it is not possible to control bleeding from all sources, a drainage tube should be used. Some surgeons recommend the exposure of the defect with a crucial incision, although he prefers a horseshoe-shaped flap.

The results of cranioplasty, from the standpoint of the repair of the defect, are almost universally good. He had seen reports of cases where, in removing the graft from the tibia, the latter has been broken or the wound became infected, but these are complications that should have been avoided. Insofar as the operation affects the relief of such symptoms as headache, dizziness and the like, possibly more than half of them are successful. Statistics vary as to the influence of the operation as a prophylactic or in relieving epilepsy. On the whole, reports more than justify the undertaking.

STATED MEETING, HELD FEBRUARY 7, 1918

The President, Dr. Edward Martin, in the Chair

EXTENSIVE CAVERNOUS ANGIOMA OF THE NECK TREATED BY RADIUM

Dr. D. L. Despard and Dr. C. B. Longenecker (by invitation) presented a child, observed by them in the Surgical Department of the Jefferson Medical College Hospital.

The mother stated that the growth had become noticeable a few months after birth, and while at first small had rapidly increased in size until the present time. When presented there was a large cavernous angioma occupying practically the entire left posterior triangle of the neck (see Figs. 1 and 2).

The growth seemed to take its origin not only from the floor of this triangle, but also from beneath the clavicle and from behind the lower half of the sternocleidomastoid muscle. It was entirely subcutaneous, without skin involvement, beyond a slight dusky discoloration, where the veins or the dilated endothelial spaces approached the skin surface and could be seen through it. These could be felt upon palpation, were easily compressible, only to recur upon the withdrawal of the pressure. In view of the hazards attending operation for its removal, he consulted Doctor Newcomet in regard to radium, who was of opinion that it might be materially shrunken by its application. So the child was placed under his care and later when Doctor Newcomet entered the Military Service, Doctor Longenecker continued the treatment, with a brilliant result.

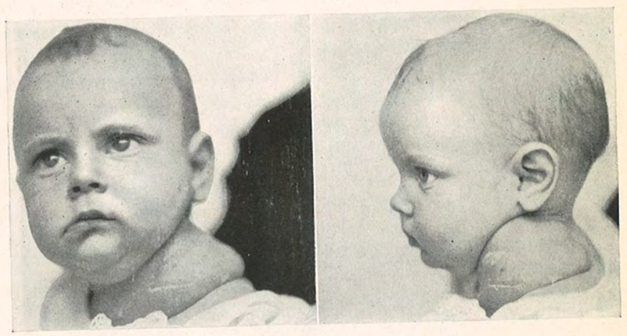
PLASTIC (RECONSTRUCTIVE) SURGERY OF THE HAND AND FOREARM

Dr. A. Bruce Gill read a paper with the above title, for which see page 17. He also presented for examination the patients who had been under his care, demonstrating the results secured.

Dr. Penn G. Skillern, Jr., said that the point which Doctor Gill brought out in regard to making incisions in the normal horizontal flexion creases in preference to vertical incisions is worthy of emphasis. The difference between these two incisions is just this: the vertical incision across a flexion crease is followed by keloid overgrowth and deforming contracture; the horizontal incision through or in a flexion crease is followed by an invisible scar. He recently removed a luxated semilunar by cutting through the proximal flexion crease of the wrist: at the end of two weeks no scar could be found. In transplanting the palmaris longus in its sheath to the little finger by the method which he recently described (*Medicine and Surgery*, December, 1917, 1108) he exposed the empty flexor tendon sheath of the little finger by

Fig. 1

Fig. 2



Figs. 1 and 2.—Cavernous angioma of the neck.

raising an anterior flap from the flexion surface in the following manner: Two horizontal incisions were made—one through the distal flexion crease of the little finger and the other through the flexion crease of the palm—and these two incisions were connected by a longitudinal incision along the ulnar border of the little finger; by raising this quadrilateral flap and reflecting it to the radial side excellent exposure of the desired field was obtained.

Doctor Gill stated that in the case of tenolysis in which he transplanted fat-fascia lata to the wrist and arranged it in three tiers to enwrap the flexor tendons he had difficulty from necrosis of the overlying skin, due to the excessive tension to which it was subjected from bulging of the large amount of fat and fascia stuffed into the forearm. In these cases of tenolysis of many closely-related tendons it is Doctor Skillern's practice to take the flat piece of fat-fascia transplant and, with the fat side toward the tendons, arrange it in and out among the tendons until it resembles a corrugated board: the summits of every two adjacent corrugations are then stitched together, thus forming a series of tendon sheaths; the free lateral borders of the transplant are sutured to the cut lateral margins of the deep fascia so as to anchor the corrugated tendon sheath. This method, originally devised for a case of old Volkmann's contracture, has been uniformly successful.

Dr. Gwilym G. Davis called attention to the service of a fat flap. The cargyle membrane had been used, especially in treating contracture of the forearm and hand, but the serous discharge which occurred in these cases was apt to expel the membrane. Doctor Gill has demonstrated that in these operations, as in bone surgery, the autogenous graft has been the most desirable.

Since the discussion has included the question of finger tendons he would mention a method which he had found of service in one patient. The man was injured by a cut across the palm dividing the flexor tendons of the little and ring fingers. When the man was seen some considerable time after the injury he found on cutting down upon the hand that the proximal ends of the tendons had contracted to such a degree that he did not feel justified in splitting the hand as far as would be necessary in order to reach them. He, therefore, made an incision and divided the superficial flexor of the good finger in two parts—one part was attached to the deep flexor of the little finger and one part to that of the ring finger. The wound healed up well and the result was very satisfactory. He mentioned this case simply to show one of the many combinations of operation possible to do in these tendon cases. Of course, one must not be satisfied with simply doing the operation. There must be a long series of after-treatments. In speaking in this connection at the meeting of the College, Dr. R. Tait McKenzie said that in the after-treatment of such cases if the cicatricial scar is not pronounced, hot water baths, etc., may be used. A marked scar, however, is apt to be softened by the hot water bath, resulting in a raw surface and interference with healing. The selection of the postoperative treatment must be made with much care.

INTESTINAL OBSTRUCTION DUE TO GALL-STONE

Dr. W. E. Lee and Dr. Helen J. LeMaistre (by invitation) presented a woman, aged fifty years, who had been in good health up to April, 1917, when she began to suffer from constipation and mental depression. In July she was seen by Dr. F. T. Stewart who made a diagnosis of cholecystitis. In January, 1918, she complained of nausea and vomited bile. Examination elicited great tenderness over gall-bladder and right iliac region; no rigidity. Temperature was only about 100°; pulse 100 and weak. Food was withheld and flaxseed poultice applied. Next day pain was localized over stomach, and fractional doses of calomel administered. The following day (third), after a good loose bowel movement, the patient again vomited greenish bile and in a few hours her abdomen was found to be distended and there was rigidity over gall-bladder area with marked sensitiveness in epigastrium. Enema was followed with good result and distention disappeared. The fourth day (January 24th) there was distention over lower abdomen with diminished peristalsis. There was frequent vomiting of bile which was induced by any movement on part of patient. Stomach lavage resulted in the withdrawal of unmixed bile. Flaxseed poultices applied over distended area with moderate effect and enema result was found negative for blood and bile. Seen by Doctor Lee the evening of the fifth day (January 25th), at which time there was rigidity over gall-bladder area with continuing tenderness in epigastrium, distention of the transverse colon, absence of peristalsis and partial obstruction of bowels. Exploratory operation advised. Early the next morning the patient vomited a large amount of very dark fluid with decided fecal odor and she complained of intense pain in gall-bladder region. Distention unrelieved, though bowels moved voluntarily with large amount of partly formed stool, containing fresh blood and clots of a clear mucoid material with shreds of tissue. Laboratory examination showed this tissue to be fragments of involuntary muscle and fibrous tissue heavily infiltrated with red blood-cells and polymorphonuclear leucocytes, denoting acute inflammation. Patient removed immediately to General Hospital and shortly after arrival had several more bowel movements, mixed with fresh blood. Operation delayed, as it appeared that the obstruction was relieving itself. A few hours later (sixth day after onset of symptoms) she passed a large biliary calculus per rectum and distention gradually subsided. From this time (two weeks ago) patient has made a surprisingly rapid recovery. There is still sensitiveness on palpation over gall-bladder area but bowels are moving normally and patient is able to digest semi-solid food comfortably. The fæces are now of a light brown color and partly formed consistency, with no evidence of bile or blood.

THE SWIFT-ELLIS METHOD OF TREATMENT IN CEREBROSPINAL SYPHILIS

Dr. B. A. Thomas presented his experiences with the intraspinal method of treatment of cerebrospinal syphilis. He mentioned the anatomical con-

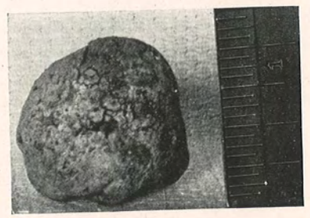


Fig. 3.—Gall-stone producing obstruction of bowel.

siderations which prompted Swift and Ellis to suggest and utilize the intraspinal injection of autosalvarsanized serum in the treatment of this disease. Attention was directed to the fact that in his experience with twenty-five cases, deductions were necessarily inconclusive, because the cases on the one hand had been treated intensively intravenously so long as improvement was manifested clinically and serologically (including examination of the spinal fluid), and on the other hand, to the fact that many cases had been referred primarily for the Swift-Ellis treatment, receiving an insufficient number of injections, and as shown by the analysis in the table of cases presented, an absolutely inadequate amount of treatment for permanent results. The technic in general was outlined, and precautions stipulated as to dangerous procedures.

Attention was directed to the fact that in a few cases of tabes treated by intravenous injections only of salvarsan, the results thus far have been apparently just about as good as in other cases, in which the intravenous injections were supplemented by intraspinal injections of autosalvarsanized serum.

In the treatment of paresis, Doctor Thomas believed that salvarsan, either intravenously or intraspinally, possessed no advantages over mercury and the iodides, and in fact was likely to be harmful.

From his experience, Doctor Thomas believes that the question of the value of intraspinal medication in the treatment of cerebrospinal syphilis is still an open one, and does not believe that it should be resorted to so long as improvement can be obtained from intravenous injections alone of salvarsan. He strongly believes that mercury and the iodides still continue to be indispensable remedies for the best treatment of cerebrospinal syphilis, although their administration in certain types of this form of the disease may and should be preceded by intravenous injections of salvarsan, and possibly by intraspinal medication if further improvement is no longer manifested following the intravenous injection. Certainly patients with marked cordical degeneration offer little if any hope of improvement by this or any other known method of treatment.

CARCINOMA OF THE PENIS

Dr. B. A. Thomas presented a negro, aged thirty-seven, who came to the Genito-urinary Department of the Polyclinic Hospital in the latter part of December, 1916, with a history of life-long phimosis. A year prior to admission he noticed a subpreputial discharge, and a few months later the glans penis began to enlarge, and a bloody discharge appeared from the preputial orifice. Examination revealed an indurated irregular ulcerating mass four to six centimetres in dimensions, involving the entire glans. The inguinal lymph-nodes were palpable; the Wassermann reaction was negative.

On January 5, 1917, a bilateral inguinal lymphadenectomy, followed by total extirpation of the penis, was performed under ether anæsthesia. The laboratory report rendered by Doctor Kolmer showed a squamous-celled

carcinoma, with very early involvement of the lymph-nodes. During his stay in the hospital, the patient was given intensive X-ray treatment, in the hope of preventing recurrence. The patient was discharged from the hospital exactly four weeks after the operation.

The patient was exhibited to show the satisfactory results, inasmuch as he has shown no signs of recurrence to date, over two years. He has complete control of urination, obviously assuming the sitting posture, and is actively engaged in laboring work.

PLASTIC (RECONSTRUCTIVE) SURGERY OF THE HAND AND THE FOREARM*

By A. Bruce Gill, M.D.
of Philadelphia

Reconstructive surgery of the hand and the forearm is of very great importance because of the large number of mechanics and workmen who suffer injury to these members and who are more or less permanently disabled thereby. Injuries of the upper extremities are much more disabling than similar injuries of the lower extremities.

It is difficult surgery because of the complex and fine structure and function of the hand. There are certain principles which must be here strictly observed; for ill-advised, poorly-planned, and improperly-executed operations will only make the patient worse. And even slight infections may destroy your finest work.

Finally, this branch of surgery has been more or less neglected by the general surgeon. It is often tedious and requires considerable patience and prolonged after-treatment. Unfortunately, repair of injuries of the hand and the forearm is frequently made by the inexperienced hospital interne in the receiving ward. The patient is afterwards dressed in the surgical dispensary. And as his wound heals he is discharged with a more or less disabled hand. He departs, taking it for granted that nothing more can be done for him. Seven of the following eleven cases had hospital treatment before they were seen by the author.

The principles of orthopædic surgery applied in the operative work and in the after-treatment by massage, electricity, hydrotherapy, active and passive movements, and by the use of special splints as necessary, will go far toward the restoration of these industrial cripples to their former positions of usefulness and independence.

The following cases are presented to illustrate some of these methods of surgery and their results:

Case I.—E. M. In August, 1914, she had an infection of the right hand. Sinuses remained open at the sites of incision for five weeks. The fourth and fifth fingers were left stiff in almost complete extension, while active and passive flexion were impossible. Massage was begun and continued for almost eight months with but little improvement. She was then referred to the orthopædic clinic at the Presbyterian Hospital. Examination showed that the extensor tendons of the fourth and fifth fingers were adherent on the dorsum of the hand, that the fingers were held in almost full extension, and that active and passive flexion of these fingers were greatly limited and painful.

* Read before the Philadelphia Academy of Surgery, February 7, 1918.

Operation (May 3, 1915).—Through a longitudinal incision the extensor tendons of the fourth and fifth fingers were exposed over their entire course on the dorsum of the hand. They were found firmly adherent to the skin and to the structures beneath them. The adhesions were divided with a sharp knife to cause as little injury to the tissues as possible. The fingers could then be well flexed passively. The incision was sutured. The wound healed by first intention. Ten days later massage was begun. Some improvement followed this operation, but active and passive flexion were incomplete and forced motion or active effort elicited fairly severe pain about the metacarpophalangeal joints.

Second Operation (October 5, 1915).—The tendons were freed from adhesions and were surrounded by a layer of fat taken from the thigh. Improvement following this operation was rapid, and within a few months she regained complete normal motion and function of the two fingers. A good result was obtained only when the tendons were surrounded by fat from the thigh.

Case II.—M. N. Seen at the Orthopædic Hospital on May 26, 1917. In August, 1916, her left hand had been cut with glass on the ulnar side of the palm. An operation had been performed at another hospital in Philadelphia. Examination showed a long dense scar extending longitudinally on the ulnar side of the palmar surface of the left hand. The little finger was held in a position of partial flexion beyond which active and passive extension were impossible. Passive flexion was complete, but active flexion was absent. There was numbness over the two distal phalanges. The position of the finger interfered with her work in the mill.

Operation (September 7, 1917).—Incision along the old scar. After considerable dissection the ends of the severed flexor tendons were found buried in scar tissue one and one-half inches apart. The finger could not be fully extended owing to contracture in the joints. Union of the separated ends of the tendons was secured by means of a bridge of fibrous tissue that was adherent to the distal ends. A piece of fat from the thigh was placed about the tendon, and the wound was closed.

September 22, 1917: Wound healed, no active motion of sutured tendons.

October 23, 1917: Good active motion in metacarpophalangeal joint, none in the interphalangeal joints.

November 17, 1917: Moderate contracture in interphalangeal joints. Slight active flexion of second and third phalanges. Sharp, cutting pain in palm on motion of finger, tendons slightly adherent to scar in region of distal transverse palmar crease.

February 23, 1918: On making fist the finger flexes completely into the palm; but on holding the other fingers extended the little finger does not flex completely. Active flexion in all joints. Passive extension incomplete, even when metacarpophalangeal joint is flexed. Complete return of sensation in finger.

March 30, 1918: Good active flexion in all joints. Passive and active extension incomplete and identical. Good function of finger, no interference with work; but patient complains of pain in distal palmar crease on flexion of the finger. Advise second operation with incision along line of palmar crease to free tendons from adhesions and to place another small layer of fat from the thigh about them.

Discussion.—When operating on this case the mistake was made in making a longitudinal incision along the line of the old incision in the palm. A transverse incision along the distal palmar crease and then longitudinally along the ulnar side of the hand would have been better. The original longitudinal incision of the palm left a hard adherent scar a year later, and a thick firm scar is still present from the last operation. A longitudinal incision on the dorsum of the hand leaves no bad results, as illustrated in Case I, but on the palmar surface of the hand and fingers it should always be avoided if possible. The following case illustrates the advantage of a transverse incision along the line of a natural crease.

Case III.—G. H., a mechanic. September 20, 1917, he was struck on the palmar surface of the wrist by a steel shaving. The foreman of the shop drew out a piece of steel which was protruding from the skin. The wound soon healed.

October 16, 1917: Referred to my dispensary at the Presbyterian Hospital. Diminished sensation present along the median nerve distribution. The nerve evidently had been injured in the wrist by the steel. Unable to make good fist. Very little power in fourth and fifth fingers in active flexion.

January 8, 1918: Almost complete return of normal sensation. Only one-half normal active flexion of fourth and fifth fingers. A small firm mass felt in palm along line of their tendons. An X-ray plate showed a long narrow piece of steel present in palm of hand.

Operation (January 15, 1918).—Incision along distal palmar crease. After a fairly long search the steel was found within the common sheath of the flexor tendons lying between the superficial and the deep. Wound closed with three fine catgut sutures.

February 7, 1918: Wound healed, scar scarcely visible. Patient has returned to work. Complete normal function of fingers and hand.

Case IV.—L. S. December 22, 1917: Orthopædic Hospital. In September a heavy door closed on his left hand, and the ring which he was wearing on his fourth finger severed the flexor tendons of the finger. Operation on the finger was performed in Pittsburgh a month ago. On examination there is present a linear scar on the palmar surface of the ring finger extending from the middle of the second phalanx to the metacarpophalangeal joint. There is complete active flexion of the metacarpophalangeal joint, but none in the interphalangeal joints. The tendons are adherent to the proximal end of the scar. Finger remains in full extension and passive flexion is normal.

Operation (January 25, 1918).—Incision along the old scar. The

sublimis and the profundus tendons were found adherent to the scar in its entire extent, but not severed. A fine layer of fat was taken from the lower part of the external surface of the thigh next to the fascia lata. This fat was sutured about the tendons, and a pulley was formed at the proximal interphalangeal joint for the profundus tendon. Fine chromic gut (00) threaded on fine needles was used for this work. Wound closed. Two days after operation the patient became ill and had a high fever. Fearing that there might be a streptococcic infection of the finger I opened the wound. Only a little serum was present, but the wound was allowed to remain open. Within twelve hours the patient developed well-defined scarlet fever and was at once transferred to the Municipal Hospital. While there the fat sloughed out of the finger and the wound healed.

March 24, 1918: Wound healed. No active flexion of the finger. Tendons are adherent to the scar. Advise second operation when the general condition of the patient is normal again.

Discussion.—A tedious, delicate operation was rendered useless by a slight infection which occurred either at the time of operation or when the incision was reopened. A flap incision along the side of the finger and across the crease at the distal interphalangeal joint would probably have been better than the incision along the old scar on the palmar surface of the finger. The fat which can be used in the finger must be very delicate. The coarse subcutaneous fat from the thigh, particularly in women, is not suitable. In patients who are slender, the inner portion of the fat next to the fascia lata may be employed. This fat is covered with a delicate membrane which may well make a suitable tendon sheath. The tissue about a hamstring tendon or along the tendo Achillis, as advised by Bunnell, should give a good result. A pulley should be made for the flexor tendons where they span a joint.

The following two cases illustrate the suturing of tendons of the fingers under local anæsthesia:

Case V.—E. B., a librarian, November 5, 1917. A month ago she cut her left thumb with a steel paper-knife. The incision was small and deep and it divided the tendon of the extensor longus pollicis just distally to the metacarpophalangeal joint. The second phalanx of the thumb remains in partial flexion and no active extension is possible.

Operation (November 8, 1917).—Under local anæsthesia. The two ends of the tendon were dissected free from scar tissue and sutured with fine chromic gut. Patient could then flex and extend thumb to the normal limit. Wound closed. Uneventful recovery with good function except for slight adhesion of skin at site of incision.

Case VI.—A. B., a machinist. Seen at the Episcopal Hospital. October 15, 1916, the middle finger of his right hand was cut transversely across the palmar surface at the distal interphalangeal joint. The flexor profundus tendon was severed. The wound healed but the distal phalanx of the finger could no longer be actively flexed.

Operation (February 27, 1918).—Under local anæsthesia. A transverse incision across the distal crease of the finger with a connecting lateral longitudinal incision made a skin flap which was turned to one side to expose the entire palmar surface of the finger. The flexor profundus tendon could not be found. Its proximal end had probably retracted into the palm of the hand, where the patient says he has a point of tenderness on pressure. A strip of fibrous tissue which was adherent to the distal end of the profundus tendon was sutured to the sublimis tendon at the distal end of the proximal phalanx. Wound closed.

Discussion.—This operation may prove insufficient to secure active motion of the distal phalanx. If necessary, a second operation can be done to expose both ends of the profundus tendon and to unite them by splicing or by using a portion of a tendon of the foot as a graft.

Case VII (Reported in *Transactions of the Philadelphia Academy of Surgery*, October 1, 1917, Annals of Surgery, January, 1918).—J. D. Episcopal Hospital, June 18, 1917. The ring finger of his left hand is contractured at the metacarpophalangeal and the proximal interphalangeal joints and is flexed completely into the palm. Extensive dense scar tissue is present in the flexure of the joints. The deformity is the result of an injury sustained twelve years ago. He is a leather-worker.

Operation (June 27, 1917).—The scar tissue was excised from the finger, leaving a raw surface extending from beyond the proximal interphalangeal joint to the distal palmar transverse crease. The flexor sublimis and profundus tendons were then lengthened to allow the finger to be extended. It was then found necessary to excise a portion of the distal extremity of the proximal phalanx in order to permit of free motion in the proximal interphalangeal joint. The pouch of skin on the dorsum of this joint was used in part as a flap to cover the flexor surface of the joint. The remaining raw surface was covered by a pedicled skin graft from the left thigh.

Operation (July 11, 1917).—The pedicled graft was cut free from the thigh. The graft was firmly united to the hand.

September 17, 1917: The wound of the hand gradually healed after a little sloughing of the graft along one margin. The tendons were exposed for a time but did not slough.

The finger is straight. The skin graft has made a thick pad of tissue at the base of the finger. No active flexion of the finger is present and but slight passive motion. The patient has returned to work.

February 11, 1918: The finger is straight. There is active flexion of the metacarpophalangeal joint to a right angle. No active motion in the interphalangeal joints. Slight passive motion in the distal joint but none in the proximal. The skin graft is thick and prominent. Sensation is present in the graft except along its ulnar margin. This patient can probably be further improved by another operation which will free the tendons from scar tissue, secure better motion in the

proximal interphalangeal joint by excision of another portion of the proximal phalanx if it is found necessary during the operation, and which will reduce the thickness of the skin graft.

Case VIII.—G. W. Episcopal Hospital. In August, 1917, the patient was struck in the forearm by a piece of steel which buried itself in the muscles. At operation the surgeon had difficulty in finding the steel and made a fairly extensive dissection in his search. Finally the steel was withdrawn by the application of a strong magnet. The wound healed promptly without complication.

October 1, 1917: Referred to my service. Examination shows the flexor tendons of the fingers to be adherent to the scar of the incision. The fingers are held in partial flexion and cannot be fully extended either actively or passively. Active flexion is incomplete. There is hyperæsthesia and numbness of the middle finger.

Operation (October 17, 1917).—Longitudinal incision to one side of the scar. Flexor tendons were dissected free of all scar tissue and were surrounded by a free fat transplant from the thigh. Wound closed.

November 5, 1917: Wound healed, light massage ordered. Good use of hand.

November 19, 1917: Able to make good fist. The fat transplant moves up and down with the tendons. No pain at any time in arm. Normal function of the hand. There is complete active extension of wrist and fingers and almost complete hyperextension of the wrist when the fingers are kept extended. Normal sensation in the middle finger.

Discussion.—This case illustrates the fact that a clean operative dissection of the forearm may be followed by adhesions which greatly interfere with normal use of the hand. It is the author's opinion that in any operation, primary or secondary, which requires a dissection of the structures of the forearm, measures should be employed to prevent adhesions of these structures to one another and to the skin. The simplest and probably the best means of prevention is the free fat transplant. Cases nine and ten, in which clean operations were also productive of dense scar tissue, confirm this opinion.

Case IX.—G. F. Episcopal Hospital. In July of 1917 the patient fell from a stack and cut his left forearm transversely to the bones on the palmar side about the junction of the middle and lower thirds. He was treated in a hospital for three weeks, within which time he was operated on.

October 5, 1917: Examination reveals a deep transverse scar on the palmar surface of the left forearm. The arm and hand below the scar are slightly bluish in color and cool, and are without sensation. The patient says the hand "feels dead." There is complete ulnar and median paralysis below the scar, accompanied by wasting of the muscles of the hand. The fingers and wrist are in a position of extension, and there is complete absence of active flexion of the wrist and fingers and thumb except for slight power in the radial flexor of the wrist.

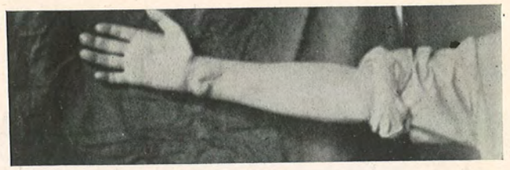


Fig. 1.—Case IX. April 9, 1918.

Fig. 2.—Case IX. May, 1918.

Fig. 3.—Case X. May, 1918.

FIG. 4.—Case XI. April, 1918.

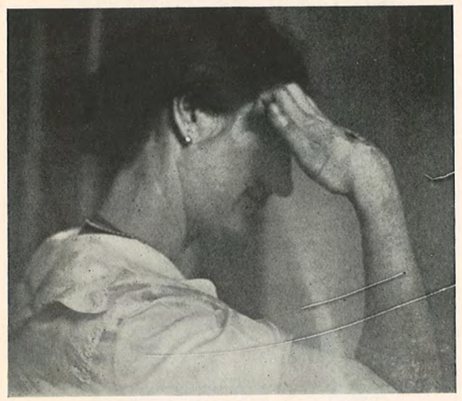


FIG. 5.—Case XI. April, 1918.

November 19, 1917: The patient has had treatment by massage and has developed very slight active flexion of the metacarpophalangeal and the proximal interphalangeal joints.

Operation (November 21, 1917).—Through a longitudinal incision all the structures in the lower half of the forearm were dissected free from dense scar tissue. The dissection had to be carried down to the bones and the interosseous ligament. The ulnar nerve was found fastened to a tendon, the ends of the median nerve were buried in scar tissue, and but one or two tendons were found united. The ulnar artery had evidently been ligated at an earlier operation, as it was not patulous. The dissection of the nerves and tendons was carried down beneath the annular ligament until they were completely free of adhesions. All the tendons were lengthened to permit of their proper suturing. The two nerves also were lengthened and sutured. Fat was then taken from the thigh and placed between the deep tendons and the bones, another layer between the deep tendons and the superficial ones, and a third layer between the superficial tendons and the skin. Tubes of fat were sutured about the two nerves. The skin incision was closed, and the hand and arm were placed on a dorsal splint.

December 24, 1917: Along the line of the old transverse scar the skin sloughed a little, and the underlying fat became infected. The patient has slight active flexion of the wrist and metacarpophalangeal joints, but none in the interphalangeal joints.

January 7, 1918: Some of the superficial tendons of the arm have sloughed out. The wound has been treated from the beginning with dichloramine-T, and it is now healed. There is active motion of the radial and ulnar flexors, slight motion in the metacarpophalangeal joints and some motion in all the joints of the fingers and thumb. Sensation has returned on the dorsum of the hand.

March 4, 1918: There has been steady improvement in all active motions and in sensation.

April 4, 1918: Almost normal active motion of the wrist and about one-half normal active flexion of the fingers and thumb. Sensation has returned to the hand and fingers except in the median and the ulnar distribution. The superficial tendons are adherent to the scar.

Operation (April 17, 1918).—An incision was made at the side of the former one. The superficial tendons were found to be ununited, with their ends separated about two inches, while the deep tendons were all united but were partially adherent to scar tissue. The two nerves were also ununited, and the proximal end of the ulnar nerve could not be found. Again the superficial flexors were sutured after being lengthened. The tendons of the little and ring fingers were sewed together above and below the gap and a part of one tendon was used to bridge the gap. The same procedure was employed with the superficial flexor tendons of the index and middle fingers. The median nerve was spliced and sutured. Fat from the other thigh than the one used at the first operation was placed between the deep and the superficial tendons, and between the superficial tendons and the skin. The hand and arm were dressed on a dorsal splint.

Discussion.—A free fat transplant must of necessity secure nourishment and a new blood supply from the surrounding tissues, if it is to live. It may do this with difficulty when the tissues with which it is in contact are scar tissue with but scanty blood supply.

In this case three layers of fat were introduced within the arm, and it is not to be wondered at that the scar tissue in the skin, together with the superficial layer of fat, failed to secure proper nourishment and sloughed. But the surgeon should not be discouraged if in an extensive plastic operation he does not secure an ideal result at the first attempt. If he be able to improve the condition in part by successive operations, a good result will be obtained in the end.

In this case a result from the suturing of the nerves is scarcely hoped for. In fact at the second operation the proximal end of the ulnar nerve was not found. If the tenoplastic work has now been accomplished, the proper nerve-suturing must be attempted at a later operation, when the ulnar nerve may be exposed above the present wound and followed downward.

Case X.—M. McD. Episcopal Hospital. On August 27, 1913, this patient, a girl of six years of age at the time, fell from an express wagon and suffered a fracture of the right humerus at the elbow. She was taken at once to the receiving ward of the Episcopal Hospital and the arm was dressed in a position of hyperflexion of the elbow. An X-ray picture taken the same day showed that the fracture had been reduced. She was dressed again two days later, August 29th, in the surgical dispensary. Blood blisters were present on the forearm. There appeared to be no feeling in the hand and fingers. No pain. On October 7, 1913, she was seen by Doctor Ashhurst who found the following conditions: elbow motion, 75 to 135 degrees. Slough on ulnar surface of forearm two and one-half inches long and one inch wide, which seemed to involve only the skin and subcutaneous tissues. No sensation below the wrist. Beginning Volkmann's contracture. Hand in mid-pronation with scarcely any rotation possible.

November 3, 1913: Motion of elbow 50 to 130 degrees. Granulating wound on ulnar surface 1.0 cm. above the ulnar styloid, 3.0 x 2.0 cm. Wrist extends 20 degrees, flexes 45 degrees. Claw hand. When wrist is flexed to the limit, the fingers can be fully extended. Sensation present in radial nerve distribution on the outer side of the web between the thumb and index finger, and nowhere else. No sensation in median nerve distribution. The only sensation in the ulnar distribution is on the ulnar surface of the fifth metacarpal.

November 24, 1913: Wound healed. Massage and active and passive motion ordered.

December 8, 1913: Sensation has returned in the distribution of the radial nerve. Rotation of the forearm has slightly improved.

December 22, 1913: Slight power in the lumbrical muscles.

January 5, 1914: Fingers can be straightened when wrist is extended. Improving.

February 16, 1914: Anæsthesia present chiefly in the ulnar distribution.

March 9, 1914: Wrist can be slightly hyperextended. Dorsal ulnar and median anæsthesia, palmar anæsthesia distally from web of fingers except the thumb.

Operation (March 25, 1914).—By Doctor Ashhurst. Dissection of the structures of the forearm. The incision was closed without placing any fat about the structures beneath.

April 20, 1914: Active movement of the flexor profundus digitorum in the middle and ring fingers; doubtful in index and little fingers. Sublimis active in all. Extensors of fingers slightly active. Thumb flexors and adductors inactive. Massage and passive motion ordered.

October 12, 1914: Elbow motion 30 to 155 degrees. Anæsthesia on extensor surface of two terminal phalanges of middle finger and on flexor surface of tips of index and middle fingers. Some power in deep and superficial flexors of the fingers.

August 20, 1915: Thumb much improved. Elbow motion and areas of anæsthesia unaltered.

October 1, 1917: The patient disappeared and has had no treatment during the past year. Elbow motion 45 to 155 degrees. The right forearm is much smaller than the left and is one inch shorter. Absence of rotation, forearm in mid-position. The hand is in extreme flexion and cannot be extended to the straight line, and it is deviated to the ulnar side. There is slight active flexion of the fingers, but none of the thumb. The patient does not use the right hand. The forearm is very small and the structures are apparently imbedded in dense scar tissue. There is very little muscle tissue remaining. Operation advised for cosmetic purposes.

Operation (October 7, 1917).—By the author. The structures of the forearm were dissected free from dense scar tissue. All the tendons were lengthened to permit full extension of the wrist and fingers. Fat from the thigh was placed between the tendons and beneath the skin. The muscles of the forearm were found to be almost altogether replaced by fibrous tissue.

May 6, 1918: Normal sensation in hand and fingers. Wrist and fingers are in a position of extension to almost a straight line. Normal active flexion of the wrist. Active and passive extension of the wrist to 180 degrees. Slight active flexion of the metacarpophalangeal joint of the index finger, none of the middle finger, and good of the fourth and fifth fingers. Very slight active flexion of the interphalangeal joints of all fingers but the middle one. Complete active and passive extension of the fingers. Abduction, adduction and opposition of the thumb are good, but there is no active flexion. The patient uses her hand for many purposes, and is able to pick up objects between the thumb and index finger.

Discussion.—This case indicates that operation for Volkmann's contracture may be useless and even harmful unless layers of fat are placed about the dissected structures to prevent re-adhesion.

This child was operated on to remove the unsightly contracture of the hand. This has been accomplished. But she is developing an unhoped-for function of the hand, and the small wasted bellies of the muscles of the forearm below the elbow seem to be growing larger. There is good power in the extensor group of muscles and good power in the flexors of the wrist. The surgeon should never consider a case hopeless, as some improvement can almost always be secured. Possibly a later operation in this case to free further the flexors of the fingers and the thumb may lead to a development of these muscles which now appear to be wasted away. Tendon transplantation may also improve the function of the fingers and the thumb.

Case XI.—K. B. Orthopædic Hospital. This patient lives in Youngstown, Ohio. In February of 1917 her right arm was injured in a machine. The elbow was broken and the back of the hand was badly lacerated. She was treated in a hospital for a month.

December 22, 1917: An irregular cicatrix is present on the outer aspect of the arm and elbow. The external condyle of the humerus is sharp and prominent. The elbow is fixed in absolute ankylosis at 130 degrees, and the forearm is fixed in almost full pronation. There is but 15 degrees of rotation possible. On the dorsum of the hand is a broad scar which is adherent to the extensor tendons of the fingers. The hand is in a position of slight palmar flexion and ulnar deviation and cannot be extended beyond 180 degrees. Active extension of the fingers is complete. Active and passive flexion of the metacarpophalangeal joints are almost completely absent, and there is but very slight active flexion of the interphalangeal joints.

Operation (January 18, 1918).—(1) Excision of the elbow through an external lateral incision. (2) Through a longitudinal incision on the dorsum of the hand the extensor tendons were dissected free from the skin and from the bones of the hand. A free fat transplant from the thigh was placed underneath and over the tendons, and the wound was closed. But very slight passive motion of the metacarpophalangeal joints was possible under ether.

February 7, 1918: Elbow wound healed. Incision on hand has opened slightly at one end. Patient has almost normal motion in interphalangeal joints. She wrote a letter to-day, the first one for a year.

February 22, 1918: Passive motion of elbow 60 to 160 degrees without pain. Very slight active motion.

March 16, 1918: Normal flexion and extension of interphalangeal joints. Very slight motion in metacarpophalangeal joints. Active motion of elbow 90 to 180 degrees, passive motion 60 to 180 degrees. Lateral stability good. Rotation of forearm is one-half of the normal.

April 4, 1918: Active motion of elbow 60 to 180 degrees, passive motion 35 to 180 degrees without pain. Active rotation of forearm one-half of the normal, passive two-thirds of the normal. Normal motion in fingers except in the metacarpophalangeal joints. A small superficial piece of fat sloughed from the wound in the hand. Wound now almost healed. Use of hand and arm has been showing improvement week by week.

Discussion.—In this case also there was slight sloughing of part of the fat transplant, due, probably to the poor vascularization of the skin in the region of the scar. Here no damage was done, however, as the tendons did not become exposed in the wound.

Aside from the subject of this paper there may be noted in this case the good result which follows excision of the elbow for old fractures or fracture-dislocations. This patient now uses her hand and arm for dressing her hair, for feeding herself, for writing and for many other important functions, all of which were lacking before her operation.

These cases illustrate the variety of operative procedures that must be employed: plastic work on tendons, nerves, and skin; skin, fascia, tendon, and fat grafting; excisions and arthroplasties of joints.

Conclusions.—Many of the numerous cases of partial or complete loss of function of the fingers, the hand, and the forearm due to infections or to injuries may be greatly improved or entirely cured by proper surgical procedures. It may be necessary to perform a number of operations in the severe cases to obtain a good result. Operative measures should not be postponed too long, particularly in those cases which begin to show trophic changes in the joints. Patient and prolonged after-treatment is frequently required, but in this the patient is usually a willing helper because he notes the continued improvement in his condition. Finally, it may be said that one seldom finds a more grateful man than he who has had restored to him the function of a hand which he had despaired of ever using well again.

STATED MEETING, HELD MARCH 7, 1918

The President, Dr. Edward Martin, in the Chair

EPITHELIOMA OF THE FACE FOLLOWING X-RAY TREATMENT OF A KELOID

Mr. J. S. Ravdin presented a woman, aged forty-one years, who was admitted to Dr. Chas. H. Frazier's service at the University Hospital, November 20, 1917, with a "running sore" on the right side of the face and the neck.

At fifteen she had typhoid fever, during which time she developed an abscess in the right mastoid region. This was lanced and pus was evacuated. A few years later a keloid appeared in the scar and this was followed by another keloid below the scar. These enlarged until when she presented herself for treatment at the Howard Hospital in 1902, the original keloid covered the entire mastoid process, while the lower one extended from the tragus of the ear above to below the angle of the jaw below, and from the anterior border of the sternocleidomastoid to the anterior border of the masseter.

Doctor Frazier removed the upper keloid, but it was followed by a recurrence. The patient was then referred to Doctor Pancoast for X-ray treatment. This was in the latter part of June, 1903. X-ray treatment was continued over a period of about four years. The doses were not measured. At the time of her discharge in 1908 the keloids had practically disappeared, there remaining only a scar. She was told to return occasionally for observation, but this she failed to do.

In 1915, after a latent period of eight years, she returned. The skin at the site of the keloids had broken down. X-ray treatment at this time was futile. On November 20, 1917, she was admitted to Doctor Frazier's service. Examination at this time showed at the angle of the right jaw and extending on to the cheek anteriorly and the mastoid process posteriorly a sluggish ulcer. Its edges were indurated and everted. It was not very movable on the underlying tissues. A serum exuded from it, which was odorless. It was painful. There was no glandular involvement.

The patient was operated on November 26th, and the area was excised by a wide circular incision. The growth did not seem to infiltrate the underlying tissues. The edges were seared with the actual cautery, bleeding points controlled, but no attempt was made at closure of the wound.

C. A. Porter and S. B. Wolbach in *The Journal of Medical Research,* of October, 1909, reported a number of X-ray carcinoma. They called attention to the latent period between the last X-ray treatment and the beginning

of signs of degeneration, also to the relatively benign character of many of these epidermic carcinomas.

E. P. Cumberbatch, in the October, 1913, number of the *Proceedings of The Royal Society of London,* reported a technic whereby he claims to get most excellent results from the X-ray treatment of keloids. He divides the area into four parts and each area is treated separately. No area receives more than one-half a pastille dose of Sabourand, tint B, and each area is given a fortnight's rest before repeating the dose.

ADDRESS ON "SHOCK"

Dr. Miles T. Porter, having been introduced, said that with regard to shock one finds, especially on the part of those who have not been actually at the front in this war, a failure to recognize certain things which are obvious enough when one is actually in the work. One of these is in regard to the definition of shock. When the shock case comes in, the ambulance driver or stretcher bearer used to come to report that there was a shock case. There never was any question about the diagnosis. The patient was the color of muddy parchment; the eyes were turned up, the whites only showing; utterly relaxed. The heart is feeble; respiration in uncomplicated shock is never deep; always feeble, but more frequent than normal and the blood pressure is very much reduced. The appearance of the patient alone gives the diagnosis in these ordinary cases of shock. It is very important to recognize the condition at the beginning, the importance lying in the fact that it is very much easier to save the patient in the early hours of shock than in the later hours. If the low blood-pressure is maintained certain changes occur. He knew of no other way of recognizing the very early stages than by the measurement of the diastolic blood-pressure. One need not say that every case of low diastolic blood-pressure will die of shock; but when the diastolic pressure falls to a low level, if the patient has not shock one may be certain that he will have the symptoms and difficulties of shock if the blood-pressure remains low for any length of time. We have come to a point in the treatment of this condition in which the systematic taking of the blood-pressure is of as much importance as the systematic taking of temperature to judge of the continuance of fever. This systematic taking of blood-pressure he did not see practised in any of the French hospitals. It would save many lives. The general tendency of shock cases when once in the grip of shock is to die under the treatment, or the lack of treatment, ordinarily given to them at present; whereas, a treatment which demands no great experience, and requires only the intelligence of systematic attention to a few things, will save about four-fifths of the cases. The literature of shock for the last twenty years or so contains various conclusions, various ideas, which are either entirely erroneous or which are only partially comprehended. One of these ideas is that shock is due to exhaustion of the vasomotor centre. This is not the case, because it is shown that in profound shock the vasomotor centre still gives

reflex change to blood-pressure on stimulation of the sciatic nerve far too great to be accounted for if the centre were exhausted. Moreover, it has recently been shown that in profound shock the superficial vessels are constricted, which would not be so if the vasomotor were exhausted. It is also not true that shock is due to stimulation of nerves of sensation. It can be shown that stimulation of any nerve for several hours at a time with strong currents can be made without causing shock. The speaker had stimulated almost every nerve in order to find nerves the stimulation of which would cause shock. In none of the cases in normal nerves was there a fall of blood-pressure; on the contrary, the general effect was to increase blood-pressure. It is, however, true that patients are found in such a state that slight stimulus will produce a condition resembling shock. An example is reported in the ANNALS OF SURGERY of an interesting case cited by him twelve years ago in which a woman with cancer of the breast, with enlargement of the glands in the lower part of the neck and axilla, had suffered for many months and had had morphine and was in a highly nervous state. During the operation it became necessary to put a clamp on one of the cut nerves of the brachial plexus, when the woman fell into a condition thought to be shock. He did not believe that that was shock, but inhibition of the heart. He held to that belief because previously the same clinical picture has been produced by experiments which he did and in which the animal had morphine. The reason for the state was that the patient had become sensitized. That conception of sensitization is new. It is based upon good experimental observations. The first of those observations which he had ever recorded is in the second chapter of the first volume of the *Journal of Experimental Medicine,* in a paper upon "Ligation of the Coronary Arteries," which was the second paper on this subject, the first having been written by Welsh and Flexner. In it are reported a large number of cases, results of ligation of the coronary artery in dogs. If the artery is large there occurs sudden arrest of the heart with fibrillary contractions apt to be fatal in the dog. The interesting point here is that there were several series of these experiments and in all of the series but one dose was given of morphine and cocaine; that following ligation of the left coronary artery in 50 per cent. of cases there was arrest of fibrillation. A second ligation caused arrest in 85 per cent. of the cases. In other experiments made with pure ether the morphine and cocaine had so sensitized the heart that a stimulus otherwise innocent caused a fatal arrest of fibrillation. Years later he found in studying the tonus of the heart muscle another state of sensitization. In experiments recently published in the *Journal of Experimental Medicine* upon pneumonia, tracings from the heart muscle were shown from dogs that had died of pneumonia. In these dogs it is found that at the end of three and one-half hours tonic contraction has taken place to an extent equal to the ordinary contraction of the heart. In experiments to determine the effect on blood-pressure of stimulating the sciatic nerve a rat received morphine and cocaine. When about to stimulate the sciatic

nerve to obtain the vasomotor reflex we found upon lifting it that the heart "fell down"; there was inhibition, frequent and feeble beat which lasted three-quarters of an hour. Warm saline solution was given, and the nerve was again lifted when the heart fell into the same state, remaining so for half an hour. With more warm saline solution the rat recovered and the experiment proceeded in the ordinary way.

If you make a survey of the diseases in which the arteries are affected, in certain migraines in which there is prolonged restriction of the fibrillary vessels, you will see that patients subject to migraine get into a state in which a little extra fatigue or other stimuli which under ordinary circumstances will produce no such effect bring on the prolonged spasm and all indications of the disease. It is obvious that sensitization of the heart leading to prolonged inhibition is a factor in the production of shock.

Then there is the hydrostatic fall, a fall which can be illustrated by an artificial scheme. The best example of a hydrostatic fall is seen in cases in which novocaine has been given carelessly. The sudden fall of blood-pressure does not last long and is rarely fatal.

The question of hemorrhage is not well understood. In the loss of blood there is a critical point below which you can take but a small quantity of blood without dangerous symptoms appearing. Just here is another point deserving of attention: The amount of blood necessary to carry on nutrition of the tissues varies with the state of nutrition in those patients. If the metabolic factor or the chemical operations of the tissues are diminished or impaired, then obviously more blood will be necessary to nourish those impaired tissues than if these elements were at their normal level. Consequently, the blood which can be lost is a variable quantity. Hemorrhage *per se* is not a cause of shock.

These are the principal sources of confusion with regard to the cause of shock. When the speaker first went abroad in 1916 to study at the front the cause of shock, he was informed by the surgeons that shock was seen oftener in fractures of the thigh and in multiple wounds through the subcutaneous tissues. His personal experience bore this out. It has been found that the blood of such patients contains large quantities of fat. It is also known from experiments on animals and examination of tissue of human beings that fat embolism takes place in this condition. Fat emboli have been found both experimentally and after shock in the human subject; after fractures they have been found especially in the lungs, brain and other organs. When he came back from France he tried to find a chemical substance which might be absorbed by bone marrow; it occurred to him that fat embolism might be the cause of shock. He demonstrated this by injecting 3½ c.c. of neutral olive oil into the jugular vein of a cat.

He had taken pains since acidosis was considered in connection with shock to inquire of several persons supposed to know more about the subject than anyone else in this country. The result of that inquiry was that he should not quote them personally but that they believed that while there

was no doubt that even in early stages of lowered blood-pressure the alkali reserve is diminished in the blood there is a doubt whether the amount of diminution observed in the ordinary case of complicated shock is of great clinical importance. That doubt is a very complicated matter resting upon matters which he personally is not competent to discuss. The question is whether the reduction shown by the test in the alkali reserve really does mean acidosis in the cases in which it has been said to mean acidosis.

As practical men it is necessary that we should not leave any reasonable chances untried. He, therefore, inquired what it was best to do under the circumstances. It was their opinion that where acidosis was suspected it was advisable to draw the urine from the bladder, then to administer from 3 to 5 grammes of sodium carbonate properly diluted and after an hour to test the urine reaction. If the urine were found to be alkaline no acidosis was present; if it were still acid the probability would be that acidosis was present. It is the opinion of these gentlemen that the sodium bicarbonate is not without certain potential dangers.

In the practical handling of a case of shock you should in the first place take the diastolic blood-pressure. The maximum blood-pressure is of uncertain value in shock because the arteries are well filled, the heart beat frequent and feeble, and therefore the maximum blood-pressure is impaired more than 15 mm. The diastolic pressure is a much more certain sign and it is also very easy to take. The test is of greatest importance because shock is above all a disease in which the understanding of a critical condition is vital to the saving of the patient. In shock there is a level to which the blood-pressure sinks above which level the patient is likely to recover. Below that level there is a vicious circle which results in the patient's death. That level he had called the critical level in shock. This level depends somewhat upon the instruments used. He would say that sixty was this critical level; that with a level of from 55 to 50 the tendency is to die; that with a level of 65 the tendency is to get well with almost any sort of treatment.

To summarize: the patient in shock must not be washed. He must not be put into a soft bed; he must not be given normal saline solution indiscriminately without any record of the blood-pressure; the blood-pressure must not be guessed at, but must be measured every fifteen minutes. It takes one and three-fourths minutes to make a reading of the diastolic pressure. The patient must not be warmed up in bed and then taken out of the bed without a blanket on an ordinary stretcher, carried 500 feet uncovered and given chloroform. If he does not die it is because he is young and vigorous and not because he has not had ample opportunity at the hands of the surgeon. All of these things he had seen done repeatedly. At the head of one of the hospitals was a distinguished professor of surgery. He said he was glad to see him, that all the shock cases were dying. After he had been there ten days five of the cases recovered. The only difference in treatment was that the things enumerated were corrected. The method finally worked out in France has proved to be a good one. When a case

comes in it is taken to a little room canvased off from the part of the tent in which the operations were done. The patient is put upon a slanting table so that the feet are 30 cm. higher than the head. The blood-pressure is taken every fifteen minutes and if at the critical level normal saline is given with adrenalin. If this does not keep the pressure up carbon dioxide is given. The clothes are not removed but cut away round the wound. Chloroform is never used. Whenever possible local anæsthesia is employed. Operation is performed as rapidly as possible and if advisable carbon dioxide is given during the surgical procedure. The patient is wheeled back fifteen or twenty feet and the expert in charge of the case must remain with him for an hour. These are the principal points in the care of the shocked case.

There are a good many cases in which none of the efforts heretofore employed in shock will raise the blood-pressure. In those cases something must be done. It occurred to him that it might be of value to use the respiratory pump. In the use of carbon dioxide we get any type and rate of pressure we like. The result of the increased action of the respiratory pump is to carry much more blood from the veins into the slightly emptied arteries and to the heart which is not properly filled. The inevitable result is that in two or three minutes from the beginning of treatment the pulse is much stronger and the blood-pressure is up 10 to 12 mm. It can be raised 30 mm. in animals and fifteen in man. If the blood-pressure fall to the critical level it makes a great difference in the prognosis. He would suggest to utilize this extremely simple method or improve upon it. He did not maintain that fat embolism is the general cause of shock, nor did he maintain that carbon dioxide respiration is a heaven-sent remedy which will remove all danger from shock. It is of advantage in shock, but the real point in regard to treatment is to make systematic effort based upon repeated measurements instead of risking the patient's life by pure guess work.

Dr. H. A. Hare said that the air hunger referred to by Doctor Porter has apparently been taken by many persons as an evidence of toxæmia, meaning that the respiratory centre has been stimulated by the B. oxybutyric acid or that there is an effort of Nature, by deep inspirations, to oxidize the B. oxybutyric and diacetic acids into harmless acetones. He would not be surprised if it was found that this view is entirely erroneous. He was inclined to think that part of this deep respiratory effort which occurs under these circumstances is Nature endeavoring by the respiratory apparatus to help the heart pump; and Doctor Porter in his remarks dropped a word or two which seemed to give some emphasis to this point. He had repeatedly seen cases of pneumonia in which he had been convinced that the cough of the patient which was thought to be annoying, and which the physician tried to stop by the administration of opiates, was really an effort on the part of the respiratory mechanism to assist the heart in pumping venous blood. Deep inspirations and forcible expirations alter venous

pressure, and venous pressure is one of the things which has gone wrong in this extraordinarily interesting condition.

In regard to vascular dilatation, the fundamental conception of shock held during the last thirty odd years is that taught by Horatio C. Wood that shock was due to vascular palsy, is due to an accumulation of blood in the great veins. It is only within the last few years that surgeons have employed atropine to prevent the accumulation of blood in the great veins, although those of us engaged in clinical medicine have long regarded it as one of our great aids.

When Doctor Porter referred to the exposure of the patient to cold in the transfer from ward to operating room he was reminded of an incident observed many years ago in London in experimental work upon the brain of monkeys. The monkeys were brought in clad in little red dressing gowns and kept warm by hot water bags. Inquiring the reason for this he was told that if this were not done the monkey died of shock during the operation. In the afternoon of the same day he saw Victor Horsley remove a large brain tumor from a woman clothed only in a nightgown and lying on a one inch glass-topped operating table. He wondered whether the vital resistance of the monkey and the difficulty of its maintaining heat had any bearing on human surgery. The maintenance of heat on the one hand and the presence of excessive heat on the other are points all too frequently ignored. We often see patients brought into the operating room with the blankets rolled up and hanging across the base of the neck; the belly exposed, with no recognition of the fact that it is the heat citadel of the body. As soon as the belly is opened the cold is felt there. The chairman will remember that many years ago we carried on a series of experiments upon animals in which we showed that the introduction of fluids of various temperatures into the peritoneal cavity produced a most extraordinary variation in blood-pressure. Fluids a little below the normal temperature of the animal caused profound drop in blood-pressure. These same fluids applied to the wall of the abdomen or introduced high up in the bowel, where they circulated in the same area except that the bowel wall was between them and the peritoneal cavity, caused no variation in blood-pressure. Heat, therefore, according to these experiments is of considerable importance.

In regard to the saline question; he was interested many years ago in having a demonstrator of physiology standing beside him who, when he injected a considerable quantity of fluid into the animal, expressed great surprise that the blood-pressure did not rise. There is nothing more fictitious than the idea that such injection of fluid is followed by rise of blood-pressure. You can inject three and four times the equivalent of the total amount of the blood of an animal without causing a rise in blood-pressure.

Doctor Porter did not refer to the hypertonic solutions or to the use of the viscous fluids. If there is one function of the body about which it is most jealous and most cautious it is the maintenance of the normal chemical constitution of the blood. If you give a man with healthy

kidneys 30 grains of any potash salt three times a day he will have no symptoms, the kidney will eliminate the potash and maintain the normal condition of the blood; but if the man has renal disease the potash becomes a poison. The moment you put in a pint or quart of strong bicarbonate of sodium solution, unless you are going on the principle that the symptoms are due to acidosis and that you are able to neutralize the acidosis as in a test tube by adding alkali, you are putting into the blood stream a preparation of sodium which Nature never intended should be there. Personally, I believe that little will come of this new acidosis treatment in shock. I do not believe that acidosis has anything to do with shock. Doctor Porter said that the degree of acidosis was so small that it did not produce symptoms. Doctor Hare's conception is that the individual is bleeding to death in his own vessels and that there is an accompaniment of loss of nervous equilibrium. He believed that in the problem of shock there is a condition exceedingly complex in Nature in which certain factors in certain cases are dominant and in other cases other factors are dominant, and that it is not a single pathological state or a proposition as simple as we see in the consolidated lung of croupous pneumonia.

Dr. John B. Roberts said that about thirty-five years ago he wrote in the first volume of "Holmes's System of Surgery" (which Doctor Packard edited in this country) on shock, and showed the similarity of symptoms of fat embolism and those of surgical shock. He had not, however, seen much reference to this fact in surgical literature, until he read what Doctor Porter has recently written. Surgeons knew that shocked patients seemed to revive considerably under the effect of ether anæsthesia, when we formerly amputated limbs as soon as reaction seemed moderately well established. Indeed, in those earlier days hypodermic use of ether was employed to some extent as a remedy for shock. See "Holmes's System of Surgery," American edition, 1881, vol. i, p. 145. The distinction made then was that so-called "delayed" shock might be fat embolism. May not Doctor Porter's cases have been examined by him after shock had been replaced by fat embolism?

Doctor Porter closed the discussion, saying that with the history of blood-pressure, he had noted that several times in the history of fat embolism a condition simulating shock had been seen. If, however, these citations are examined it will be found that in no case is there anything like the surgical shock as seen on the field of battle. His contribution consists of a method of measuring low blood-pressure in conditions resembling shock and he had presented certain facts of which he was sure. He did not personally know about the use of gum acacia mixed with saline solution. It must be tried with caution. It is not necessary to have the blood-pressure remain up for a long time; these patients are just on the edge between life and death; if you can bring them back to life for ten minutes at a time you will probably get them through. If, therefore,

you have a remedy by which you can raise the blood-pressure again and again, try it, and nurse the patient past this critical point.

With regard to opium, the surgeons in France who had seen a good deal of this condition of shock were in the habit of giving opium whenever the patient was restless. He himself believed that it was a good thing, but his experience in connection with the circulation is that it is never safe to speculate. The blood-pressure can be raised even in a normal individual by carbon dioxide inhalation. So, when he is asked to explain how it is that fat embolism produces shock he frankly says that at the present moment he had no definite information regarding it and would be incapable of offering a hypothesis.

STATED MEETING, HELD APRIL 4, 1918

The President, Dr. Edward Martin, in the Chair

TREATMENT OF GUNSHOT FRACTURES OF THE MANDIBLE

Dr. John B. Roberts read a paper with the above title, for which see page 48.

Dr. Hunter W. Scarlett said that during two and a half years at the Ambulance in Paris, there were treated many gunshot fractures of the jaw and face, and he was enabled to follow several of these cases. He then showed a series of pictures of two cases, in which there was extensive loss of bone and soft tissue and with no possibility of retaining bone fragments or of applying splints. In the first case, after thorough cleansing and removal of foreign material from the wound, the tissues were approximated as nearly as possible to the normal. When the scar tissue contracted to the utmost, and the time for operation arrived, they excised the scar, dissected back the flaps and approximated the soft tissues. After that the dental surgeon took charge of the patient. The benefit derived from the plates which he inserted was quite marked. In the beginning of the treatment of the case it was, of course, necessary to feed the patient by a tube through the nose. After the plate was made, the man was able to chew with a certain amount of comfort.

In the second case, in which the fracture was received just inside the angle of the jaw, reduction was made before the patient came to the hospital. The pictures show the great amount of mutilation of the soft tissues and the result obtained by simply excising the scar tissue, dissecting the flaps well back, and approximating the two edges.

Dr. George P. Müller noted that in the gunshot injuries of the jaw encountered in the War, hemorrhage is an occasional complication, and contrary to experience in civil surgery comes from the distribution of the lingual artery in the majority of cases.

Dr. Penn G. Skillern, Jr., with reference to the relation of silver wire to necrosis of the jaw, said he thought that silver wire should be discarded in favor of an animal suture, such as kangaroo tendon. Sutures of this type placed in the mandible are not as irritating as silver wire and yet possess sufficient tensile strength, particularly if the tendon knots are reinforced by catgut suture knots, since the kangaroo tendon knot is very liable to slip. War fractures of the mandible are accompanied by greater loss of substance than the fractures encountered in civil life; in fact, a gap in the mandible results in a large proportion of the cases. The majority of ununited gunshot fractures occur on the lateral aspect of the mandible and exhibit a gap rarely exceeding 3 cm. in length. He did not think suffi-

cient emphasis had been placed upon the value of bone grafting in mandible injuries. In his opinion a bonegraft forms the most satisfactory splint for fractures of the mandible with breach of continuity. While most of these fractures are compound yet the bonegraft resists infection sufficiently long to justify its use, especially if inserted after the acute infection has been controlled. It encourages reproduction of bone on the part of its host and acts as a scaffolding. The proper distance of the fragments from one another can be maintained with the "shoulder graft"—a bonegraft provided with a couple of shoulders, which abut against the ends of the fragments and maintain their proper relation to the gap. The ends of the graft are fitted into gutters developed in each fragment and retained by kangaroo tendon sutures passed through drill holes and around the graft. Autogenous bonegraft screws give better fixation and he uses them in preference to kangaroo tendon because they make the graft mechanically a part of the mandible. The autogenous bone screws are passed through the graft into the mandible, and if the infection is controlled, as is now rendered more quickly possible with chemicals like dichloramine-T, which can be used in the mouth when dissolved in the non-irritating chlorcosane, the mandible in favorable cases will proliferate bone across the gap, guided by the graft.

Destruction of the chin can be remedied by cutting a U-shaped graft from the upper portion of the tibia, the apex of the U corresponding to the tibial tubercle, which by its smoothness and prominence forms an excellent chin. This graft is then transferred to the mandible and secured to the margins of the defect.

Destruction of the central portion of the mandible also can be remedied by a U-shaped graft, made larger than that for the chin, according to the extent of the defect. The graft ends are fastened on each side to the body ends.

Destruction of the body and part of the ramus of one side can be remedied by cutting an L-shaped graft from that portion of the tibia which extends from the inner surface of the internal tuberosity of the tibia downward and forward to include part of the tibial crest: by kangaroo tendon sutures placed through drill holes the crest portion of the graft is secured to the stump of the ramus, and the tuberosity end to the symphysis end of the sound side of the mandible. Platt, Campion and Rodway (*Lancet*, March 30, 1918, 461) report nine cases of mandible injury in which tibial bonegrafts were implanted successfully. Cole (*loc. cit.*, 459) describes a novel pedicled graft method in the treatment of ununited mandible fractures.

As to the source of the graft, that taken from the antero-internal surface of the tibia high up seems to work better than a graft from any other bone: some, however, use the rib near the angle for this purpose; others, the crest of the ilium.

Dr. Edward Martin said that he had taken some pains to ask dental surgeons in what way the general surgeon should coöperate with them in preparing the field for the really skilful technician. They advise first to fix in a position of good occlusion; to preserve the space between the lips and cheek to prevent dribbling; to employ, if we have it, the moulded splint containing the dentist's moulding wax. They advise against wiring or, on the part of the unskilled, an attempt at plaster-of-Paris work.

In regard to the wiring of which so much has been said, he asked an expert man to wire for a demonstration for his class a broken jaw made by a rifle bullet. In reply to his inquiries he said it would take him about an hour to do the work, and an inexperienced man three hours; further, that the fixation when done would not last. In view of this he asked, is it any use to teach men who are not expert the art of wiring? Do the dentists do it?

Dr. Gaskill (replying to Doctor Martin) said that wiring the mandible for fixation is the simplest form of splint. It can be done in a short time, and if the wire is sufficiently strong the fixation may last almost indefinitely. It is quite a simple matter.

ACUTE PANCREATITIS

Dr. John B. Deaver read a paper with the above title, for which see page 40.

Dr. George P. Müller asked Doctor Deaver if he ever attempted to get rid of the necrotic mass at the head of the pancreas. It is hard to understand how an incision in that necrotic, hemorrhagic mass can afford drainage. Doctor Deaver also spoke of waiting until there was recovery from shock. He wondered if he would not rather put it that energetic measures should be speedily adopted against shock? The probabilities are that the patient will not recover from shock while he has the pathology. Doctor Deaver will remember that in 1904 they read a joint paper on acute pancreatitis. He did not believe that except for improvements in operative technic that knowledge of this disease has been much advanced since that time.

Dr. Deaver, in conclusion, said that in a small percentage of acute pancreatitis he has found that pain was referred to the left shoulder and back. He used gauze packing for stopping the bleeding and drainage, which he allowed to remain in place until it became loose. He also stated that in bleeding after incising the necrotic pancreas if the gauze packing did not suffice he was usually able to check the flow of blood by through and through catgut suture.

ACUTE PANCREATITIS*

By John B. Deaver, M.D.
of Philadelphia

In the presence of an acute abdominal crisis the practitioner is likely to forget about a certain elongated gland situated in a deep recess behind the stomach as the probable cause of the sudden and dramatic syndrome he is called in to treat. It is because of the importance of this organ in upper abdominal disease that I venture once more to discuss the subject of acute pancreatitis.

It is, perhaps, no exaggeration to say that the condition is more often unrecognized than it is diagnosed before operation. There are a number of reasons why this is so. In the first place it is comparatively infrequent, but nevertheless more frequent than is generally supposed, and, as in other abdominal conditions, there is no one sign or symptom that can be said to be pathognomonic of the disorder; and most often the desperate condition of the patient makes operation imperative without the formality of a definite diagnosis. The latter, of course, applies particularly to the ultra-acute cases. It is in the less acute cases diagnosis is important, as we shall presently see. Another fact that interferes with a positive diagnosis is that acute pancreatitis is so frequently associated with other severe abdominal lesions, such as cholecystitis, perforating cholecystitis, perforating gastric or duodenal ulcer, appendicitis, etc. In fact, it is often mistaken for one or the other of these conditions; most cases, however, come to operation with a diagnosis of acute intestinal obstruction. Differentiation is usually possible only after a careful examination and a carefully taken history, and then only if the case is seen early, that is, several hours, or at most a day or two after onset. The confusion is also in some measure due to the fact that pain, without doubt the most conspicuous and persistent symptom, in acute pancreatitis may arise in various parts of the abdomen, although, as a rule, it originates deep in the epigastrium rather to the left, later radiating to the back, and is at once severe and overwhelming. It is, if possible, more agonizing than the pain of perforating viscus. Shock in the ultra-acute case may be so extreme that death ensues in a few hours. Shock is more prolonged in severe cases of acute pancreatitis than in ruptured viscera. The character of the pain differs from that of acute intestinal obstruction inasmuch as in the latter the onset is less severe and is at first intermittent, growing progressively worse in the course of a few hours. I may, however, remark that in the acute obstruction due to strangulated internal hernia and twists, the pain is intense and at first referred to the site of the initial pathology. With regard to the localization of the pain in acute pancreatitis,

*Read before the Philadelphia Academy of Surgery, April 4, 1918.

Desjardin has suggested a *pointe pancreatique* over the outlet of the duct of Wirsung, 5–7 cm. above a line connecting the umbilicus with the right axillary cavity, as of diagnostic value, but this has not been found a constant feature. The Mayo-Robson's point, about 10 cm. above the umbilicus, is more characteristic. Sometimes the pain localizes in the region of the appendix, and is then probably due to a distention of the inflamed peritoneum, as the result of the diffusion of the exudate in the region of the cæcum, such as often takes place in perforating gastric or duodenal ulcer. Or again, as the result of the inflammatory process and the action of the pancreatic juice, there is necrosis and sloughing of the tissues which find their way into the ileocæcal region and give rise to a tumor mass suggestive of appendicitis, as in the case reported by de Groot and also one in my experience. Operation in de Groot's case revealed a normal appendix; the abdominal cavity was filled with blood-stained exudate, and there was no trace of blood in the pancreas. Typical fat necrosis was found in the ascending colon and in the preperitoneal fat. A large stone was present in the gall-bladder. There had been a history of several attacks of severe epigastric pain radiating to the right, and a diagnosis of acute appendicitis had been made.

In my case the patient came to the hospital for the relief of a biliary fistula which had formed after a cholecystostomy (done elsewhere) one year previously. There was tenderness and marked rigidity in the region of the right iliac fossa. At operation the appendix was found to be normal. Operation consisted of cholecystectomy and appendectomy. The pancreas was enlarged throughout, especially its head. After operation bile continued to drain for several days, followed by a discharge of pus. The tenderness in the right iliac fossa persisted. A second operation four weeks later revealed an abscess, material from which contained fat necrosis. The patient died on the sixteenth day. At autopsy the pancreas was found completely necrosed.

Vomiting is a constant feature of acute pancreatitis and is frequent and persistent for at least twenty-four hours, when it may subside somewhat; except in the late stage, it is not fecal. Nausea and retching may continue; hiccough is a frequent symptom and is persistent and oft-repeated.

The accompanying constipation is not always complete. In this it differs from intestinal obstruction. Flatus is sometimes spontaneous or can be obtained, and stool, also, by enema.

There is absence of marked rigidity, which, on the other hand, is the most pronounced physical feature in ruptured viscera. Tenderness in the left costovertebral angle is of extreme importance from a diagnostic point of view, indicating, as it does, involvement of the central portion or body, and more especially the tail of the pancreas. Distention is not so marked as in other abdominal crises, and is limited at first to the upper portion of the abdomen; in fact, the small intestine has in some instances been found collapsed.

The pulse is usually quiet and slow at first, and gradually increases. Subnormal temperature accompanies the initial collapse, but rises moderately later on. The temperature range is low compared to that of a spreading peritonitis.

Cyanosis is often seen and appears as, what is considered by some, a characteristic dull yellow hue.

There is leucocytosis, and the polynuclear count is increased.

As to predisposing factors, obesity and alcoholism are sometimes mentioned. Age and sex do not seem to play a part in this respect, as the disease has been observed in young persons of both sexes as well as middle-aged and older ones. In the series of fifteen cases operated at the Lankenau Hospital, since 1913, the ages ranged from twenty-four to fifty-four. Some authorities, notably Körte, claim a preponderance of males in the proportion of two to one. This has not been my experience. In the above 15 cases there were 11 females. Linder[1] reports 76 per cent. females in 33 cases.

We may therefore say that a sudden acute abdominal seizure, pain overwhelming, in an apparently healthy, usually obese, individual, accompanied by incessant vomiting, upper abdominal distention, a transverse resistance not easily elicited, weak pulse, subnormal temperature, collapse, and sometimes cyanosis, should suggest acute pancreatitis. The previous history will usually reveal one or more, usually more, attacks of severe epigastric pain which have been regarded as gall-stone colic and have been treated as such. Not infrequently the first attack of this kind occurs during or soon after a pregnancy. That it may be due to a pancreatic lesion is well illustrated in Case II, cited below. Watts[2] reports 7 cases of acute pancreatitis, 2 of which occurred four and seven weeks respectively after a pregnancy.

There is, indeed, little doubt that in a large number of cases of gall-stone disease the pancreas has been involved, and it is because of this fact and because of the unfavorable prognosis presented by acute pancreatitis as such that I so strongly and continuously advocate early surgery for gall-stone disease, as well as for other chronic abdominal conditions. It is a well-established fact that the gall-bladder is the upper abdominal organ most frequently affected by infection. Owing to the anastomosing network of lymphatics in the retroperitoneal tissue which connects the gall-bladder and the pancreas, it is but natural that secondary infection of the pancreas may occur by this route. In like manner, not a few cases of gastric and duodenal ulcer and also colitis have come to be associated with disease of the pancreas. Here again the path of infection can be traced through the lymphatics leading from the colon through the transverse mesocolon to the pancreas. My experience with small circumscribed abscess of the pancreas in perforating appendicitis and, in another instance, of pancreatic abscess

[1] Jour. Amer. Med. Assoc., 1917, lxix.
[2] Ann. Surg., 1917, lxvii, 293.

and retroperitoneal diffusion of pus from infection of the left lower extremity would also seem to indicate the possibility of retroperitoneal infection of the pancreas from a distant focus by way of the ascending lymph channels.

Acute pancreatitis is essentially a surgical disease, and the importance of making a diagnosis in the less severely acute cases thus becomes apparent. For merely the relief of tension afforded by operation in these cases not only favorably affects the circulation, but in providing an outlet for the exudates inhibits the local destructive toxic process. The extensive study to which the pancreas and its secretion have been subjected during the past decade has taught us to regard with increasing respect and alarm the inherent noxious action of the powerful ferments of the pancreatic juice. The typical areas of fat necrosis, which furnish the most striking and reliable diagnostic sign to the surgeon, we now know to be due to the lipolytic action of lipase together with the trypsin of the pancreatic juice. As I have elsewhere pointed out,[3] the rôle of the proteolytic ferment, trypsin, in connection with acute pancreatitis has only recently been recognized. It is but natural that any inflammation which causes a diffusion of lipase must also carry with it the other ferments of the pancreatic secretion. Trypsin as a factor in this process has been overlooked because its action is not so greatly evident as is the fat necrosis due to the lipase, although it is possible that hemorrhage, so often noted in acute pancreatitis, may be traced to the digestive action of the trypsin on the vessel walls.

Trypsin is known to be one of the most powerful ferments elaborated within the body. In weakly alkaline solution it exerts a powerful action in splitting proteins into their lower constituent molecules. While in the intestinal canal this action is part of normal digestion and the end products are made available for absorption and for metabolism, when directed against the tissues this powerful agent is capable of doing much harm. In other words, trypsin is normally secreted in the pancreas as protrypsin and requires the activation of the so-called enterokinase of the duodenum to convert its latency into active energy. This is one of the reasons why normally the pancreas itself escapes self-destruction. But in the presence of abnormal conditions, trypsin is activated within the pancreas, its digestive and destructive action is readily seen on the tissue cells and vessel walls of the pancreas and surrounding structures, injury of which permits the escape of blood, with acute hemorrhagic pancreatitis as the result.

The destructive action of trypsin may by inference and demonstration be further seen in the toxæmia of acute intestinal obstruction, which has been shown (in experimental work) to contain a powerful toxin that proves fatal in exceedingly small doses.[4] This substance complies with the essential characteristics of a proteose, one of the earliest decomposition products of protein when acted on by trypsin. Furthermore, the resemblance of the

[3] Jour. Amer. Med. Assoc., August 11, 1917.
[4] Whipple, Stone and Bernheim: Jour. Exper. Med., 1914, xix, 166.

toxæmia of acute pancreatitis to that of intestinal obstruction has been remarked by Sweet.[5] It is not at all unlikely that the toxæmia of the two conditions is either identical or closely related, and is due to the toxic derivatives of the proteolytic action of trypsin. The practical value of these theories, if true, is self-evident.

The surgery of the pancreas must be directed to providing an escape for the highly toxic pancreatic fluid which has become activated as the result of infection or of trauma, or as the result of a chemically induced inflammation by the irritating action of the dammed back bile. In other words, the pancreas must be drained. We are not yet prepared to resect the pancreas, although experimental work, notably that of Sweet, has shown that at least two-thirds of the gland can be removed with a reasonable degree of safety, the only difficulty being one of technic. For the present, however, especially in the ultra-acute cases, we can do no more than by rapid section and drainage hope to save the life of the patient. But outside of these desperate cases the question arises whether to confine the work to the pancreas or to deal with associated lesions. In the severe cases I have no hesitancy in stating emphatically that our energies should be confined to the pancreatic lesion. Operation on the bile tract plays little if any rôle in these cases, and the time consumed only adds to the risk. In a recent series of fifteen cases (operated since 1913), draining the pancreas was the only procedure in three, all of whom recovered; in three others a cholecystostomy with drainage of the pancreas, two recovered and one died; in this fatal case the question arises—had operation upon the pancreas alone been done would recovery not have occurred? One case of pancreatostomy and cholecystectomy ended fatally. This is the case already referred to. In the remaining eight cases nothing was done to the pancreas, drainage of the gall-bladder in six gave five recoveries, and drainage of the common duct together with removal of the gall-bladder in two resulted in one recovery and one death.

The mortality in the series (4 deaths) equals 26.6 per cent., an encouraging improvement on the figures of a previous series of 22 cases which represented a mortality of 54 per cent. (Deaver and Ashhurst: Surgery of the Upper Abdomen, vol ii, p. 303; Philadelphia, 1914).

As to the time of operation: In the fulminating case the rapid progress from bad to worse may make immediate intervention necessary. I am not always in favor of operating in a state of profound shock. I cannot agree with Sweet who favors operating in profound shock, using saline and adrenalin infusions before, during and, if necessary, after operation. In certain cases I deem it wise to wait for a short time in order to give the patient a chance to rally and to wait for the peritoneal inflammation to localize. This, however, is a matter of judgment acquired only by extended experience. In the interim, the Murphy-Fowler-Ochsner method of treatment is instituted. Severe shock may be combated by the administration of morphine, infusions of salt solution, or adrenalin and pituitrin, and thus the patient's condition brought as speedily as possible to a point where operation may be undertaken with a reasonable expectancy of a favorable outcome. Early operation is desirable, especially in the hope of preventing the extravasation of blood and ferments into the pancreas and the surrounding tissues. Since the pancreas is not provided with a capsule, the extravasated material readily finds its way into the surrounding parts. The presence of blood and fluid exudate in the pancreas requires incision and packing with gauze. The question of the extent of incision or scarification and puncture of the pancreas cannot be stated in any hard and fast rules, our experience being still somewhat limited. Too free and indiscriminate an incision presents the danger of free hemorrhage, difficult to control. Sacrification of the peritoneum over the gland should, however, be sufficient to allow gauze drainage to be brought into direct contact with the surface; this also opens up the retroperitoneal space and aids in preventing accumulation about the pancreas. A few blunt punctures of the pancreas are of service in providing free exit for the contained blood, lymph, and the obstructed secretion.

[5]Sweet: Surgery of the Pancreas, 1916, Philadelphia.

In operating on the pancreas we may choose one of two routes—the transperitoneal or the extraperitoneal through a loin incision. The latter allows approach to the pancreas, especially its tail, without entering the peritoneal cavity. While this may be of advantage it does not permit free exposure of the parts, so that radical surgery, should it be indicated, is not possible. It is, in fact, feasible only where the symptoms point to the localization of the inflammatory exudate or to the presence of pus in the loin.

The transperitoneal route is in order in a beginning pancreatitis when the localizing symptoms are all epigastric, when there is a palpable tumor or when the diagnosis is in doubt. This doubt is often cleared up by the presence of fat necrosis and typical odorless beef broth fluid in the peritoneal cavity. Once in the general peritoneal cavity the pancreas itself can be reached either through the gastrocolic omentum, through the lesser omentum, or through the transverse mesocolon. While presenting the disadvantage of the risk of infecting the general peritoneal cavity, the advantages of this approach are seen in the free exposure of the operative field, the opportunity for radical surgery, should this be desirable, and for establishing adequate drainage, a most important item whether the disease is in a suppurative or in a hemorrhagic state. In acute hemorrhagic pancreatitis, having approached the organ through the transperitoneal route, the only possible procedure is to apply tampons and drains freely to the organ itself, going either above or below the stomach according to circumstances. Both tubes and gauze drainage should be used and should be conducted to the surface through an enveloping sheet of rubber dam to lessen the chance of adhesions to the stomach and intestines. Any free fluid in the peritoneal cavity should, of course, be removed by gentle wiping; for this pancreatic

exudate itself contains sufficient toxic material to cause death. Drainage of the pelvic cavity is also indicated in these cases.

One of the most troublesome postoperative effects of drainage in acute pancreatitis is the formation of sinuses. The effect of the pancreatic ferments on the tissues can be noted in the intense irritation of the skin over which the discharge flows and in the sluggish formation of granulations continuously subjected to the severe erosive action of the pancreatic juice. The skin should, for this reason, always be protected by a bland ointment to prevent contact with the secretions, for after excoriation has once taken place it is practically impossible to get anything to stick to the moist surface. In order to limit the activity of the pancreas a strict antidiabetic diet, as suggested by Wohlgemuth, is advisable, and is found useful in promoting healing.

In conclusion, permit me to give two recent histories which will serve to illustrate some of the points contained in this discussion.

Case I.—Female, fifty-four years old, married, admitted July 10, 1917, with a history of repeated attacks of severe abdominal pain requiring morphia for relief. The pain was generalized over the whole abdomen, but was most pronounced over both hypochondriac regions, extending to the back. Persistent vomiting accompanied the attacks. Never jaundiced. Had one such attack three weeks ago, and another the day before admission. Vomiting in the latter had ceased for several hours, but nausea persisted. Bowels moved day before admission. No cardiac, respiratory or nervous symptoms.

Past medical and social history otherwise negative.

Physical Examination.—Obese, middle-aged woman. No jaundice or adenopathy. Teeth fair. Throat congested; left tonsil inflamed and swollen, no exudate. Chest negative. Heart regular, slow, poor tonus. Blood-pressure 120–80.

Abdomen: Slight general distention; tenderness marked in upper abdomen equally on both sides, with rigidity partly voluntary. No masses palpable. Peristalsis subnormal. Temperature on admission 98°; pulse 56; respiration 24.

Tentative diagnosis, gall-bladder disease.

Operation (July 11, 1917).—Upper right rectus incision. Small amount of turbid fluid present in the peritoneal cavity, infiltrating the great omentum. Stomach found distended and pushed forward. A rent was made in the gastrocolic omentum, opening up the lesser peritoneal cavity, from which a turbid fluid escaped. The pancreas was found to be ruptured. One piece of gauze was packed into the pancreatic substance. A sheet of rubber dam was placed down to the pancreas and one piece of gauze within it. Another piece of gauze was packed outside the rubber dam. The gall-bladder was opened and a cholecystostomy performed. Wound closed to drainage. Dry dressing.

The patient had a prolonged convalescence with septic temperature for some time. Was discharged, August 29, 1917, with a clean granulating wound almost closed.

Case II.—Woman, aged twenty-four, married. Admitted February 16, 1917, with severe pain and abdominal distention. Onset of pain four days ago. Began in left chest and later in epigastrium, radiating around both costal margins to both shoulders, and then spreading over entire abdomen which became very much distended. Persistent vomiting of bitter greenish material. Unable to retain any food. Bowels moved by purgative, distention subsided somewhat. Has a slight cold but no pain in chest on deep respiration.

Previous history negative. Never had a similar attack. Has a child three weeks old.

Physical Examination.—Well-nourished, rather stout young woman. Lips parched. Tongue partly coated and peeling. Teeth poor. Breath foul. Chest respirations rapid. Expansion shallow. Breath sounds harsh. Heart negative.

Abdomen: General abdominal distention. Voluntary rigidity; unable to make satisfactory examination. Temperature 98°; pulse 84; respiration 28.

Operation (February 19, 1917).—Peritoneum opened. Omentum protruded showing multiple areas of fat necrosis. Gall-bladder distended with stones and gall-bladder chronically inflamed. Omentum adherent around gall-bladder. Lesser peritoneal cavity opened through the gastrocolic omentum. Small cavity in the pancreas found filled with blood. Extensive fat necrosis present. Four pieces of gauze were packed in the cavity of the pancreas through the opening in the gastrocolic omentum. One cigarette drain was placed down to the pancreas. One piece of rubber dam was placed alongside of cigarette drain and two pieces of gauze superficially around the other drainage. Abdomen closed to drain. Dry dressing.

The patient made a good operative recovery, but continued to drain freely for several weeks. Convalescence interrupted by left pneumonia and acute tonsillitis. Finally a good recovery, and was discharged May 6, 1917.

TREATMENT OF GUNSHOT FRACTURES OF THE MANDIBLE*

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Gunshot wounds of the lower jaw furnish very variable and many complicated fractures of that piece of the human skeleton. Blows received from slowly moving heavy projectiles may cause breaks practically indistinguishable from those seen in civil practice. Small rapidly moving bullets may simply bore a hole through one or both sides of the mandible, traversing the enveloping soft tissues with little damage. Large pieces of the body or either ramus of the mandible may be carried away or the fragments driven into the mouth, pharynx, or the soft structures of the face.

In addition to the comparatively inconsequential injuries, multiple and comminuted fractures occur from pieces of shell casing and from shrapnel; from secondary projectiles thrown into the face, and from blows with rifle butt, sword, or bayonet. This discussion might be called a consideration of war, instead of gunshot, fractures of the mandible.

The shape, situation, and function of the lower jaw and its relation to other facial structures lend to the vulnerating missile an extraordinary opportunity for serious complicating lesions. Much of the difficulty found by the surgeon in his attempt to restore the patient to his former military efficiency comes from the complications arising from sepsis. This danger is common to all war wounds and needs no special consideration. The removal of projectile and contaminating foreign substances, the prevention of infection by early aseptic excision of damaged tissues, the use of chemical antiseptics and the evacuation of cavities containing albuminous fluid liable to putrefaction should differ to but a moderate degree from the same activities in other regions. It may be said, however, that in the face an abundant vascularity, a free anastomosis of blood-vessels and the consequent unusual resistance to microbic attack permit greater retention, at the hands of the surgeon, of splinters of bone and of partially devitalized soft tissues than is wise in the limbs or trunk. The difficulty of maintaining a dry wound after reduction and fixation of an open or an infected fracture adds to the possibility of subsequent suppurative inflammation and septic necrosis. Establishment of free drainage by incision below the mandible, with introduction of tubes, so that gravity may aid in the escape of infected discharges, will do much to obviate the evil of saliva, food, and nasal mucus reaching the wounded surfaces. Giving water and liquid food through a funnel and soft rubber tube, for a week or ten days, may be very valuable as a preventive measure in fractures accompanied by wounds likely to assume septic complications.

* Read before the Philadelphia Academy of Surgery, April 4, 1918.

When one recalls the shape and function of the mandible, the real reason for its frequent malformation after union of a fracture is obvious. The bone reminds one of a crude horseshoe, with a high caulk at each end, applied to the skull upside down. Each caulk terminates in two projections. The posterior projection ends in a cylindrical knob for articulation with the temporal bone of the cranium, the anterior is flattened for the grasp of the tendinous insertion of the temporal muscle. This rude model of a horseshoe is furnished with sixteen sockets, on the same edge as that from which the caulks arise, for the roots of the lower teeth. When man opens his mouth for eating, drinking, or speaking, the mandible moves downward from the cranium and face as a hinged bottom drops from a box. The axis of motion is a transverse line drawn through the two rami a little above and a little behind the third lower molars. In addition to the open and shut movement of the jaws, there occur, during mastication, crushing and grinding motions of the molar teeth, caused by the action of the masseter and pterygoid muscles.

It is fortunate for patients who sustain fracture of the lower jaw (mandible) that the two upper jaw bones (maxillæ) above furnish an immovable anvil against which the teeth of the mandible strike in chewing food. This anvil-like mass of bone and teeth may be utilized by the surgeon as a splint to support and steady the broken lower jaw after its fragments have been so replaced as to reconstruct the dental arch. This may be done with muslin bands furnished with hooks glued to each jaw and then laced.

It is an axiom that the broken mandible should have the contour of its body or arch readjusted in a manner to reproduce the occlusion of upper and lower teeth existing prior to the occurrence of fracture. The surgeon thus has his patient's upper jaw for a standard, by which to assemble the various fragments of the mandible found in a gunshot or a comminuted fracture. This happy condition may be unattainable, because many patients have previously lost teeth in one or both jaws, or some teeth have been carried away by the gunshot force which produced the fracture awaiting reduction.

The usual fractures occurring in the body of the mandible are not difficult to reduce and keep reduced, if both jaws have intact teeth. The difficulty of reduction is usually not great in other circumstances, unless there has been great loss of teeth or marked ablation of bone by the trauma of the projectile. One readily obtains a proper occlusion of the teeth, and then holds the mandible against the maxillæ by means of an external bandage, chin-strap, or splint. In comminuted injuries the reduction is not apt to be easy; and its maintenance may be difficult. The absence of teeth, even if only a few have been lost, prevents very often the successful employ of the upper jaw as a supporting splint. The operator must then devise a method of fixing firmly the fragments in apposition by means of

interdental or intermaxillary splints or by the adaptation of some mechanical connection or bridge between the major fragments.

The general surgeon may undertake the treatment of severe fracture of the body of the mandible with some hesitation, because he realizes his unfamiliarity with dental manipulations within the mouth. Much of this is due to a want of consideration of the relations of the teeth to the fracture and a neglect of a study of the mechanical and anatomical needs of the injury. A dental surgeon may have, it is true, a manual dexterity and an experience which give him an unusual facility in treating mandibular fractures; but a surgeon without a sufficient degree of alertness and deftness to learn the few needed manipulations must be a sorry surgeon also in other technical procedures. The principles by which fixation of mandibular fragments is to be obtained can in all most exceptional cases readily be learned by a painstaking and conscientious operator. It is well for us to take steps to acquire such knowledge.

Reduction of the fracture by pressure of the fingers on the teeth is generally easy, though comminuted fragments or displaced teeth may cause interlocking and require removal before correct apposition is obtained. Teeth which are simply loosened should not be taken out unless they impede reduction or are situated within the line of fracture; then it is wise to extract them. The normal relation of the upper and lower teeth in most mouths brings the upper incisors in front of the lower when the mouth is closed.

In usual fractures of civil life, little tendency to displacement is shown after the lapse of ten days of treatment. Retentive dressings may usually be removed about two weeks from the time of readjustment of the dental arch. The patient may then be given an opportunity to cautiously chew soft food and to demonstrate whether the fragments have been so adjusted as to give the best use of the teeth for mastication. Consolidation at that time will not be so complete as to preclude slight changes at the hands of the surgeon for a better adjustment of fragments.

After the surgeon has brought the fragments into apposition in uncomplicated fractures, the upper and lower teeth should be kept in contact by closing the mouth and then holding the mandible firmly against the upper jaw by a figure-of-eight bandage of occiput and chin, or by some similar appliance, to prevent the patient opening his mouth. This is not a difficult matter if all or nearly all the teeth are present in both jaws.

The mouth should be cleansed with disinfectant washes frequently, and feeding carried out by introducing liquids through the crevices between the teeth or through a tube passed between the cheek and teeth into the space behind the last lower molar. The hair and beard of men should be closely cut before external bandages are applied, in order to prevent slipping of the bandage and to add to the comfort of the patient. When a simple bandage will not give sufficient firmness or when its lateral or backward pressure causes over-riding of fragments, a molded splint should

be applied to the outside of the skin, to constitute a hollow cap fitting the front and lower surfaces of the mandibular region. The splint should extend on each side nearly as far back as the angle of the jaw. It may need a crescentic portion of its posterior edge cut away in order to avoid pressure on the throat above the larynx. The splint is to be padded, unless molded from gypsum and gauze, vulcanized rubber, or modelling compound. Before applying the bandage, the chin splint may be steadied by carrying a strip of rubber adhesive plaster over the splint and bringing the ends high up on the cheeks. Although most fractures in the dental arch communicate with the mouth by tears of the closely adherent gums, the fracture does not usually become infected. This rule does not hold good, however, if the fracture is a comminuted one or the mouth allowed to continue fetid during the treatment.

If the tendency to displacement is persistent, wiring the fragments together, or fixing one or more teeth of the mandible against those of the upper jaw by wires carried across from the teeth of the mandible to the teeth of the maxillæ may be a valuable expedient. Provision must be made for immediate release in the event of vomiting from anæsthesia or seasickness. Sometimes fixation by an intraoral or dental splint becomes necessary. Wiring the fragments in position may be done by passing a strong silver thread around several teeth on each side of the fracture and twisting the ends tightly with pliers. Rebellious fractures may require the ends of the bone to be drilled and wire sutures passed through the drill openings. This is most apt to be needed when the jaw is toothless or greatly atrophied near the point of fracture.

Dental splints are appliances worn inside the mouth and so fitted to the teeth and alveolus of the mandible that motion at the seat of fracture is prevented. A plastic impression of the teeth and alveolus is taken while the fragments are held in position; and from this a splint to fit the irregular outlines is made of rigid material. In making an intermaxillary splint, a similar impression is taken also of the maxillæ above. By means of impressions thus made in plaster-of-Paris, a splint of metal or vulcanized rubber is constructed with indentations into which the properly adjusted teeth properly fit. By applying such a dental or intermaxillary splint to the teeth, the bone is held continually in contact with it and mobility at the seat of fracture rendered impossible. This immobility is due to the crowns of the teeth being buried in the indentations on the surface of the splint. The simple dental splint fitting the teeth of the mandible alone and fastened to the alveolus may be sufficient. Instead of a dental splint, it may at times be better to construct a splint with indentations to hold the teeth of the upper jaw on one surface and the teeth of the lower jaw on the other surface. This is the intermaxillary splint. If a splint is made for the mandible alone it is fastened to the jaw usually by rods coming from it at the corners of the mouth and then attached to a splint beneath the chin. This device is probably not as convenient and

satisfactory for preventing lateral movements as the intermaxillary splint steadied by close contact with the upper as well as the lower teeth.

A temporary splint may be made by softening a gutta-percha strip in hot water, molding it to the crowns of the lower teeth so as to overlap the adjacent gum, and hardening it with cold water. Such a splint may be held in position by wires carried by means of needles through the muscles in the floor of the mouth, and out through the skin of the chin, so that they may be twisted under the mandible over small rolls of plaster or pieces of cork. In subjects who have lost all or nearly all their teeth, interdental splints molded to the atrophied gums present about the only efficient means of maintaining immobility. In all forms of splints greater immobility will, as a rule, be obtained by bandaging the jaws together. If desirable, gutta-percha wedges may be placed between the jaws on each side of the mouth, in order to have a space in the middle for introduction of food. A crude form of intermaxillary splint may be made of cork cut to fit the teeth of the two jaws. An impression tray, such as is used by dentists in taking impressions for dentures, may be utilized as an emergency splint by putting softened modelling compound in its grooved surface and attaching wires to be thrust through soft parts and twisted under the mandible outside of the face.

Union of ordinary fracture of the mandible takes place in about five weeks. In many cases apparently likely to give bad position there is ultimately quite a good result, provided that sepsis does not occur and a fairly good apposition of fragments is maintained during the early stages. This statement, however, is subject to many qualifications, the most important of which is that a general surgeon without technical knowledge of the value of dental skill may obtain much poorer results alone than if he has the advice of an able dentist. The tray idea may be utilized to form an intermaxillary splint, if the surgeon will fasten two trays together by means of a posterior hinge. Softened modelling compound placed in the gutter of each tray will allow impressions to be taken. When the compound has hardened the trays and their contents will be efficient as an emergency splint.

When there is a considerable loss of the bone at or near the symphysis, the two fragments will probably be drawn together by the muscles displacing the broken bone; this later will be increased by cicatricial contraction. Thus is given a narrow arch; and sometimes the contraction makes a V-shaped lower jaw. Such a deformity makes it impossible for the teeth in the mandible to have proper occlusion with those of the maxillæ. The patient, therefore, is unable to properly masticate food. When the fracture is in the lateral portion of the body, the larger fragment is usually drawn toward the smaller which is situated on the fractured side. This causes deviation of the chin to the broken side.

The normal occlusion of the teeth should be reëstablished in gunshot fractures as soon as possible, even before there is any general suturing of

stripped-off soft tissues, if these are greatly lacerated. Unless this is accomplished, the fracture displacement will probably become permanent and reconstruction of the contour of the face very difficult to effect. When a portion of the bone is deficient as the result of fracture, the immediate treatment should be conducted in very much the same way as that which is necessary subsequent to excision of the mandible for tumor or necrosis. The operative or accidental loss of a portion of the body of the bone requires that displacement should be prevented early by holding at once the pieces in normal position. This may be done by placing between the ends some plastic material which becomes hardened after its adaptation. The ends of the bone may be held in position also by heavy wires bridging the gap and attached to the teeth on opposite sides. The rigid wire used in this manner, when there are no teeth for its attachment, may be inserted in the inferior mandibular canal or passed through drill holes made through the sawed-off ends of the bone.

Several forms of splint have been devised for this purpose. Bands or caps may be fitted or cemented to the teeth and a metal arch or a vulcanite substitute for the bone be introduced between the fragments. After a few weeks' wearing of the apparatus, the displacing tendency may, perhaps, be overcome. Vulcanite prosthetic parts of the bone may be used to support plastic flaps, and vulcanite plugs may be used to push the collapsed cheeks into proper position, so as to remedy traumatic deformity. Temporary fixation is, therefore, to be always sought in war surgery as early as possible. A dental surgeon may be needed to properly make and apply the special forms of intraoral splint or apparatus needed to maintain adjustment of mandibular fragments in civil as well as military surgery. Torn-off soft tissues may sometimes be held against the underlying bones of the face with tacks or small staples driven into the bone. The bones may be kept coapted at the seat of fracture with screws or fracture plates of steel or aluminum. This method is usually inferior to that by intraoral splints.

Most gunshot fractures of the mandible are open and, therefore, liable to become contaminated, and later infected. The treatment of the wounds has been touched upon already. Large areas of skin and muscle may be detached from the bones of the face in gunshot wounds. The raw surfaces should be cleansed and well painted with tincture of iodine, or dichloramine-T, or other antiseptic, and vulnerating missiles and foreign bodies thoroughly removed as soon as possible after injury. These fractures should be reduced immediately and the fragments fixed. Even a temporary fixation of fractures is of distinct value as a preliminary to reconstruction of the facial outlines.

If the mandible alone is broken, the upper jaw may be used as a support or splint. To do this, place a mass of softened modelling compound between the upper and lower teeth and drive the upper jaw and mandible into it in the position of occlusion. The composition is then allowed to

harden in position. This gives a very fair splinting of the broken lower bone. The chin may be supported with a cap of pasteboard, metal, or modelling compound held in position by a figure-of-eight bandage of occiput and chin. Fastening the upper and lower jaws together by wire ligatures around opposing teeth of the bones may also be serviceable until a better form of apparatus for steadying the broken mandible can be obtained. Some of these methods may, in fact, be employed as a permanent means. They may also be used at times in steadying fractures of the upper jaw, though in these there is usually less displacement than in those of the more movable mandible.

The soft parts may be brought together over the broken bone after the fracture has been reduced. They should not be sutured so closely as to interfere with drainage, if there is a probability of infection becoming marked. Care should also be taken not to stitch the muscles and skin in so tight a manner as to tend to reproduce deformity at the seat of break. When large flaps of tissue have been torn from the bones, stitches occasionally need relief of strain. This may be accomplished by molding plates of vulcanite to the forehead and cheeks, fixing these by straps around the head and connecting with them by jointed steel springs of heavy wire. To the ends of these springs are attached truss pads to press and hold like fingers the detached soft parts into normal position. Tacks or staples may be employed to hold such accidental flaps against the bone, if sutures are not available.

Drainage will be particularly needed in damaged tissues of the lower facial region and chin. This should be provided for in some cases of fracture of the lower jaw by incision below the inferior margin of its body. Practically all fractures of importance in the alveolus and body are contaminated through the wounded gum with saliva and food products. Many such fractures will probably heal more promptly if, at the time of the original dressing or shortly afterwards, an incision is made below the inferior margin and drainage established. The gum is torn at the time of injury because it is so closely adherent to the bone. This adherence, however, is a protection against spreading of infection.

There occurs at times great swelling from laceration of the tongue or infection of that organ and the other tissues within the mouth. This complication may require that the breathing of the patient be provided for by laryngotomy. Possibly a tracheotomy some distance below the larynx even may be demanded. If the attachment of the tongue to the symphysis of the mandible is severed by reason of operation or the complicated character of the fracture, the patient may become asphyxiated by the tongue falling backward and closing the opening of the glottis by pushing the epiglottis downward and backward. To avoid this catastrophe, the swollen tongue may need multiple incision to lessen its bulk. It sometimes is wise, especially after anæsthesia, to put a long string through the end of the tongue, knot it at the ends, and leave a hemostat

attached to it. This instrument by its weight holds the tongue forward, and can readily be seized by the patient himself or nurse to reëstablish breathing, should the tongue fall dangerously backward. This string with the attached hemostat may be removed at the end of twenty-four hours.

Major V. P. Blair gives a valuable series of suggestions on the treatment of mandibular fractures due to gunshot and shrapnel injuries. These may be epitomized as follows:

(1) *Fractures of the body of the mandible in front of the last existing tooth with no loss of bony substance.* This type may occur from concussion without the projectile striking the jaw. Fixation may be obtained by the usual methods of civil practice.

Hullihan continuous dental splint and Gilmer's vulcanite lingual band splint wired to teeth, shown in this article, are satisfactory in such cases.

(2) *Fractures of the body of the mandible in front of the last existing tooth with considerable displacement or considerable loss of substance and with few teeth remaining.* The majority of gunshot fractures, according to Blair, belong in this class. Fixation is to be secured in the two usual varieties as follows:

(*a*) With loss of substance at the symphysis the tendency is for the fragments to be drawn together in front with the occlusal surfaces of the teeth facing each other.

(*b*) If the loss of substance is in the lateral portion of the bone, the fragment on the sound side is drawn over toward the affected side.

In both instances, the fragments, which are separated by a gap due to the avulsed bone, are best held apart and fixed in normal relation to the upper teeth by the metal jacket and wire splint described by Hayes. This may be made in one solid piece; or it may be applied to the bone in sections, which are subsequently fastened together.

(*c*) When there is a tendency for the lower jaw to swing over to one side, on account of the loss of substance, the outer surface of the splint on the opposite side may be furnished with a metal flange to engage the teeth of the upper jaw. This acts as an inclined plane to throw the teeth into proper occlusion when the jaws are closed.

(3) *Fractures of the mandible behind the last existing tooth.*

These fractures include those of the body of the bone, the ramus, and condyle.

(*a*) If no tendency to displacement is present and no loss of substance has occurred the simplest method of treatment is fixation of the lower jaw to the upper with ligature wires directly applied to the teeth, or by the employment of Gilmer's posterior or lingual arch already shown in a previous figure. Always provide for prompt release of the jaws to permit vomiting if the wounded man is liable to seasickness or vomiting from any cause.

(*b*) Fractures of the angle and ascending ramus with loss of bone without displacement may be treated by wiring without splint (see Fig. 1).

(*c*) If the ramus is displaced either forward or laterally, the anterior fragment may be fixed by wiring the teeth to those of the upper jaw and the ramus steadied by means of an intraoral plastic splint of modelling composition. This is molded within the mouth. The ramus is drawn back with a hook introduced through the cheek or a lion-jaw forceps holding it through the skin. While it is thus supported the modelling compound is introduced, applied to the maxilla above and the ramus of the mandible and allowed to harden between the ramus itself and the last molars of the upper jaw, but continuing downward behind the mandibular molars. Remember the danger of a locked mouth in the event of vomiting during transportation or travel by sea.

(*d*) If no teeth are available for wiring the jaws against each other, intermaxillary fixation with ligature wire may be applied. This is done by drilling holes through the mandible at the level of the roots of the teeth about three-quarters of an inch distant from the fracture line on each side. Through these openings strong wire is carried and twisted so as to hold the fragments in coaptation. Other holes are drilled in the upper and lower jaws in the incisor region, or in other satisfactory sites, and wires for approximation and fixation are carried through both jaw bones so as to give firm contact of mandible to maxillæ. The fracture is then reduced and all the wires twisted to maintain the corrected position at the seat of fracture. Early release may be afforded by teaching the patient how to cut or untwist the ends of the wires in case of nausea or vomiting. Long ends to the wires or the habitual presence of strong scissors may thus save life from threatened suffocation with vomitus.

(*e*) Upper and lower swaged metal jackets may be found serviceable in the fractures under discussion. Sometimes the tendency to displacement in a lateral direction may be overcome by attaching to the splints hooks to which intermaxillary rubber bands may be fastened. If it is thought necessary to hold the jaw in fixation with the mouth open, in order to prevent forward displacement of the ramus, the Herpin splint seems available and likely to be useful.

Gunshot fractures of the mandible are so essentially open fractures in most cases that osteomyelitis and other septic complications are common. Necrosis may thus impede union and cause permanent non-union with atrophy of the ends of the fragments. A definitely false joint may result at the point of fracture. Violent primary hemorrhage may occur from the missile injuring the lingual, facial, or one of the carotid arteries. Secondary bleeding may threaten the life of the patient. Septic œdema of the tongue, throat, or glottis may give origin to dangerous dyspnœa. Unintelligent treatment or the character of the osseous injury may cause union or occur with great deformity of the mandible, malocclusion of the teeth or facial disfigurement from scar contraction. These sequels require active operative treatment on general surgical principles. Bone transfer by flap from clavicle or grafting from rib or tibia may enable the

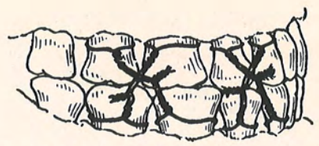


FIG. 1.—Gilmer's method of fixation by holding mandible against maxillæ with wires around necks of the teeth. (Blair from Gilmer's Oral Surgery.)

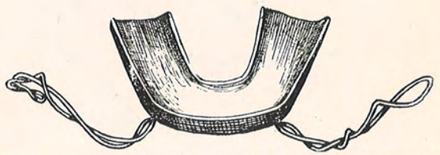


FIG. 2.—Impression tray to be used as Kingsley splint temporarily by filling it with softened modeling composition. (From Blair's Injuries of Jaws.)

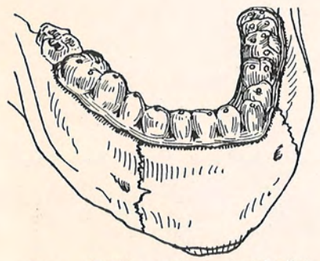


FIG. 3.—Hullihan continuous dental splint. (Blair after Angle.)

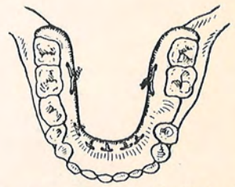


FIG. 4.—Gilmer posterior band splint in place. (Blair.)

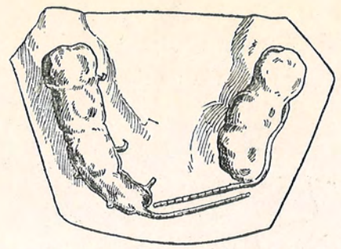


FIG. 5.—Model of a sectioned metal jacket and wire splint; the two halves to be lashed together with fine wire. (Blair after Hayes.)

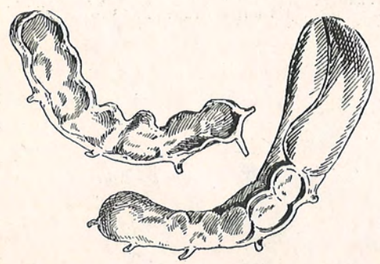


FIG. 6*a*.—Swaged metal jacket splint with hooks for ligature wire. (Blair after Davenport.)

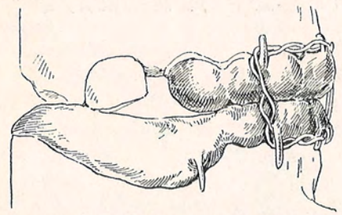


FIG. 6*b*.—Model showing swaged metal jacket splint as applied to teeth and wired to fix jaws. (Blair after Davenport.)

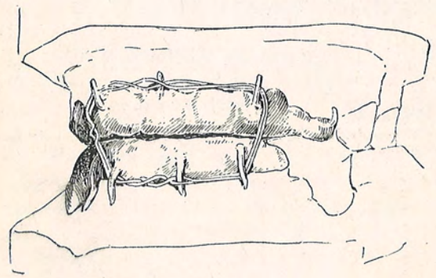


FIG. 6*c*.—Model showing swaged metal jacket splint as applied to fix jaws together. (Blair after Davenport.)

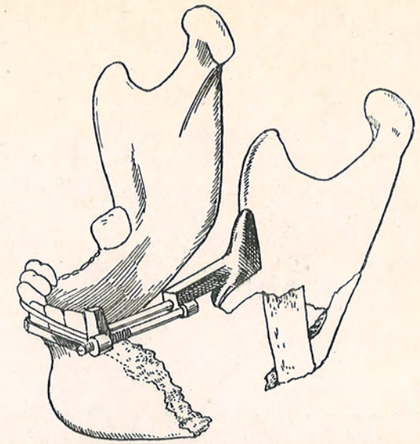
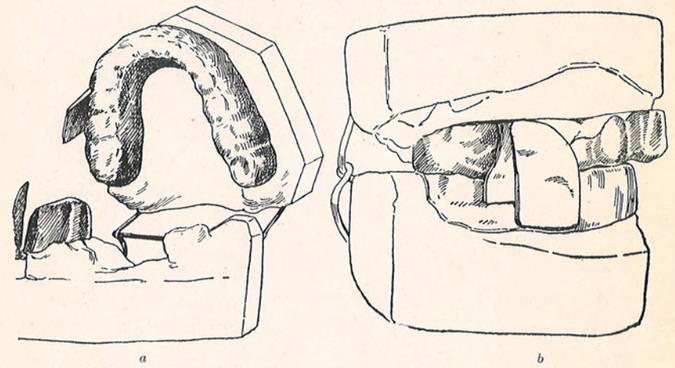
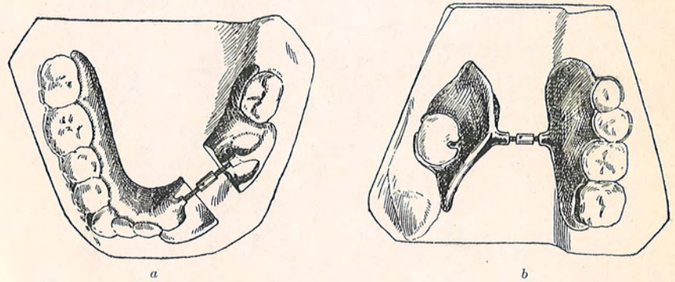


FIG. 7.—Lower bar and saddle splint. (Blair after Herpin.)



a *b*

FIG. 8.—Metal jacket splints with inclined planes to throw teeth into proper occlusion when mouth is closed by bringing jaws together. (Blair after Hayes.)



a *b*

FIG. 9.—Models of sectional vulcanite splints with jack screws for slow separation of fragments of fractured mandible drawn together by muscular traction.

surgeon to reconstruct the mandibular arch; or he may use a graft of costal cartilage for this purpose.

It is probable that about one-half inch of lost substance in time may be reproduced across the gap between the fragments of a broken mandible, if normal occlusion of the teeth is maintained by fixing the jaws together. Morestin prefers for grafting sections of the sixth, seventh, and eighth costal cartilages. These he shaves into proper shape with a knife, and accurately fits them into the gap with their ends driven into the bone. He uses such grafts to reconstruct the angle and vertical ramus as well as the horizontal ramus. Although the cartilage may not be converted into bone and may not actually assume firm union with the ends of the fragments, the false joint is not, he says, of much disadvantage. Fixing of the jaws together is necessary in the after-treatment.

Pont advocates the use of tibial bone grafts and insists upon absolute fixation of the mandible against the maxillæ after the grafting operation. This immobilization is maintained for several months. Instead of grafting, a bone transfer may be made by chiseling off a part of the sternal end of the clavicle, leaving the sterno-mastoid attachment as a muscular pedicle, or by turning up a flap from the chest and neck, including a plate of bone from the front of the clavicle.

Further experiences of these and other writers will probably modify methods in minor details.

RIB CARTILAGE TRANSPLANT FOR SADDLE-BACK NOSE*

By Penn G. Skillern, Jr, M.D.
of Philadelphia

Case I.—Male, white, aged twenty, clerk, who fifteen years previous to admission suffered fracture of the nasal bones. Examination reveals depressed bridge of nose (Fig. 1). The patient is blind in the left eye, due to lues. He received intensive arsenobenzol treatment.

Operation was performed under local anæsthesia (novocaine ½ per cent.). Incision made over seventh right costal cartilage close to sternum; tissues retracted; section of cartilage, 2 inches long by ¼ inch broad by ⅛ inch thick, removed and placed in normal saline; field sprayed with dichloramine-T; hæmostasis effected; wound closed with interrupted sutures of silkworm-gut; one piece of rubber dam placed in outer angle of wound for drainage; dry gauze dressing.

Novocaine ½ per cent. subcutaneous infiltration made in midline of nose from glabella to tip. Vertical incision ½ inch long in mid-nasal furrow: tissues retracted; periosteum of frontal bone exposed. With Mayo curved dissecting scissors a subcutaneous tunnel was made from glabella to tip: scissors withdrawn, tunnel packed with dry gauze. Horizontal incision ½ inch in length made in periosteum of frontal bone. Cartilage transplant removed from saline solution, gutter made in deep surface. Transplant with perichondrium uppermost inserted into subcutaneous nose tunnel, after removing gauze packing from latter and mopping latter with dichloramine-T: upper flap of periosteum of frontal bone raised with blunt hook, upper end of transplant inserted beneath same. Incision closed with one suture of silkworm-gut. No dressing was applied (Fig. 2).

Case II.—Male, white, aged twenty-four, single, pugilist, who was admitted to Polyclinic Hospital (Case Record No. 324-9) on December 11, 1917. The patient as a pugilist had received numerous blows upon the nose, resulting several times in fracture. In consequence the bridge of the nose is depressed, this forming a variety of saddle nose (Fig. 3). The patient states that at one time after receiving an injury he blew his nose and the eyelids filled with air. Physical examination reveals a naturally broad nose, the bridge of which is depressed, so that the anterior nares face somewhat forward. The operation was essentially the same as in the previous case, except that a transversely curved incision was made between eyebrows and with convexity downward. The result is shown in Fig. 4, the patient's friends agreeing that his nose had been considerably improved by the operation.

According to the experiments of Dr. John Staige Davis, of Baltimore, cartilage transplants are practically never absorbed, while bone transplants

* Presented before the Philadelphia Academy of Surgery, May 2, 1918.

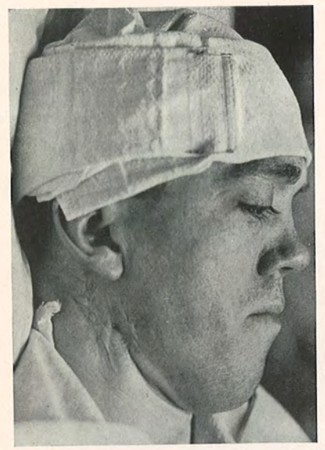


Fig. 1.—Saddle nose before operation; note short distance between eyelashes and surface of bridge of nose.

Fig. 2.—Nose after operation: note great increase in distance between eyelashes and surface of bridge of nose.

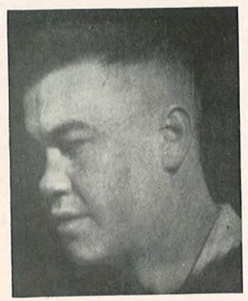


Fig. 3.—Case II. Saddle nose before operation.

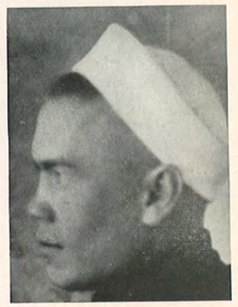


Fig. 4.—Case II. Nose after operation.

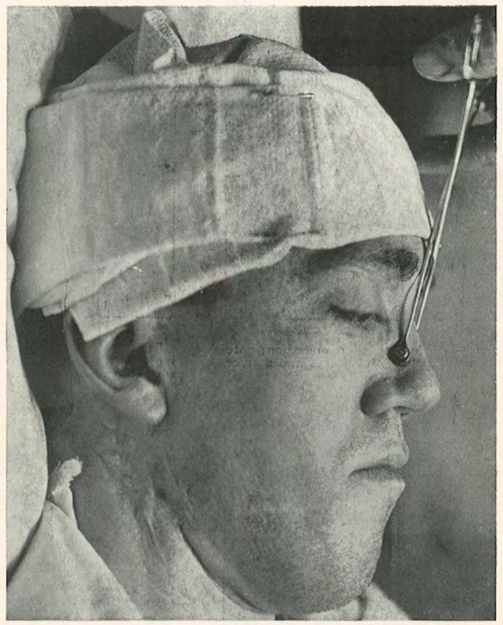


FIG. 5.—Author's test for determining approximate size and shape of graft to be inserted.

unless accurately contacted with bone and periosteum lead a precarious existence, and are ultimately more or less absorbed. Cartilage has the further advantages of being easily obtained and easily pared with a knife to the desired pattern, while by its elasticity the intervening portion between the ends, which are supported by the frontal bone above and the septal cartilage below, takes up the slack in the skin, thus filling the latter to the required level and without undue tension; the graft itself is not subject to fracture in the event of a blow upon the nose, as would obtain were a bone graft employed. Regarding the use of dichloramine-T, the subcutaneous nose tunnel was first packed with gauze saturated with this substance, thus sterilizing the space and taking up whatever oozing there might be, just as when preparing a pocket in the scrotum for the reception of an undescended testicle. One silkworm-gut suture was used to close the wound, which was left exposed to the air. In the first patient there had been some transitory œdema over the forehead after operation, but in the second patient postoperative œdema did not take place. As regards the choice between the supranasal and the intranasal routes for insertion of the graft, the objection to the latter would be the danger of infection spreading to the graft field from the nasal cavity, especially bearing in mind the advice of the late Dr. John B. Murphy—namely, when preparing the pocket for reception of the graft to take great pains to avoid opening into the nasal cavity with the dissecting gynesic scissors, in order to avoid the ever present danger of infection from this source.

The frontal bone is nourished and reproduced from the dura, the periosteum covering it being devoid of osteogenetic properties: for this reason burial of the upper end of the graft beneath the periosteum of the frontal bone is not done with any expectation of getting nourishment or reproduction of bone from that source, but it is done with the idea of more firmly securing the graft *in situ*. Recent experiments show that cartilage when transplanted establishes nutritional relationship with its host just as surely as bone does.

In Figure 5 is shown a test devised by the author for determining the approximate size and shape of the graft to be inserted. With thumb and index finger applied to base of nose at its middle draw the skin forward: the skin over the bridge will now resume its normal conformation, and a space will be found between the skin and the bridge, representing the amount of height-loss of the bridge and therefore the thickness of the graft; the anterior nares will drop downward to their normal site.

SURGICAL TECHNIC IN ORTHOPÆDIC SURGERY*

By Walter G. Elmer, M.D.,
of Philadelphia
Instructor in Orthopædic Surgery in the University of Pennsylvania

Orthopædic surgery makes peculiar demands upon us in regard to surgical technic. The operations, if they are to be successful, must be carried out in an aseptic manner. Perfect asepsis cannot be attained, but we can very nearly reach it if we go about our work with intelligence and painstaking care in regard to the smallest detail.

In performing the operations of orthopædic surgery it is frequently necessary to use a good deal of force in correcting the deformity, and no matter how carefully the skin has been prepared, these forcible manipulations will force the staphylococcus epidermis albus from the deeper layers of the epithelium out to the surface where the organism is capable of causing mild infection in the operation wound. An example of this is seen in the correction of a talipes equinovarus, where the foot is stretched and manipulated by the operator's hands or molded over the König block or perhaps the Thomas wrench is used. And in order to secure the required amount of correction, it may be necessary to divide the posterior tibial tendon by an open incision and do a plastic operation on the Achilles tendon. An operation of this character is usually performed at one sitting. In another class of cases the forcible stretching and correction is done at some time previous to the operation and the foot held in its corrected position in a plaster-of-Paris case until a later time, when the tendon transplantation or arthrodesis may be done—as in the infantile paralysis cases.

When silk is imbedded in the tissues and we wish it to remain permanently, the slightest infection of the silk will defeat the operation, as the silk will eventually cause suppuration and must be removed. If silk is used as an artificial ligament or tendon, it acts as a foreign body in the tissues. The tissues react to its presence and deposit granulation tissue along the strand. This in time becomes converted into fibrous tissue and we have then a new ligament or tendon of living tissue, the centre of which is the buried silk. The process requires a long time. The limb must remain fixed in plaster-of-Paris about nine months. The silk will then remain permanently in place. But if the silk is infected with even so mild an organism as the staphylococcus of the skin, it will probably loosen and work its way out or must subsequently be removed.

In opening joints great care must be taken to avoid introducing the

* Read before the Philadelphia Academy of Surgery, May 2, 1918.

skin coccus within the joint cavity. Therefore, two knives should be used—one for the skin incision and another to use in the deeper structures.

But my purpose in presenting this paper is to call attention to several important ways in which the wound may become contaminated by organisms far more potent than the skin coccus, types of infection which may defeat the operation and even be a serious menace to the life of the patient. The responsibility rests largely upon the nursing staff and the technic of the operating room is good or bad according to the intelligence and ability of the nurses in charge of it.

The head nurse must directly and personally supervise the work of her assistants, and the directress of nurses is responsible for the head nurse. The most important feature of a large general hospital is the operating room—and this includes, of course, its personnel.

The visiting surgeon in performing a series of operations expects everything to proceed smoothly and without friction—doctors and nurses working in harmony—and all coöperating to secure the best results. When one operation follows another in quick succession—perhaps not five minutes in the interval between them—it is not always possible to relegate the septic cases to the last, as it sometimes happens that infectious material is encountered when it is not expected.

A gall-bladder may be septic or an appendix may be lying in a small pocket of pus. A clean pelvic operation may reveal a pyosalpinx. Therefore, in every series of operations one must take it for granted that they may not all be clean cases.

The operating-room nurse and her assistants must have absolute confidence in their ability to so conduct the technic that there is no possibility of carrying infection from one patient to another. This requires constant vigilance and can only be entrusted to a highly trained head nurse.

In most hospitals it is customary for the directress of nurses to make a daily tour of inspection of the hospital under her charge. She visits the private patients and the ward patients, sees that the wards are clean, looks at the bed linen, walks into the kitchen and pantry, opens the doors of cupboards and closets, inspects the toilet rooms and in a hundred other ways assures herself that the hospital is being conducted in a clean and orderly manner. And yet more important than all these is the operating room, and I would suggest that the directress of nurses occasionally vary her routine and go unannounced into the operating room or the clinical amphitheatre when a series of operations is in progress and remain throughout an entire forenoon or afternoon watching with vigilant and critical eyes every detail of the work of her nurses.

In my visits to hospitals in other cities I usually seek out the operating room nurse and, if she can spare the time, ask her many questions in regard to the surgical technic.

From a seat in the clinical amphitheatre during a series of operations

one can also gain a very fair idea of the care and thoroughness with which the nurses have been taught.

I will mention some of the weak links in the chain of surgical technic as they have come to my notice in different hospitals, and the fact to be kept in mind is that any one of these weak links is capable of causing a complete breakdown in our surgical asepsis and result in the failure of our efforts to secure clean primary healing of our operation wounds. Of what use is it to insist on our surgical staff, both doctors and nurses, wearing mouth guards, when it is possible to point out faults in the technic by which septic virus may be carried from an infected case to a clean one?

First, then, we will consider the gutta-percha gloves. As the gloves can be sterilized *absolutely,* it is a good thing to use them. But the most important function of the rubber gloves is to prevent the skin of our hands from being infected with the highly tenacious poison of a septic case, as the skin of our own hands when so contaminated cannot be rendered clean for a clean operation which is to follow. A doctor or a nurse may carry this infection on their hands for several days in spite of all efforts to disinfect them. And it is most important that the hands and forearms of the surgeon and his staff of assistants should at all times be protected from contact with septic material.

The preparation of the rubber gloves, therefore, is a matter of the most vital moment. Beginning, then, with a pair of gloves which have been worn during a septic operation—which might have been a ruptured appendix and local peritonitis, an empyema of the gall-bladder or of the thorax, a pyosalpinx, or a dermoid cyst, drainage of an infected knee-joint or opening the thigh-bone for acute osteomyelitis, puerperal sepsis and many other conditions. Poison of this character may remain potent for many days upon rubber gloves, basins, table tops and the like.

The infected gloves are washed with soap and water by a nurse who perhaps is handling them with her bare hands. Her hands, therefore, become the carriers of infection, and even though she may not be assisting at operations, she may have a good deal to do with making the necessary preparations for an operation.

In some hospitals the nursing staff apparently has implicit faith in the autoclave. The nurses believe—and it is difficult to convince them to the contrary—that everything that comes out of an autoclave must be sterile because it has been exposed to live steam for twenty minutes or a half hour. But the autoclave is fallible. There is a curious and inexplicable inconsistency about the use of the autoclave. The gauze and cotton which come to the hospital from mills or factories, where it is most unlikely they could have become contaminated by any really virulent organisms—probably nothing more than the ordinary dust of a workroom, which is relatively harmless—are put into the autoclave for a half hour on three successive days in order to destroy all germs and spores. The most harmless of all the materials used at the operation are subjected to the most rigid and thorough sterilization.

The live steam under twenty pounds pressure penetrates every portion of the cotton, gauze, bandages, sheets, towels, gowns, etc.

And now as to the rubber glove. It is probably capable of greater harm than any other article which is used at the operation. Operating-room nurses have sometimes told me that they depend upon the autoclave to sterilize the gloves. If the gloves have been used in a septic case they are sterilized for twenty minutes, and if they have been used in a clean case they are sterilized for ten minutes. How the nurse knows whether a case is a clean or a septic one I do not know, because it sometimes happens that the operator himself does not know, and only a laboratory report by the bacteriologist can decide the point. When the nurse is asked why the gloves used in a clean case are sterilized only ten minutes instead of twenty, she replies that the longer exposure to the live steam is harmful to the rubber—that it shortens the life of the glove. She admits that the twenty-minute period is desirable for the septic gloves, but she does not and cannot know whether the gloves are septic or not in some cases. The gutta-percha is impervious to steam. The gloves are sometimes folded twice upon themselves and bound up in a small muslin package and a pile of these are packed into the autoclave. Now it is entirely probable that the live steam reaches all the parts of the outer surface of the glove, but I believe there are air pockets inside the glove—probably in the fingers or thumbs—which the steam never reaches. These air pockets therefore permit only *dry heat* sterilization instead of moist heat sterilization for twenty minutes. And the nurse knows that she is dealing with a glove which has been used in a case which was frankly a septic one. She runs her autoclave at about twenty pounds pressure. This provides a temperature of approximately 260° in the sterilizing chamber. This is moist heat sterilization.

We know that boiling water (210° F.) will destroy all organisms and their spores in five minutes. The nurse therefore believes she has a wide margin of safety. But she overlooks the air pockets inside the gloves. These are receiving only dry heat. In order to destroy all germs and their spores by dry heat an exposure of about one hour at a temperature of 350° F. is required. The autoclave falls short of this by nearly 100° in temperature and forty minutes in time.

The surgeon, on putting on his gloves, may find when he opens the package that he has two rights or two lefts through an oversight on the part of the nurse who prepared them and proceeds to reverse one of them, thus bringing the surface of the glove which may not be sterile outside, in contact with the operation field. Or, during the operation the finger of the glove may be punctured or torn and the result may be the same. In order to avoid all possibility of doubt as to the glove being sterile, we have the nurse wash the gloves with soap and water, turning them inside out while

doing so. They are then filled with water to remove the air and immersed under the surface of boiling water and held down by a piece of wire screen so that they cannot float up to the top and be exposed to the air.

They are boiled five minutes by the clock. When the water cools, the nurse, wearing sterile gloves, removes them, dries them with a sterile towel, powders them inside and out with sterile talcum powder and folds back the gauntlet. Into this she tucks loosely a small gauze pad covered with talcum powder which the surgeon uses for dusting his hands. The gloves are then placed without folding in a muslin cover and put into a large glass jar. The final preparation is just before they are needed for an operation. The muslin packets are placed full length in the autoclave, lying loosely in rows, not packed together in compact bundles, and sterilized for twenty minutes. The steam easily reaches every part of the glove and the dusting powder also. The surgeon can have absolute confidence in these gloves—there is no possibility of their carrying septic material from a previous operation.

There is another object which may be a carrier of a deadly virus and that is the sand pillow. It usually has a rubber or mackintosh cover. When it is used in a septic operation—as in an acute osteomyelitis or the drainage of an infected joint or necrosis of bone—the discharges from the wound soak through the sheets or towels and soil the sand pillow. The stains are wiped off with a wet cloth later before the nurse puts it away upon a shelf, but no attempt is made to sterilize it. Within a day or two the pillow may be called for again. This time the surgeon is going to remove a bone graft from the tibia to be inserted into the spine, or he finds it a convenient support in doing an arthrodesis on the foot. The most rigid asepsis is required. A nurse brings in the sand pillow, the surgical nurse wraps a sterile cloth about it and it is placed under the patient's limb. So long as the sterile cloth remains dry no harm results. But it does not remain dry. Blood may run down upon it from the wound, or wet gauze sponges come in contact with it, instruments which have been rinsed in the basin of sterile water may be placed upon it, the surgeon washes his gloved hands in the sterile water and returns to the operation with his gloves dripping, and so the coverings of the sand pillow become wet. It is then only a matter of five or ten seconds before the operation field becomes contaminated with the poison of the septic case of the day before. I usually demonstrate this to my class of students by making a red ink stain on the sand pillow and allowing it to dry. The pillow is then covered with a white cloth and a wet gauze sponge is dropped upon it. In from five to ten seconds the red stain is seen coming through and by the end of two minutes the surrounding areas are red and the gauze sponge stained through and through, although it is fourteen layers of gauze in thickness. The demonstration is very simple and absolutely convincing. This same principle applies, of course, to the tops of the tables upon which the instruments are placed and also the top of the operating table. Very often this latter is covered with a rubber

pad and this in turn with a clean sheet. If the operation happens to be upon a patient's lower limb, the limb is painted with a 3 per cent. solution of iodine while an assistant holds it up with a sterile towel. Then the surgical nurse covers the operating table with a sterile cloth—probably folded to make it double thickness and the limb is put down upon it. If the rubber pad has been soiled from the discharges of a septic case, our clean operation will almost certainly be infected as soon as the table coverings get wet. When one considers the character of the operative cases which come and go in the general routine of the operating room of a large general hospital, the great care which must be exercised by the nursing staff must be apparent.

In a single week there may be a series of operations, which includes an operation for gall-stone complicated by an acute septic cholecystitis, the removal of a pyosalpinx, removal of a papillomatous ovarian cyst or a dermoid cyst, a child with ruptured appendix and acute peritonitis, a child with mastoid abscess, another with empyema, and many other similar cases, and all along the clean cases are being operated upon. It is an advantage to have one operating room set apart for septic cases, but even this does not overcome the difficulty. However, the measures to avoid carrying infection from one case to another are simple. There should be a rubber cover provided for each table. They should be sterilized just as the gloves are. The rubber cover is in turn covered with a sterile cloth. The same is true for the sand pillow. The operating table may be covered with a sterile folded blanket and on top of this the sterile sheet folded double. Or a sterile rubber cover may be placed over that part of the operating table which is in the neighborhood of the operation and upon this the sterile folded sheet.

This same procedure is followed for each operation.

The instruments are sterilized for ten minutes by boiling them in water to which a tablespoonful of carbonate of soda has been added. Only the instruments which will be required for the operation should be prepared. It is a disadvantage to sterilize a large number of instruments which are not likely to be used. They unnecessarily complicate the use of the instrument table, and it is also hard on the instruments. The knives are not boiled. After being used they are carefully washed before being put away. They are sterilized for operation by immersion for twenty minutes in a 1/20 carbolic solution or 3 per cent. formalin. They are removed by a sterile forceps to a tray of 85 per cent. alcohol. This seems to be a safer plan than to depend upon the alcohol tray alone and particularly if the knife has been used previously in a septic operation.

Silk may be prepared by boiling it for ten minutes in a 1/1000 bichloride solution and then for ten minutes in plain water. If the silk is boiled with the instruments to which the soda has been added its tensile strength may be impaired.

The catgut should preferably be obtained from the manufacturer in

sealed glass tubes. These tubes when handled become coated with a thin layer of grease from one's fingers and in this thin film living organisms or spores may lie imbedded and perfectly protected from the action of antiseptic solutions. It is not enough, therefore, to place these tubes in a tray containing carbolic solution or formalin solution. The germs are not destroyed and the nurse, when she takes up the tube in her gloved hands and breaks it protected in gauze, is very likely to contaminate her gloves and as she removes the strand of catgut and draws it out through her fingers she may in turn carry the organisms along the catgut. Infection from the suture may result. This is avoided by boiling the glass tubes of catgut with the instruments. They are then placed in a tray of 1/20 carbolic solution or 3 per cent. formalin.

At the operation the nurse removes a tube of catgut from its tray by using a sterile forceps. She should never put her fingers into the tray. Silkworm gut is boiled with the instruments, also the rubber drainage tubes.

The white enameled basins are sterilized in the utensil sterilizer and a fresh set is used for each operation.

The large glass bowls which are seen in many operating rooms should not be used. There is no reliable way of cleaning them if they become contaminated during a septic operation. The few minutes intervening between one operation and the next do not give the operating-room nurse sufficient opportunity to render them surgically clean.

Mouth guards are worn by the surgeon and his assistants. The speaking voice is capable of projecting minute particles of saliva which carry organisms a distance of three feet, a cough or a sneeze two or three times that far. It seems unlikely that quiet breathing through the nostrils can infect a wound and it hardly is necessary to wear a mask which covers both mouth and nose. As the surgical nurse assists at the operation and sometimes finds it necessary to speak to the surgeon or his assistant, she may speak directly upon the suture which she is holding at the moment only a few inches away from her mouth. It is quite important, therefore, that she also should wear a mouth guard. The same applies to the anæsthetist if the operation is upon the head or neck or shoulders.

And finally it is worth while to mention the very mild infection which may be carried by sweat. It has never seemed to me that this is a serious menace, and yet it is possible that our catgut ligatures or sutures may become infected in this way and prevent the clean healing of the wound.

The sweat may come from the patient's skin as well as from the forearms of the operator or his assistants. No matter how carefully the surface of the patient's skin or the hands, forearms and arms of the operator and his assistants and nurses may be prepared, when the sweat glands begin pouring out their secretion until the sweat collects in droplets there is always a little risk of very mild wound infection.

The climate of Philadelphia is very hot in July and August, and it is not unusual to find ourselves working in an operating room with the temperature near or even above 100° F. The air, furthermore, is saturated with moisture. A leaking skin is inevitable under these conditions. The sleeves of one's gown may become saturated or occasionally a drop of sweat may fall from the gauntlet of one's glove upon the field of operation. Under such uncomfortable conditions, I have found it an advantage to wear a gown with short sleeves and work with gloves and with the arms bare to above the elbows. During the operation I frequently rinse off my gloves and forearms to the elbow in the bichloride basin. The skin of the patient surrounding the immediate field of operation should be frequently mopped with a wet bichloride sponge.

Talcum powder cannot be sterilized in bulk. In the laboratory of the University Hospital we have been able to obtain living spores from the central portion of a box or shaker of talcum powder even though it had been repeatedly "sterilized" in the autoclave. The moist heat cannot penetrate the powder sufficiently to kill the spores which may be lying deeply imbedded in it.

Following is the surgical technic which I outlined for the assistance of our nursing staff in the Orthopædic Department of the University Hospital about two years ago. We have found it satisfactory in every way.

SURGICAL TECHNIC—WARD L.

The Patient.—The day preceding: In the morning give drams two of castor oil, or dram one of aromatic fluidextract of cascara sagrada, and late in the day give a simple enema. In the afternoon prepare the region of operation. This means the whole extremity. In preparing the foot, pay particular attention to the toes, between the toes, the toe-nails, etc. First scrub with tincture of green soap and sterile water—using gauze sponges—for ten minutes. Follow this with sterile water, then scrub and thoroughly douche the part with a warm 1-2000 solution of bichloride of mercury; douche with sterile water and sponge with 85 per cent alcohol. The limb is then covered with dry sterile gauze and bandaged.

The day of operation: A cup of broth or hot milk about 7.30 A. M. Water up to within two hours of operation. On the operating table, the sterile dressings are removed and the limb painted with a 3 per cent. tincture of iodine.

The Operating Room Staff: The surgeon, the assistant surgeon, the resident surgeon. The head nurse, the surgical nurse, the clinic nurse.

The resident surgeon acts as first assistant to the operator.

The assistant surgeon handles the instruments and acts as second assistant.

The head nurse is in the operating room throughout the operation and keeps a general supervision of the nurses and the operating room.

The surgical nurse has charge of the nurses' table and assists at the operation as required. She handles the sterile sheets, sponges, sutures, ligatures, needles, needle-holder, scissors, etc. She never touches anything which is not sterile. She wears a fresh sterile gown for each operation. At the end of an operation she removes her gloves. She disinfects her hands and puts on fresh gloves just before the next operation is to begin. She wears a mouth guard.

The clinic nurse does whatever is required in the operating room where sterile hands are not necessary.

The Operating Room: The washbasin and stands are scoured with "Sapolio" or "Old Dutch Cleanser," or some similar cleansing agent, and the metal parts kept bright with metal polish.

Only white-enamel basins are used in the operating room and these are sterilized in the utensil sterilizer.

On one table there are three basins: No. 1, a warm solution of bichloride of mercury, 1-1000; No. 2, alcohol, 85 per cent., about one-half inch deep and with several gauze pads; No. 3, sterile water.

The bichloride solution should be stained a faint blue, or be marked by a float "Bichloride of Mercury, 1-1000."

On another table is a basin of sterile water which is to be used during the operation. This must always be replaced by a fresh basin for each succeeding operation.

The Nurses' Table: The table is covered with a sterile cloth, and on it are placed:

1. A tray containing packages of rubber gloves of various sizes and the sterile dusting powder.

2. A jar or tray of catgut in glass tubes of various sizes. These may be covered either with a 3 per cent. formalin solution or a 5 per cent. solution of carbolic acid. The tubes when wanted are removed from the jar or tray with sterile forceps.

3. A jar containing silk of different sizes and kept the same as above.

4. A jar of rubber drainage tubes, and kept the same as above.

For each operation the surgical nurse spreads a fresh sterile sheet or cloth across the front half of this table, and upon this she places the fresh sterile tray which contains the scissors, needle-holder, needles; and a glass tray which contains the scalpels and tenotomes covered with alcohol. The nurse touches nothing on this table except the two trays and their contents and the sterile sheet upon which they rest. She must be careful not to contaminate the contents of any of the glass jars or trays which contain the catgut tubes, etc., but must always remove what she requires with sterile forceps. These forceps are, of course, re-sterilized with the other instruments before the next operation.

At the close of the operation, then the two trays and the sterile sheet are removed, to be replaced by fresh ones for the next operation.

Nothing which may have come in contact with one operation—either directly or indirectly—is to be permitted to come in contact with the following operation, either directly or indirectly.

The Instrument Table: The instrument table should be covered with a sterile rubber cover and over this a sterile sheet, and upon this are arranged only the instruments which are required for the operation. At the end of each operation *everything* is removed from this table.

Sterilization.—The gauze dressings, gauze sponges, towels, sheets, gowns, etc., are sterilized in the autoclave by live steam, followed by dry heat. Each operation is to have its own separate drum. One drum may be used solely for gowns of nurses and doctors, and this may remain in its position on its stand throughout the series of operations.

The instruments (which include everything except the knives) are sterilized by boiling for ten minutes.

The knives and tenotomes are covered with a 3 per cent. solution of formalin for 20 minutes. This is poured back into the stock bottle and the knives are covered with alcohol until used. The tray which is used is sterilized in the utensil sterilizer.

The Rubber Gloves.—These are washed with soap and water to remove all stains, turned inside out and washed again. They are then filled with water and put into a vessel of boiling water with a wire frame on top of them, so that they cannot float up on top of the water. They are boiled 5 minutes by the watch. When the water has cooled, the nurse, wearing sterile rubber gloves, removes the gloves from the water and dries them with a sterile towel, of course turning them inside out in doing this. The glove is dusted inside and out with sterile powder and folded in a piece of sterile muslin and made into a packet. These are then placed in a large glass jar having a glass cover, and put away until they are needed for operation. They are then put into the autoclave and sterilized with the surgical dressings during their final sterilization. The gloves need not be left in the autoclave longer than 20 minutes.

The glass tubes of catgut may be sterilized with the instruments and then placed in carbolic or formalin solution.

Drainage tubes should be boiled 10 minutes and then placed in the formalin or carbolic solution.

Silk, if it is to be left buried in the tissues, should be boiled for 10 minutes in a 1-1000 bichloride solution, and then for 10 minutes in water.

INSTRUMENTS REQUIRED

For every operation have ready the following:

- 2 pairs of retractors
- 2 scalpels
- 2 tenotomes—1 sharp-pointed and 1 blunt
- 12 hæmostats
- 4 curved hæmostats
- 4 tenaculum forceps
- 4 Allis forceps
- 2 dissecting forceps
- 2 rat-tooth
- 2 pairs scissors, blunt ends—1 pair curved and 1 pair straight
- 1 Allis dry dissector
- 1 grooved director
- 1 small probe
- 1 periosteal elevator
- 1 needle holder
- needles
- 1 ligature carrier

Additional instruments are required for certain operations as follows:

Tendon transplantation:
- 1 long, very slender pair of forceps
- 1 long probe with eye
- 1 drill handle and 3 drills
- 1 very narrow osteotome

Arthrodesis and transverse horizontal section:
- All the preceding instruments and also
- 1 medium gouge
- 1 small gouge
- 1 medium chisel
- 1 small chisel

Bone grafting:
- 1 Hey's saw
- 1 osteotome—medium
- 1 osteotome—small
- 1 chisel
- 1 mallet or hammer
- 1 bone-cutting forceps

Osteotomy:
- 1 osteotome—large
- 1 osteotome—small
- 1 osteotome—medium
- 1 hammer or mallet
- 1 König block
- 1 sand pillow

Arthroplasty:
- 2 saws
- 2 chisels
- 2 gouges
- 1 curette
- 1 bone-cutting forceps
- 1 hammer or mallet
- 1 drill
- 8 extra hæmostats

Erasion of a joint:
- Same as Arthroplasty and
- 1 lion-jaw forceps
- 1 sequestrum forceps

Talcum powder cannot be sterilized if it is in bulk; that is, in the dusting can. The talcum powder should be spread on a gauze sponge in a very thin layer and then placed on top of the rubber gloves just before they are enclosed in the muslin covering.

STATED MEETING, HELD DECEMBER 12, 1918.

The Second Vice-President, Dr. Harry C. Deaver, in the Chair

CHARCOT KNEES COMPLICATED BY FRACTURED LEG

Dr. John B. Roberts presented a man with Charcot knee-joints who had been under treatment for lues by Dr. B. A. Thomas at the Polyclinic Hospital prior to and subsequent to coming under Doctor Roberts's care for syphilitic fracture of the tibia and fibula of the right leg just above the ankle. This occurred about two years ago while the man was walking in the street. No undue force had been applied to the bones which simply gave way under him as he walked. There seemed to be nothing special in the X-ray appearances to suggest a bone dyscrasia. Doctor Roberts treated the fracture in a swung fracture box in the usual manner. Union took place and the man was discharged with what appeared to be a well-united fracture of the tibia and fibula. It was the opinion of Doctor Roberts at that time that the fracture was not due to syphilitic bone softening and the man was expected to have no further difficulty if he postponed weight bearing for the usual period after fractures at the ankle. A number of months afterward he came under Doctor Roberts's observation again and said that he had been walking without any special support to the fractured bones. The leg showed a large mass of bone and callus at the ankle with lateral and backward displacement at the seat of fracture. The appearances still exist but he has been wearing now a brace to prevent further deformity and disability. The Charcot knees are characteristic and the man has been under constant treatment for about four years, taking large amounts of potassium iodide and mercury and many injections of salvarsan and arsenobenzol. The long-continued treatment with the support given by the orthopædic surgeons to his knee-joints and to his fractured leg has brought this man to a condition which enables him to make a living, though when first seen by Doctor Thomas he could scarcely move the limbs which were supposed to be the seat of paralysis of doubtful origin. The man's indomitable courage and the wisdom of Doctor Thomas, his first attendant, have reconstructed his legs to an extraordinary extent.

ERRONEOUS INTERPRETATION OF X-RAY PLATES

Dr. John B. Roberts showed a boy who had sustained a fracture of the lower end of the humerus which under ether was determined to be a fracture or diastasis of the external condyle of the humerus without displacement. The X-ray seemed to show considerable displacement of the fragment at variance with what the clinical examination suggested. He also presented the X-ray plates of an old man who had had a dislocation of the right

shoulder-joint of the subcoracoid variety. Dr. Morris Booth Miller and Doctor Roberts reduced the luxation under ether and felt sure from the anatomical appearances and the surgical examination that the head of the humerus had been properly replaced. X-ray examination by a röntgenologist of experience was made. The report that came to the surgeon was that the bone was not completely replaced. The subsequent history of the case showed that reduction had been complete and the interpretation of the X-ray plate was erroneous. These cases are indications that the surgeon and the röntgenologist should work together in order to get the true meaning of X-ray results as shown in photographic plates. This statement, of course, corresponds exactly with what we all know is also necessary in pathological and surgical consultations; namely, that neither the surgeon nor the microscopist, nor the röntgenologist can depend entirely upon his own findings. Each special method of examination needs at times to be checked up and correlated with the clinical or pathological or radiological examination, as the case may be.

POST-OPERATIVE INFECTIONS OF THE PAROTID GLAND

Dr. John B. Deaver read a paper with the above title for which see page 77.

Dr. Moses Behrend said that two months ago he operated on a case, removing the gall-bladder and the appendix. Two days later the parotid gland on one side became inflamed. The following day the gland on the opposite side was affected. The pain was intense and both glands had to be incised. The man had double facial paralysis which, however, entirely disappeared. He believed the paralysis was due not to the incisions but to the enormous pressure upon the facial nerves. The man had complete control of lips, corners of mouth and cheeks before he left the hospital. The case seemed of special interest because both sides became involved. In one other case following a minor operation the man developed an infection and later a severe parotitis. Numerous incisions were necessary to get rid of all the pockets of pus, the patient making a complete recovery without facial paralysis.

Dr. J. Torrance Rugh remarked that the mouth presents the most profuse bacterial flora of almost any of the cavities of the whole body. If mucin acts to limit the development of bacteria, why then should there be such great number and variety of bacteria in the mouth?

Doctor Deaver, in closing, said that the case to which Doctor Behrend refers he saw. The source of the infection in that case was probably the tonsils. The patient had a cardiac lesion. There was an acute infection of the parotid gland with deep suppuration. An incision was made into the gland by Doctor Behrend. Doctor Deaver regarded this case as an instance of hæmatogenous infection. He frequently had this type of infection in suppurative appendicitis and other infectious conditions. He had seen abscess of the pancreas result from infection elsewhere in the abdomen.

RENAL CALCULI

Dr. F. A. Mantz (by invitation) read a paper with the above title. He said: The predisposing causes of renal calculi are sedentary habits, high living, and poor hygienic surroundings. The formation of these calculi is dependent upon the condition of the excreted urine, rather than upon an inflammatory process of the renal mucosa. However, there are exceptional cases; as pyelitis has been followed by extensive and massive stone formation in the kidney.

In order that these concretions may form, there must be of necessity an excess of certain of the solid constituents of the urine, which are most frequently urates, phosphates and oxalates. An excess of any of these salts favors a coagulation necrosis of the renal cells, thus forming a good nucleus for the deposit of any of the excessive salts that are present.

The symptoms depend more upon the position of the calculus than upon its size or shape. A calculus in the parenchyma or in a calyx, not infected and non-motile, may give rise to no symptoms at all. This fact has been proved by the X-ray examinations of patients suffering with other conditions than renal calculi, the calculi present being discovered accidentally in this way. The principal symptom is pain, radiating in a line to the bladder, scrotum and meatus, together with a desire to micturate. The urinalysis reveals red and white blood cells, pus and hyaline casts. Anuria is a symptom of bilateral lesions, but may be present when the lesion is unilateral, and is then caused by reflex action upon the other kidney.

To establish a positive diagnosis and to determine the proper treatment, we must call to our aid the cystoscope and the X-ray. The cystoscope reveals alterations in the flow of the urine from the ureter of the affected side; and catheterization of the ureters and examination of the two urines separately with the use of the phthalein test will determine whether or not the other kidney functionates sufficiently to carry on the necessary renal elimination, in case a nephrectomy is deemed expedient. Likewise, a wax-tipped ureteral catheter, as employed by Dr. H. A. Kelly, may be passed, to corroborate the presence of a suspected calculus when the X-rays fail to show a shadow. The X-ray examinations must be entrusted to the most experienced röntgenologist available—one who is able to interpret properly the skiagram and to differentiate the different shadows; since the uric acid and phosphatic calculi hardly cast any shadow, while the oxalate *stones* cast a strong shadow. The röntgenologist is often able definitely to locate the calculus, and thus facilitate its removal.

Having definitely diagnosed the presence of a renal calculus, its size and location, and whether the lesion is unilateral or bilateral, we must further analyze the patient's physical condition, so as to determine the safest and best method of effecting *the desired cure*. The principles of renal-calculi surgery are to-day so scientifically sane and sound that, by adhering to them, the mortality due to these operations may be kept very low. By making such

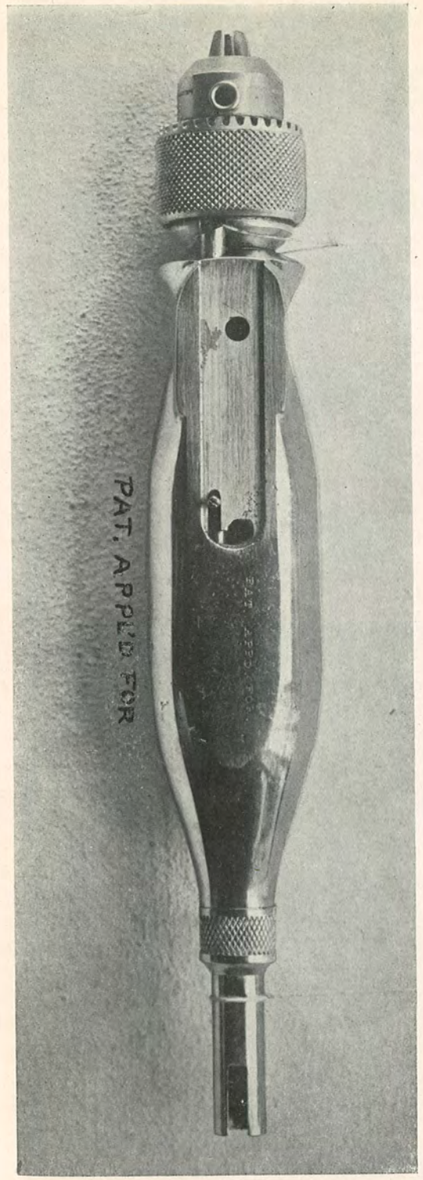


Fig. 2.—The tool-holder.

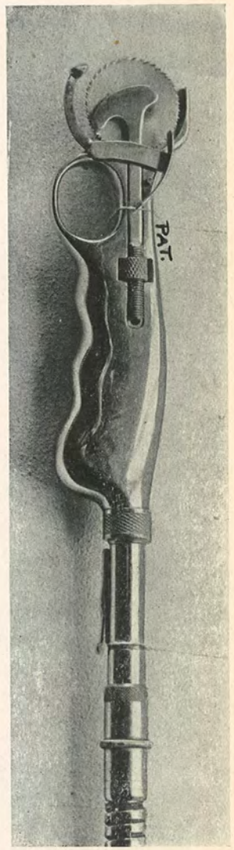


Fig. 1.

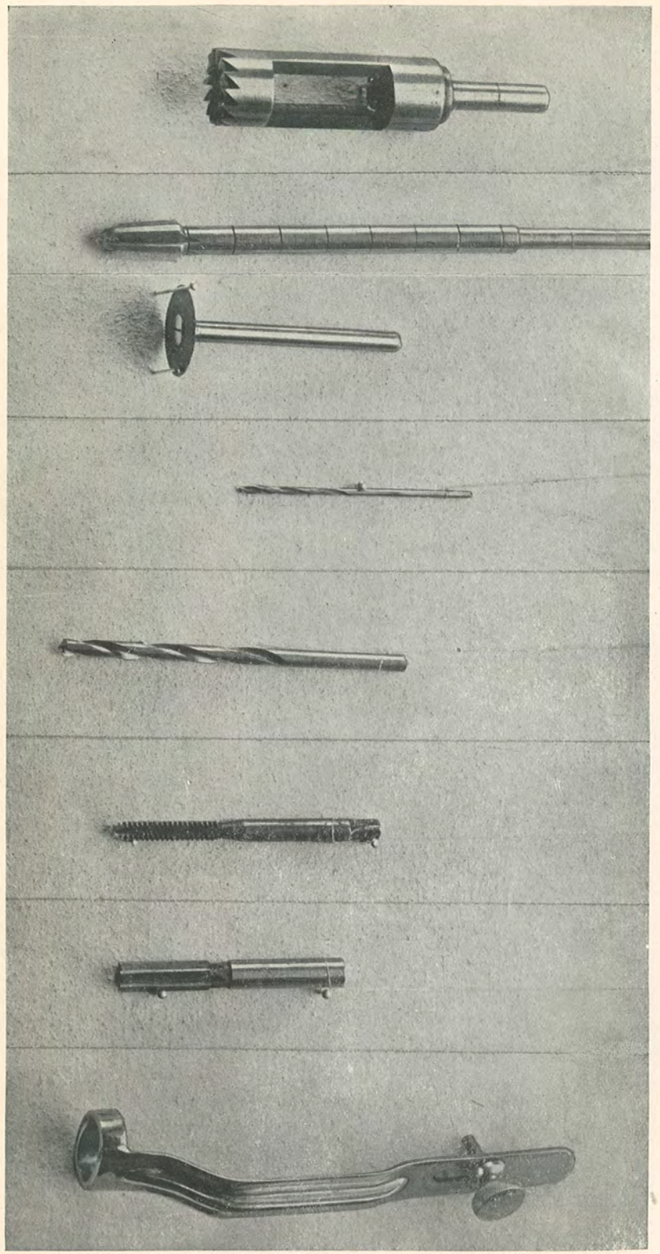


FIG. 3.—Drills, burrs and trephine.

a thorough analysis of the case, we can nearly always determine before operation whether a nephrolithotomy is required, or a pyelotomy or a nephrectomy.

We should do a nephrolithotomy only when it is utterly impossible to remove the calculus by doing a pyelotomy. As a rule, all renal calculi are friable and easily crushed. Hence, most of the larger stones that fill the renal pelvis and calices may be crushed with an ordinary Kocher hæmostat or other forceps, and removed piece-meal, by way of the pyelotomy. Afterwards, the cavity should be thoroughly flushed with a normal saline solution or a mild antiseptic, to wash out the small remaining fragments or sand.

The risk of having a severe secondary hemorrhage following a nephrolithotomy far overbalances the probability of a permanent urinary fistula as the result of a pyelotomy. These secondary hemorrhages, which usually occur from the eighth to the tenth day after a nephrolithotomy, are always severe, and constitute a great source of annoyance and embarrassment to the surgeon who is fearful of being obliged to do a nephrectomy, which would have very serious consequences in a case in which the other kidney did not functionate sufficiently to carry on the required elimination.

A nephrectomy should be attempted only when there are many stones within the kidney, or when there is one large stone with an associated infection and destruction of the parenchyma.

The nonoperative cases include those in which a renal calculus is found in an extensive X-ray examination for some other condition, and in which the stone gives rise to no symptoms; especially so, when the patient is a poor surgical risk. On the other hand, all cases with an associated complication, such as extensive pyelitis, hydronephrosis or anuria, should be operated upon as soon as possible, even though the risk may be great; also cases in which the calculus has passed from the renal pelvis into the ureter and has there remained lodged, if, within a reasonable time, it does not find its way into the bladder. A calculus within the renal pelvis or in the parenchyma, giving rise to the symptoms of renal calculi, in a patient who is a good surgical risk, should be removed immediately, to avoid possible complications and sequelæ.

There is no drug that will dissolve a renal calculus within the human body. However, it is essential to treat the patient systematically after the operation, in order to prevent further stone formation. Diluents, such as distilled water in large quantities, to dilute the solid constituents of the urine, should be given; and a limited diet should be employed. No red meats should be allowed; but cereals and vegetables of all kinds, except rhubarb, tomatoes, asparagus and strawberries. Sugars, malt liquors and wines are interdicted, especially in the cases of those patients who are of a gouty diathesis. The free use of saline purgatives is imperative.

Post-operative anuria is reflexly caused by the rough handling of the kidney and the effect of the anæsthetic. Personally, however, I believe that this complication can, in a great measure, be prevented by giving the patient large amounts of distilled water with potassium citrate, a few days before

the operation, in order to render the urine bland and stimulate its flow. Morphine sulphate, one-quarter to three-eighths of a grain, with 1/150 of a grain of atropine sulphate, should be administered half an hour prior to operating, for its anoci-association effect; but no morphine or atropine should be given after the operation.

Following the surgical procedure, normal saline solution as per the Murphy drip, should be administered, and plenty of water by mouth, as soon as the patient is able to retain it. Occasionally, also a mild diuretic may be given. These remedies constitute about all the medication necessary after the operation.

Dr. John B. Deaver said with reference to the passage of stones that failed to show a shadow, to which Doctor Mantz had called attention: They are difficult cases, and he recalled a number. One case seen recently was that of a man from the South. He had the symptoms of bloody urine, renal colic, pain, etc. He was referred to the röntgenologist. The report came back that the man did not have a stone, but that there was a tubercular area in the kidney. Another good röntgenologist said that the X-ray examination of the kidney was negative. The man was then cystoscoped and the operator said he did not know what the man had but that the blood all came from one kidney. Doctor Deaver made an exploratory exposure of the kidney and the result was the finding of a stone one-third the size of the fist in the kidney. He then called up the first röntgenologist who said he would like to have the stone. He put it in water and could not get a shadow. The case was one of those impossible of diagnosis because of the quality of the stone. No doubt there occur many such cases which slip through our hands.

NEW BONE SAW EQUIPMENT

Dr. H. C. Masland (by invitation) demonstrated the new bone saw equipment devised by him. It consists of two major instruments quickly adjustable to a flexible shaft of ample strength, driven by an electric motor.

One instrument is a circular saw mounted in a very convenient handle. The saw has a gauge immediately adjustable to cut any depth desired. This can be drawn back and an inside guard attached which protects the dura in cutting the skull or any other underlying soft tissue when the saw is used elsewhere. The nose of the instrument is about one inch wide, so that the saw can be used on deep-lying bones for either a vertical or a bevel cut.

The other instrument is a universal tool holder having a construction to facilitate the performance of various other operative procedures. Drills from the size of catgut up. Burrs of various types and sizes, a special trephine for opening the skull safely, hollow mills for bone pins, side cutting mills to make level floored gutters for inlay work, a small circular saw, taps for threading holes and dies for bone pins.

This tool may be power driven or immediately detached and used as a hand instrument.

The doctor drives his instruments at low speed and thereby eliminates burning and does not need the water drip. The equipment meets rigid aseptic requirements.

Dr. J. Torrance Rugh said that he had always felt that the difficulty in this type of operating device was in the cable, and this problem Doctor Masland seems to have solved. The majority of these cable-operated machines keep jamming and bending, but Doctor Masland has a cable which is powerful enough to drive the instrument evenly. It has the advantage also of being of a size convenient to handle in the field of operation. Doctor Masland tells us that the cable may be boiled, but it must have oil, and the speaker would feel a little doubtful about boiling it. He suggested a device such as may be used on the Albee machine. For the supply cord there is a long tube or muslin casing running up to the handle of the motor. Some have a motor of the same type as Doctor Masland's and wrap the whole thing in a sterilized casing when using it and have no trouble about asepsis.

Another feature which commends this machine is that it is a low speed motor. He had never felt favorably inclined toward a high speed motor in bone work. It will burn the bone unless water is used, and many other inconveniences attend its employment which are eliminated by the low speed machine.

Dr. Moses Behrend said that with the Albee instrument one must hold a rather heavy motor; but with this the toolholder of Doctor Masland can be held with one hand. The Albee motor will often jam, as has been said. Doctor Masland's does not do this on account of his slow speed motor. The chuck is almost perfect; it will hold a hair. The smallest kind of a drill can be used which is a distinct advantage. Also the chuck is commendable because one can put in almost any sized instrument.

Doctor Masland, in closing, said that his first sleeve was of the usual dental composition type, covered with a sterilizable muslin sleeve. This did not appeal to him as thorough asepsis. His present cable and tubing are metal throughout, save for the asbestos packing in the crease of the spiral of the tubing to make it water-tight. The sleeve is brass, nickel-plated, and of the same construction as gas or speedometer tubing. A little heavy grease is used for lubrication. This will not run out through the accurately fitted ends. If it did it could be prevented by elevating the ends of the flexible shaft in the sterilizer.

THE SEGMENT TREPHINE

Dr. John B. Roberts remarked upon the evident efficiency of this saw of Doctor Masland. Those who have worked in bone surgery of the skull have realized the trouble with ordinary saws and trephines. Years ago he undertook to use the Bonwill surgical engine for driving burrs for bone work on the extremities and head, but found it difficult to keep in order in surgical operating rooms. The little cranial trephine, which Doctor Masland has adopted to use with his outfit, Doctor Roberts had made for cranial

use about thirty-five years ago, when he demonstrated that one could safely trephine the cranium by boring holes with a flat fissure burr. An entrance could thus be made into the cranium without damaging the dura. This little trephine (Fig. 4) with its conical shape and spiral cutting surface has a way of jamming itself when the saw edge of the crown cuts through the bone to the dural surface. Doctor Masland's experimental work with him, in the laboratory and on patients with his new saw, has revived the use of this instrument. The electric motor and cable which Doctor Masland uses in connection with his saw drives the trephine very satisfactorily. The instrument is easily sterilized and has a small hole through which it may be cleaned and the button of bone pushed out if it remains caught within the trephine. It needs no centre pin, or a drain with a centering point, though the latter could be fitted to it. Through small holes made by this instrument the Gigli saw may be used, if the Masland saw is not at hand, to make the osteoplastic flap to be turned down for access to the brain surface. Some years ago Doctor Roberts devised an aseptic trephine without the old-fashioned centre pin, which is familiar to many of the Fellows. He now showed a new model (Fig. 5) recently made for the army by Pilling. It is in some respects not as satisfactory as the original made by hand at the time when surgeons began to do operations for the removal of brain tumors, twenty or more year ago, but large numbers of the present form can be made by machinery and therefore at a much lower price. It does not need the stem which the instrument maker has put upon the drum which carries the centre pin. He also showed (Fig. 6) the aseptic segment trephine which does well in making clover-shaped flaps in resection of the skull for entrance to the cranial cavity when special saws like the Masland saw are not at hand. It and the various methods used to do osteoplastic sections are valuable now that surgeons always try to have bony closure of the gap made in the cranial wall. The methods which depend upon cutting away with gnawing forceps the bone and leaving great openings to be closed only by fibrous tissue have become antiquated and are to some extent looked upon as survivals of pre-Listerian surgery.

FIG. 4.—Roberts's cranial trephine, made in 1882, to be driven with Bonwill dental engine.

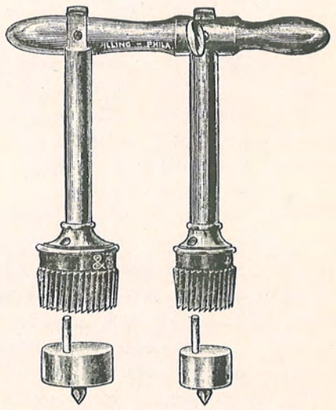


FIG. 5.—Roberts's aseptic trephine, late model.

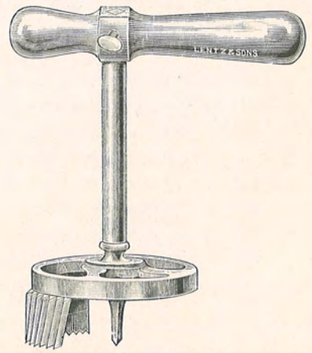


FIG. 6.—Roberts's aseptic segment trephine for making trefoil-shape flaps of bone in resecting the cranium.

POST-OPERATIVE PAROTITIS*

By John B. Deaver, M.D.
of Philadelphia

Secondary parotitis, occurring after operation, though not unknown to early surgery, has received attention only since the more general application of abdominal surgery has been practised. While not a very frequent phenomenon, it is an interesting one and worthy of more study than has been accorded it. The first reported cases all followed ovariotomy or some other operation on the female generative organs. Paget, however, as early as 1886, reported on 101 cases of secondary parotitis, one-half (51) of which took place after operation on the upper abdomen—gastrotomy, enterostomy, as well as after herniotomies, colostomy, abdominal and umbilical tumors, and penetrating injuries of the abdomen. The other 50 per cent. followed operations on the female generative organs. While at the present time, and in our experience also, secondary parotitis occurs more frequently after operations on the genitalia, especially in the female, the relative proportion has been considerably reduced. In fact, it is my belief that the type of operation, that is to say, the organ or organs operated upon, plays a minor rôle in the phenomenon of post-operative parotitis. Cases occurring in my experience may be reasonably attributed either to peculiarities of the pathology encountered, to local conditions, or to post-operative wound infection.

It is a well-known fact that the parotid gland is more susceptible to inflammation than the other large salivary glands. This is to some extent explained by the anatomical relation of the buccal orifices of the excretory ducts of the gland. According to some authorities there is also a physiological explanation for the ease with which the parotid gland is attacked by inflammatory processes, namely, the absence in the parotid secretion of mucin, the presence of which in the secretions of the other salivary glands acts as a bactericidal agent and a protection against infection. W. Stuart Low has shown in an interesting way the retarding influence of mucin on bacterial growth. He observed that sterile solutions containing mucin remained sterile for some time on exposure to air and that bacterial growth was inhibited when mucin was added to culture media. This interesting hypothesis, however, is not generally accepted, since not all bacteriologists are convinced of the bactericidal nature of mucin.

Post-operative parotitis may be classed into three groups: metastatic, occurring only in pyæmic conditions; ascending parotitis due to ascending infection *via* the excretory ducts; and traumatic, the result either of direct pressure on the parotid gland or the forcible manipulation of the jaw by the anæsthetist during operation. It is my impression that these factors are

*Read before the Philadelphia Academy of Surgery, December 12, 1918.

not infrequently the cause of subsequent parotitis. We all know how, in some instances, during ether anæsthesia, there occurs difficulty in breathing, spasm of the muscles of the larynx, cyanosis, accumulation of mucus in the mouth, etc., and how in endeavoring to overcome this condition the anæsthetist carries the jaw forward by pressing against the angle of the jaw. Sometimes, indeed too often, this procedure is not carried out as gently as it should be. If it were possible to keep records of such faulty manipulation and how frequently it is followed by the development of trouble in the parotid gland, I venture to say my contention would receive considerable support. That trauma can take place in this way is readily understood in view of the anatomy of the region. The anterior of the two large processes of the inner surface of the gland passes into the back part of the glenoid fossa behind the articulation of the lower jaw, therefore it can readily be seen how injury to this process can occur. A more frequent traumatic factor, however, is that exerted through the fingers of the anæsthetist pressing on that part of the gland which extends downwards behind the angle of the jaw into the neck.

Infection may be carried to the gland by way of the lymphatics from diseases of neighboring structures, by way of the blood-stream, and by way of the excretory duct of the gland, Stenson's duct.

The latter route seems a very plausible one since it is well known that the mouth harbors numerous bacteria to the increased virulence of which, especially staphylococcus infection may be due.

The question of ascending infection has been carefully studied and from the microscopy of the same, as described by Bucknall,[1] we learn that the process is due to choking of the gland by débris containing micro-organisms which are the same as are obtained from cultures of the gland, its pus, the orifice of Stenson's duct and the oral cavity. While in view of the fact that to-day the asepsis of the mouth receives considerable attention before and after operation this theory may lose some of its practical value, the fact remains that infection can take place by this route.

It is interesting to note that in recent times the majority of the cases of secondary parotitis have occurred after severely infected conditions, appendicitis, peritonitis, perforating gastric ulcer, etc. In fact, next to ovarian cyst, perforating gastric ulcer is said to be the most frequent operative condition which is followed by secondary parotitis. This would be readily explained by increased absorption of the intestinal contents in such cases. In very plain language, I am inclined to say that the complication occurs most frequently from "dirty bellies" where infection has probably resided and been active for some time, and where, owing to incomplete or careless surgery secondary infection takes place. Why the latter sometimes chooses the parotid gland and so often does not, is not easily explained, except perhaps by the trauma, already referred to, or by individual disposition to affections of the gland in question. That such disposition exists is generally admitted.

[1] *Lancet*, 1905, ii, 1185.

And where it does exist the parotid gland would represent a site of minor resistance.

Sometimes the dryness of the mouth following anæsthesia is given as a contributing factor in post-operative parotitis. This might apply to the cases in which the complication occurs within a day or two of operation. But these are comparatively few, most of them taking place between the third and seventh post-operative days. On the other hand, the withdrawal of food by mouth and the resulting absence of oral secretions has also been assigned as a cause for the phenomenon. Indeed, a number of cases of parotitis are reported to occur during the starvation treatment in unoperated cases of (supposed) gastric ulcer. These cases might lend support to the theory of the bactericidal action of mucin. There seems little doubt, however, that interference with normal salivary secretion and with the protective action of the saliva as it drains down the ducts may be responsible for infection in such instances.

I am aware that I have merely touched upon various points in the consideration of this interesting phenomenon. I have done so in order to get opinions from the members of the association and with the hope that at some other time I may be able to give the question the study it deserves, or perhaps stimulate others to do so.

STATED MEETING, HELD FEBRUARY 13, 1919

First Vice-President, Dr. George G. Ross, in the Chair

CHOLECYSTITIS FOLLOWING TYPHOID FEVER IN CHILDHOOD

Dr. Harry C. Deaver read a paper with the above title, for which see page 83.

PYLORIC STENOSIS IN INFANCY

Dr. Francis O. Allen read a paper with the above title, for which see page 86.

Dr. Henry R. Wharton said that in the cases of pyloric stenosis seen by him a peculiar feature is the very distinct tumor which seems to be about the size of an ordinary shellbark hickory nut and which when divided separates almost like cartilaginous tissue. Doctor Allen spoke of a case in which he failed to find a pyloric tumor but did find adhesions. A few days ago the speaker had a case at the Presbyterian Hospital which had many of the symptoms of pyloric obstruction but in which they failed to palpate a tumor. The gastric peristaltic wave was present. Operation revealed no distinct pyloric tumor, but the pyloric end of the stomach was firmly adherent in the region of the gall bladder, and was separated with some difficulty. The following day the patient was doing very well, had no vomiting up to the time of his death. At the end of the third day the pulse failed and the patient died but presented no abdominal symptoms. Attention has been called to the fact that in these cases a certain number die with marked thymus symptoms. There seems to be some association between cases of thymus gland enlargement and pyloric tumor.

Dr. H. C. Deaver said that during the last five years thirty-four cases of pyloric stenosis had been under care at the Children's Hospital of the Mary J. Drexel Home. Dr. John B. Deaver and the speaker had operated upon an equal number.

In the early cases they did a posterior gastro-enterostomy for this condition, with a mortality of 18 per cent. During the past two years they have been doing the Rammstedt operation.

The youngest patient, a child six days old, was born in the Lankenau Maternity by Cæsarean section. This child vomited continuously until the sixth day, when he was operated upon and a congenital stenosis demonstrated.

The Rammstedt operation is a very simple one, entailing little shock and requiring not more than fifteen minutes for its performance. The amount of shock depends largely upon the condition of the child.

In their early work for this condition these children were emaciated and very poorly nourished, but during the last two years pyloric stenosis

is being recognized, and hence these cases are being referred for operation much earlier than heretofore, and for this reason they are better subjects for operation.

Since they have been doing the Rammstedt operation their mortality has been 10 per cent. Hemorrhage has been a factor in this mortality. In releasing the stenosed pylorus care is necessary to guard against opening the lumen, especially at the duodenal end, where the bowel is very thin. This accident had happened to him in two instances. In both instances he promptly closed the perforation with no ill result.

He makes his incision through the anterior surface of the stenosed pylorus, making the incision parallel with the small vessels which run through the peritoneal covering; and, where there is bleeding, he transfixes the vessels and ties them. He never drops the pylorus back until he is sure that all oozing has ceased.

Regarding diagnosis, the only cases they get are those sent in by the pediatrician, the family physician never recognizing the condition. As a rule, these children are always emaciated and poor subjects for any operation. Fluoroscopic examination is a great help in confirming the diagnosis, and it also converts the skeptical.

Some writers say that the absence of bile in the vomitus is pathognomonic; he does not think this is so because the fluoroscopic examination has demonstrated in several instances the pylorus not completely obstructed. There has been absolute constipation in all their cases.

They had had two cases where the incision opened up on account of the sutures giving way. He now uses through and through silkworm sutures, not removing the sutures for ten days to two weeks.

In the thirty-four cases operated upon the diagnosis in each instance was confirmed by the operative findings.

The oldest child operated upon for pyloric stenosis was six months of age; the majority of the cases have been from six to ten weeks old.

Dr. E. L. Bauer said that the diagnosis of pyloric stenosis in practically all the cases he had seen in the services of Drs. Harry C. and John B. Deaver had been rather easily made. He had seen some cases in the dispensary and some outside. If there has been any question in diagnosis the fluoroscopic examination was made and the cases studied carefully, not, however, losing any time in this study. He was not in sympathy with the attempt to feed these children as suggested by many pediatricians. Practically all such methods fail. He believed the cases to be essentially surgical and should be referred to the surgeon promptly before the chances of benefit are lessened by temporizing with medical treatment. There is always a question of doubt in diagnosis in unoperated cases, particularly those that are reported as having recovered. In all the cases operated on by Doctor Deaver the pylorus was shown to be hypertrophied. Medical cases reported as recoveries are usually instances of digestive disorders in children simulating stenosis. The typical case

is not likely to be overlooked. In a case at Hammonton seen in consultation by an acquaintance, the mother of the child had made the diagnosis from the text-book. If the family physician is taught that these cases should come to the operating table early the mortality records will be considerably reduced. The six-months-old child operated on by Doctor Deaver came into the Mary Drexel Home through one of the doctors on the surgical staff at the Lankenau to whom it had been referred. The child was extremely emaciated and in bad condition. The operation was attempted but with not much hope of securing good results. The child survived the operation and did well for about six weeks. It was thought that it should be kept in the hospital rather longer than the average child in order to feed it, but as with many of the cases staying long in the hospital, it picked up an infection and died of broncho-pneumonia six weeks after the operation.

DR. ALLEN, in closing, spoke of a case which he had not reported, that of a girl five years of age, who, he was convinced, had pyloric stenosis, but he was not able to prove it. There was enormous distention of the abdomen. The child was under the care of a physician during its life, being seen by him from time to time, and there was always present more or less stomach trouble. The distention was enormous. The child was having great difficulty in breathing, and though Doctor Allen could not offer any great hope of benefit, he thought he might relieve the distention by making an abdominal incision under a local anæsthetic and puncturing the bowel. He found that the distention was all in the stomach; the posterior wall of the stomach presented below the umbilicus. He put in a trocar and let out an enormous quantity of fluid and gas, but the child died before he could do anything further. He did not enlarge the incision to see what the difficulty was. The history suggested a pyloric obstruction and the distended stomach corroborated the diagnosis, but he could not say positively that a tumor of the pylorus was present.

CHOLECYSTITIS FOLLOWING TYPHOID FEVER IN CHILDHOOD*

BY HARRY C. DEAVER, M.D.
OF PHILADELPHIA, PA.

SEQUELÆ of typhoid fever in childhood are not as common as in adult life. However, they are to be promptly recognized and combated when they do occur. This applies with particular emphasis in abdominal crises, that appear so suddenly, and are so rapid in their course.

The most frequent abdominal sequelæ to typhoid in childhood are perforation, hemorrhage and appendicitis, but the younger the child the less frequent is their occurrence. One of the most unusual conditions that would simulate them is cholecystitis.

Curiously enough, despite the fact that the gall-bladder harbors the Bacillus typhosis in large numbers after an attack of typhoid fever, cholecystitis is unusually an early sequel. It seems that the organism must be especially virulent, the individual lacking in resistance, and drainage poor, to set up an inflammation in the gall-bladder. When local infection does occur, however, it usually proceeds rapidly and an early perforation ensues. Diagnosis is usually made after perforation has taken place.

Keen's table,[1] added to by Erdmann,[2] contains adult cases chiefly, but Keen's nine cases under fifteen years of age, noted in the original table, have not been revised. Eight of these died, one recovering following an operation. All had perforations. The recovery noted was a case of Alexieef's,[3] occurring in a five-year-old girl. The patient was doing nicely after her fifth or sixth week, when she had an attack of pain, rise in temperature, and was delirious. She was operated upon two days after the perforation occurred, and drained. Seven weeks later she had a recurrence and finally recovered.

The first evidence of abdominal pathology as a sequel to typhoid fever is pain. Pain should bring to mind at once the following: Distended bladder, diarrhœa, fecal impaction, constipation, intestinal obstruction, intestinal perforation, hemorrhage, appendicitis, iliac phlebitis, peritonitis, cholecystitis and pneumonia with pleurisy. An immediate examination will reveal other signs or symptoms that will point the way to a definite conclusion.

The localization of pain, if possible, in the upper right quadrant, radiating through to the back, tenderness and perhaps a palpably distended gall-bladder point to upper abdominal disease. Pneumonia should be carefully excluded even in the presence of very marked abdominal signs. Vomiting occurs, and the pulse rate goes up. Leucocytosis is present,

*Read before the Philadelphia Academy of Surgery, February 13, 1919.

12,000 to 18,000, but may go well into the twenty thousands. The picture is one of profound shock, and closely resembles obstruction, perforation, or a high ruptured appendix. Time will not always permit an exact diagnosis, nor should a prolonged effort be made to differentiate the type of abdominal catastrophe, for delay will militate against the patient's chance of recovery. Keen and Erdmann show that no cases recover without operation, and four of seven that were operated did recover. All had perforations. The statistics just quoted includes the nine children previously mentioned, and aggregates thirty-four cases. The case to be presented resembles Alexieef's closely in its inception and early course, but there the similarity ceases, except that both recovered.

H. S., aged five years, was admitted to the Children's Hospital of the Mary J. Drexel Home, September 10, 1917, with her two little sisters, aged four and two years and eight months, respectively. The three had typhoid fever, as did their father and mother. The mother was also pregnant and aborted during her illness. H. had a fever for about three days, but had been ailing for about ten days.

She had nose bleed, headache and indefinite abdominal pains. There was no vomiting. She was constipated. An enlarged spleen was manifest in a few days, and rose spots also appeared. Heart and lungs were negative for any pathology, as were the extremities. Leucocyte count was 8800, and she had two positive Widals following a negative. The temperature on admission was 103.8° F. and went to 105° F. It stayed within this range for eight days, and then came down gradually, striking normal in six days. No untoward symptoms marred her apparent rapid recovery and gain in strength from the fourth of October until the twenty-second.

On the morning of October 22, H. vomited and complained of abdominal pain. The pain was generalized. She was given an enema with good result. Lavage did not give relief. The child was shocked, abdomen rigid and tender, the thighs flexed upon the abdomen. There was no distention and feeble peristalsis was present. The temperature was subnormal. Two hours after the first pain she was operated upon. Ether was given and an incision made through the right rectus muscle. A considerable quantity of serous fluid escaped from the peritoneal cavity.

When the gall-bladder was exposed it was markedly congested, slightly distended and had a dark area along the under surface of the fundus. There was no perforation. The gall-bladder was aspirated and a thick, dark, viscid, purulo-sanguinous fluid was removed. Moist pads were used to wall off the gall-bladder. The contents upon laboratory examination showed no typhoid agglutination, the Hay bacillus being found in the culture. The gall-bladder was drained with iodoform gauze. A piece of plain gauze was placed beneath and under the gall-bladder for drainage, and a fenestrated rubber tube was placed in the pelvis. The deeper layers

of the abdominal wall were sutured with chromic catgut, silkworm gut in the skin.

The gauze was removed in five days, a small strip of plain gauze being replaced in the gall-bladder. A biliary fistula developed, which was subsequently closed and the child made an uneventful recovery.

Alexieef's case and this one both began with pain in the abdomen, in the course of their fifth or sixth week of typhoid fever. Both had similar symptoms, but his case went on with fever, chills and delirium, finally getting out of bed with consequent collapse. Operation after perforation did save the child despite a recurrence. My case was operated upon promptly and had no recurrence. While a secondary operation for the fistula was performed, it was not a dangerous procedure and the child did not have as rough a road to ultimate recovery as Alexieef's patient.

This comparative picture should show the advantage of careful attention to pain as an indicator of impending abdominal disaster. It should demonstrate the vital necessity for early surgery in an acute abdominal crisis.

Finally, while sequelæ are less common after child typhoid, when they do occur, they are more fulminating in their character, and always demand immediate attention.

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PYLORIC STENOSIS IN INFANCY *

By Francis Olcott Allen, Jr., M.D.
of Philadelphia

Some time ago I reported two cases of pyloric stenosis in infants before this academy. Since then I have operated upon seven additional cases, making nine in all. This is a sufficient number to arouse one's interest in this curious pathological condition and to justify some tentative conclusions in regard to it. The subject is receiving increasing attention in the literature, and a number of valuable reports have appeared, the latest by Green and Sidbury, in the current number of *Surgery, Gynæcology and Obstetrics,* discussing in considerable detail our meagre knowledge of it.

It is generally assumed that the pyloric ring is congenitally abnormal, but no explanation is forthcoming as to its true etiology. It must also be assumed that the hypertrophied muscle is thrown into spasm by unknown factors. Otherwise it is difficult to explain the frequent remission of symptoms and the occasional recovery of a patient without operation. We have not even an assumption to explain the overwhelming preponderance of the disease in boys. Girls seem to be almost exempt. All of my cases but one were boys. Like intussusception, it occurs most frequently in breast-fed infants.

The babies are usually healthy at birth, well nourished, and well formed, and make a good start. Then in a varying number of days or weeks they begin to do badly, vomit after feeding and fail to gain. The doctor in charge is driven to change the food, and for a time they again do well. Then the symptoms return and the food is changed again. This may go on for several weeks, but, as a rule, there is a progressive loss in weight until operation must be done. Many cases have some fecal evacuations, showing that the pylorus is not entirely closed, some have no stools for days at a time. The vomiting is not the regurgitant type, so common when an infant's stomach is overfilled, but is propulsive and copious.

A few quotations from my notes will illustrate the histories of these babies.

(Six weeks old.) "Baby weighed over 10 pounds at birth and did fairly well for two or three weeks, though vomiting more than normal. Then began to vomit almost everything. Weaned and various feedings given. No stools for two weeks."

Ten days later.—"Wet nurse has been tried, but baby has lost weight again, vomiting. Weighs but little over 6 pounds."

(Six weeks old.) "This was a thirteen-pound baby, now weighing 5 pounds 12 ounces. Vomiting almost everything, though has some stools. Emaciated, has purpuric eruption."

(Five weeks old.) "Under observation several days. Seems to improve some days, but on the whole does not gain. Weighed 6.9 at birth."

(Two months old.) "Vomiting began when about one month old. Has lost weight, but is not emaciated."

(Two months old.) Breast fed at first, then various mixtures. Frequent vomiting since about second week. Seven and three-quarter pounds at birth, now 5 pounds. Looks badly."

* Read before Philadelphia Academy of Surgery, February 13, 1919.

Histories such as these are presumptive evidence that the pylorus is not normally patent, and in themselves would justify laparotomy. Fortunately, the diagnosis is always corroborated by the physical examination. Sooner or later gastric peristalsis becomes visible. It is best seen when the baby is taking a feeding or soon afterward. In its struggle against the obstruction, the stomach becomes distended, filling the upper abdomen, and the peristaltic waves can be seen through the thin abdominal wall passing from the left costal margin to the right. Frequently, but not always, the tumor can be felt. Its position varies. It is to be looked for on the right side between the umbilicus and the ribs. In one of my cases it was found at operation deep down under the liver; in another the distention of the stomach had carried it into the right kidney pouch. In neither of these cases was it palpable before operation.

Operation should be done as soon as the diagnosis is fairly certain. The diagnosis is made by the pediatrist, and I have never seen a case until the symptoms were fairly characteristic.

In my first case, in December, 1916, I did a gastro-enterostomy. In the others I have split the tumor longitudinally down to the mucous membrane, as suggested by Rammstedt in 1913. This operation requires care to avoid opening the duodenum, for the apex of the tumor bulges into the duodenum, and in trying to make the division of the tumor thorough enough to relieve the obstruction, it is easy to perforate the duodenal mucous membrane. I made this mistake once. I put in two fine catgut sutures and no trouble resulted. This operation requires care, also, to avoid hemorrhage. The tiny vessels come from the inferior aspect of the pylorus and I have found that the nearer the superior aspect of the pylorus the incision is made, the less the bleeding. In my first operation of this kind I made the incision on the lateral aspect of the pylorus, the easiest place, and the baby died a few hours later with its abdomen full of blood. It is almost impossible to catch and tie the vessels, so that any manœuvre to avoid them is worth while. In the last two or three cases I have operated from the left side of the patient, in order to hold the pylorus more easily in my left hand, and make an incision in its superior aspect with my right. This is a decided gain in convenience.

In spite of these dangers in the operation, perforation and hemorrhage, the procedure is so simple, and can be done so rapidly that it is likely to suplant gastro-enterostomy. In fact, judging from the reports I have seen in the last year or two, it seems to have done so already.

Of my 8 Rammstedt operations, 2 died, a mortality of 25 per cent. Downs reported 35, with 23 per cent.; Gallie and Robertson 16, with 31 per cent.; Green and Sidbury 5, without a death. Scudder, Stillman, and Richter did 36 gastro-enterostomies with 13 per cent. mortality, a remarkably good record. My gastro-enterostomy did pretty well for a week, then died unexpectedly on the eighth day, from some undiscovered cause. My first death with the Rammstedt was from hemorrhage, as already described. The second death was my seventh case, a girl baby two months old, who had been vomiting since the second week. The condition was not recognized by the family physician and she was in poor condition when a pediatrist was called in and made the diagnosis.

I found a rather large hard nodular tumor, split it, and closed the abdomen. The baby did very well until the afternoon of the third day, when the respirations became weak, of the Cheyne-Stokes type, and death ensued quickly. The pulse remained good after the respirations began to fail. I do not know how to explain such a death. It was similar to the death of the gastro-enterostomy case. Enlarged thymus, acidosis, and other vague causes have been discussed.

In addition to these cases of pyloric stenosis due to tumor, I want to report one case of a different form.

A boy baby seemed normal after birth and did well for a time, then began to vomit and lose weight, and finally gastric peristalsis became visible. A diagnosis of stenosis was made by the family physician and consulting pediatrist, and I concurred.

I operated when the baby was three months old. Instead of the usual tumor, I found a distinct plication at the pylorus, the duodenum bent forward and adherent to the stomach for a distance of almost a quarter of an inch. The area was hyperæmic and there were definite cobweb adhesions. I divided the adhesions with scissors, and straightened out the pylorus. It seemed patulous and I did nothing more but close the abdomen. The baby did not do very well for the first week, and the wound broke open. I closed it under an anæsthetic and inspected the pylorus, finding it apparently patulous and normal. Since then the child has done well.

STATED MEETING, HELD MARCH 13, 1919

Dr. G. G. Ross, Acting-President, in the Chair

SEPARATION OF THE LOWER EPIPHYSIS OF THE FEMUR

Dr. Henry R. Wharton reported three cases in which the lower epiphysis of the femur had been separated, as follows:

Case I.—John W., thirteen years of age, was admitted to the Presbyterian Hospital, July 1, 1913, having, twenty-four hours before, fallen from a wagon, injuring the right knee. He was seen by a local physician, who attempted to reduce the deformity at the right knee, under an anæsthetic, but failed. When seen shortly after admission, the region of the right knee was much swollen, and the deformity presented was that of an anterior dislocation of the knee-joint. The joint was fixed in a position of slight flexion, the head of the tibia and epiphysis of the femur being in front of and above the lower end of the shaft of the femur. X-ray examination showed a separation of the lower epiphysis of the femur, the head of the tibia, with attached epiphysis, being in front of the lower end of the femur.

Two attempts, under anæsthesia, were made to reduce the displaced epiphysis without success. The displaced epiphysis then was exposed by a lateral incision on the outer aspect of the knee; this later was supplemented by one on the inner side. A large amount of blood-clot was exposed in the tissues around the seat of injury. By extension and flexion of the knee and the use of an elevator, the epiphysial fragment was with great difficulty restored to its normal position. Fearing a recurrence of the deformity the epiphysis was secured to the diaphysis by a heavy silver wire suture. The wounds were closed without drainage and the limb secured in a posterior splint. Infection of the wound occurred, which required opening of the wound and drainage.

Some days after the reduction had been accomplished it was noticed that the patient had foot-drop, evidently from contusion of the external popliteal nerve. The patient's convalescence was slow, by reason of the wound infection, but he made a good recovery, and when last examined, some three months after the injury, had good motion in knee-joint, aside from slight restriction in flexion. The foot-drop had entirely disappeared.

In this case the reporter said that it was an error to have closed the wounds without drainage, in view of the large amount of blood-clot deposited in the tissues and the contusion of the parts. Fixation of the epiphysis to the diaphysis by suture was unnecessary, as in these cases, when the deformity has been reduced, there is little tendency to its reproduction.

Case II.—H. D., six years of age, fell down an iron stairway on the Pennsylvania Railroad, and was admitted to the Presbyterian Hospital, March 13, 1918, a short time after the accident. He presented then marked swelling and deformity of the right knee, which on examination proved to be a separation of the lower epiphysis of the right femur, with anterior displacement of the epiphysis and attached head of the tibia. X-ray examination confirmed this diagnosis. The patient was given an anæsthetic, and after somewhat prolonged manipulation the deformity was overcome and the epiphysis restored to its normal position. A moulded binder's board splint was applied to the limb, which extended from the foot to the groin, and in a week, when the swelling had subsided, a plaster-of-Paris splint was applied. The splint was retained for six weeks. After this time passive motion of the knee-joint was practised, and the patient was soon walking without difficulty.

Case III.—T. G., sixteen years of age, was admitted to the Presbyterian Hospital, July 4, 1918, having a short time before been struck by an automobile, injuring the right knee. The right knee presented a very remarkable deformity. The leg and knee-joint appeared to be drawn inward, while the lower end of the femur above the knee projected outward and was covered by the tightly stretched skin. The rough transverse edge of the lower end of the femur could be felt just under the skin, the injury evidently being an inward lateral displacement of the lower epiphysis of the femur. An X-ray examination showed this to be an inward displacement of the lower epiphysis of the femur, with a limited oblique fracture of the inner edge of the shaft of the femur.

Under anæsthesia by manipulation a fair reduction of the displaced epiphysis was effected. A binder's board splint was applied, extending from the foot to the upper part of the thigh, and when the swelling had subsided at the end of a week, a plaster-of-Paris bandage was substituted. Fixation of the limb was kept up for six weeks, and after this time pasive motion was practised, and the patient was encouraged to use the limb. When seen two months after the accident, he had good motion of the right knee-joint.

Doctor Wharton, in commenting on these cases, said that these three cases of simple separation of the lower epiphysis of the femur are the only examples of this injury that have come under his observation. He had seen a number of cases of compound separation of the lower epiphysis of the femur in which the lower end of the femur lacerated the soft tissues, sometimes the great vessels, and was driven through the skin. These cases occurred in pre-antiseptic days, and were promptly treated by amputation of the thigh. As he recalled it, the accident usually was observed in boys, who, in attempting to jump on a moving wagon, had the limb caught between the spokes of a revolving wheel. He had no doubt that in these cases at the present time, if the great

vessels were not injured, under modern methods of treatment it would have been possible to have had recovery with a useful limb. In all of these cases he had been impressed with the great difficulty in reduction of the displaced epiphysis. In the first case, in which several attempts were made, open operation was resorted to, and even here reduction was very difficult. In examining the X-ray plates for Cases II and III it will be noticed that the reduction of the epiphysis in each case is not perfect, but the functional results are normal.

Dr. A. Bruce Gill raised the question as to the subsequent growth of the bone in cases of separation of the epiphysis in young children. Doctor Haas of San Francisco has published a series of papers on injuries of the epiphysis in relation to the aftergrowth of the bone, claiming that the growth of the bone will be retarded in certain instances. He himself had never seen these cases long enough to know whether separation of the epiphysis in growing children interferes with the development of the bone. In cases of osteomyelitis of the lower end of the radius he had seen deformity develop as the result of defective growth, and likewise in osteomyelitis of the lower end of the tibia.

Dr. Henry R. Wharton, replying to Doctor Gill's question, said that in quite a number of epiphysial separations in children he had not seen much interference with the subsequent growth of the bone. He had seen some cases in which the epiphyses had been destroyed by ostomyelitis and in these there was marked deformity.

MULTIPLE FRACTURE OF THE PELVIS WITH THYROID DISLOCATION, DISLOCATION OF THE RIGHT FEMUR, DISLOCATION OF LEFT ASTRAGALUS, COMPOUND FRACTURE OF RIGHT TIBIA, LACERATED WOUND OF THE LUMBAR REGIONS

Dr. Henry R. Wharton reported the following case:

B. B., twenty-five years of age, a brakeman, was admitted to the Presbyterian Hospital on the night of June 28, 1918. He was caught under a moving freight car and sustained the following injuries: Fracture of a large portion of right ilium, fracture of the right ischium, separation of pubic symphysis, thyroid dislocation of head of right femur, compound dislocation of right astragalus, fracture in lower extremity of left tibia, extensive lacerated wound of skin fascia and muscles of the lumbar region.

The patient on admission was suffering from profound shock, so that temporary dressings only were applied. He was put upon stimulating treatment, and the next morning still presented the symptoms of profound shock. As he had passed no urine, a catheter was introduced and bloody urine was evacuated. The possibility of rupture of the bladder was considered, but a second catheterization some hours later showed the urine was free from blood, so that the hæmaturia was probably due to contusion of the kidney. As

it was considered that he might die at any minute, no attempt was made to reduce the dislocation.

On the third day after admission, as the patient had reacted somewhat, he was etherized and the dislocation of the femur was reduced by manipulation, also that of the left astragalus, and his fractures were dressed. The patient had a slow convalescence. The pelvic fractures were dressed with difficulty on account of the extensive wound in the lumbar region.

He was finally discharged from the hospital October 6, 1918, and is now able to walk quite well, although his gait has been changed by the deformity resulting from the pelvic fractures.

RHINOPHYMA

Dr. John H. Gibson read a paper with the above title, for which see page 95.

EMPYEMA

Dr. John Stewart Rodman read a paper detailing observations in empyema made at Camp Bowie, Texas, for which see page 49.

Dr. John H. Gibbon said that military experience has advanced surgery, especially in the surgery of joints and of the chest. There is nothing about which he could speak more enthusiastically than of the sterilization and closure of the pleural cavity by the use of Dakin's solution. The first discussion he had heard of this work was by Tuffier, who reported 26 cases of infection of the pleural cavity with only four due to pneumonia, the others being due to gunshot wounds. All were sterilized under Dakin's treatment and closed. This should answer any qusetion concerning the efficacy of the Dakin treatment. If one can sterilize the chest cavity and close it regardless of a big dead space underneath, one can say that whatever has been used it is the right method. They found that a great many of these wounds did not need closure but closed themselves. Doctor Rodman did not refer to the fact that a certain proportion of wounds reopen. This does not mean, however, that the wound has not been sterile. They had had gunshot wounds reopen after having been closed for two or three weeks, but the fluid was absolutely sterile in every one. Local anæsthesia should be employed and if the technic is properly developed the operation is not a painful one. When hemorrhage occurs the Dakin's solution has not been properly used. The agent does not encourage hemorrhage. In the American evacuation hospitals they had many large open wounds, but secondary hemorrhage was unusual because the cases were clean and had been sterilized by Dakin's solution. Secondary hemorrhage is the result of infection.

Dr. D. L. Despard, in connection with the sterilizing power of Dakin's solution, reported a case of long standing, that of a man operated on for empyema eighteen or twenty months prior to coming under his care.

The man had a persisting suppurating sinus into which a probe could be passed for six or seven inches; he also had a persistent daily rise in temperature from 99° to 100° every afternoon. The opening was small, but a rubber tube a quarter of an inch in diameter could be inserted into the bottom of the sinus, and the patient, being a druggist, made his own Dakin's solution and injected it himself. In a month the purulent discharge had ceased; the tube was kept in for a week or ten days longer and then removed. He has had no temperature for several weeks and apparently the cavity is entirely closed.

Doctor Rodman said that notwithstanding anæsthesia is regarded as being unsafe in these cases, he had never been able to resect ribs without some pain, even if infiltration and anæsthesia with novocaine were carefully done and the intercostal nerves blocked. Therefore, he had preferred at this stage of the operation light general anæsthesia, preferably using gas-oxygen. Again he agreed with Doctor Gibbon that if the Carrel technic of using Dakin's solution is correctly applied bleeding is not likely to occur—Dakin's solution in the proper concentration (.5 per cent.) will not dissolve healthy tissue, having a selective action on necrotic tissue. If the blood-vessel is necrotic there is no reason to believe that it will escape, but this chance is worth taking for the marked benefit to be derived in getting rid of necrotic tissue and infection in general.

Dichloramine-T has not the solvent effect that Dakin's solution has and for that reason is not as valuable as a sterilizing agent. In his opinion it cannot be compared with Dakin's solution in sterilizing quickly large infected cavities. Dichloramine-T is valuable but chiefly so in small surface wounds.

UNILATERAL TUBERCULOSIS OF THE KIDNEY

Dr. J. Leon Herman (by invitation) read a paper with the above title.

Dr. John H. Gibbon said that one troublesome aspect in renal tuberculosis is that there are cases in which it is difficult to be absolutely sure that there is a good kidney on the other side. About fifteen years ago exposure of both kidneys was urged by Leonard Freeman in doing nephrectomy, to determine whether tuberculosis was present in the supposedly good kidney. In one case operated on twelve years ago in which catheterization of the ureters was not possible both kidneys were exposed, and one found to be perfectly normal. The man made a good recovery and has remained well, except that he had tuberculous necrosis of costal cartilage two years later. In another patient in whom the testicle had been removed for tuberculosis, blood in the urine led to the suspicion of tuberculosis of the kidney. Operation was not submitted to and the man later had an attack of great pain, passing clots down the ureter. The bladder was opened by suprapubic incision by another surgeon, and in that case there was a question which kidney was involved,

although the symptoms clearly pointed to the right side. Repeated attempts to catheterize the ureters failed. There was, therefore, nothing left to be done but to expose the kidneys. This was done, exposing the supposedly good kidney first. A small fluctuating area in this kidney was incised and a stream of tuberculous pus escaped. This little abscess had no connection with the urinary tract. The abscess was excised. The other kidney was removed. This has been five years ago, and, while the man may not be called well, he has never developed tuberculosis of the remaining kidney. The interesting feature about this case is that had they been able to catheterize the ureters they would not have learned of the presence of the abscess found in the supposedly good kidney, which was not indicated in any way. Both of these patients were physicians and both are now carrying on an active practice.

RHINOPHYMA*

By John H. Gibbon, M.D.
of Philadelphia, Pa.
Surgeon to the Pennsylvania Hospital, Professor Surgery, Jefferson Medical College

This distressing disfigurement occurs in the third or hypertrophic stage of acne rosacea. Fortunately, in spite of the frequency of acne rosacea, this condition is not an inevitable or even common termination of the disease.

It is inseparately associated, especially in the layman's mind, with inordinate indulgence in alcoholic beverages, but it has occurred in the case of many very temperate persons and has been often seen in total abstainers: consequently, we may hardly expect it to disappear with the enforcement of the recent amendment to our Federal Constitution. Excessive use of tea, coffee, tobacco and good food, as well as extreme cold and heat, are considered by the dermatologists as causative factors. There is probably no comfortable indiscretion which has not been named in this connection, so there is nothing more to add in the way of causes, but as far as the three cases here reported are concerned, I think they may be acquitted of any charge of over-indulgence in the flesh pots. A fact probably worthy of note is that rhinophyma is very rare in women and yet they are notoriously indiscreet in their treatment of the alimentary tract, both as to what they put in it and the regularity with which they evacuate it.

Looked at pathologically this condition can be expressed in one word —hypertrophy—involving particularly the connective tissue, the sebaceous glands and the blood-vessels of the skin. The most striking of the hypertrophic features is the great size of the sebaceous glands, their big blocked ducts and their apparent increase in number. The big tortuous capillaries and veins are conspicuous superficially but they are not found to the same extent in the deeper portions of the skin. The thickness of the skin even in the absence of lobulation is surprising. The usual limitation of the hypertrophy to the lower half of the nose is difficult to explain but renders its surgical treatment much easier. Where pendulous lobules of hypertrophied skin hang from the alæ, the skin at their bases is never so thick as in other parts of the involved area. This renders simple excision followed by suture possible in many cases. There seems to be no limit to the growth of the lobulated masses. In Keen's case, the only one I believe reported before this Academy (January 4, 1904, Annals of Surgery, vol. xxxix, page 665), the patient was obliged to lift his enlarged nose up out of the way in order to take soup from a spoon or

* Read before the Philadelphia Academy of Surgery, March 13, 1919.

liquid from a glass. If the commonly assigned cause of this condition is the true one, it is unfortunate that the patients are not so handicapped in the early stages of the disease.

Electrolysis and galvano-cautery puncture probably constitute the only methods of treatment of this disfiguring condition which may be said to be generally practised, and yet I am inclined to believe excision under a general anæsthetic gives better, quicker, more certain and more lasting results.

I assisted Doctor Keen in 1903, when he operated upon the case already referred to, in which the result was most gratifying, and since have operated on three cases. Unfortunately I have failed to locate two of these patients recently, but the results engendered great gratitude in the patients, and I believe if any marked recurrence had taken place they would have returned. The photographs before and after in two of the cases show what was accomplished. No photograph was made in the second case, but the condition in this case was quite as marked as in the others, interfering, as the patient assured me, with his "business" (that of a pedlar), and the result equally good.

The surgical procedure is quite simple and consists of excision of the lobules and the paring or shaving of the hypertrophied skin until the nose has assumed the size and shape which might be considered normal. The work might be considered more suited to a sculptor than to a surgeon.

Although bleeding is very profuse from innumerable vessels, it is very rare that any of these require a ligature: even the use of forceps is rarely required excepting in the case of the vessel at the base of the ala. One should be careful not to pare away the entire thickness of the skin because if this is done it delays healing and necessitates the formation of cicatricial tissue. In Case I it will be noticed that there are two such areas on the left ala.

The way in which the sebaceous material exudes from the divided sebaceous ducts and skin is quite like that of butter or cheese squeezed through a piece of cheese-cloth. One can readily believe that there is not only a hypertrophy of the sebaceous glands but an increase in their number. When the nose by the process of shaving has been brought to what may be considered normal, the bleeding can be arrested to some extent by hot applications and pressure, but oozing will continue for a number of hours. I have allowed several layers of gauze to remain in contact with the denuded area for a number of days and have simply changed the outer layers of gauze. If the entire thickness of the skin has not been removed, it is remarkable how quickly healing takes place in these cases.

The surgical procedure and the results are so satisfactory that I am convinced that many more of these cases should be operated upon.

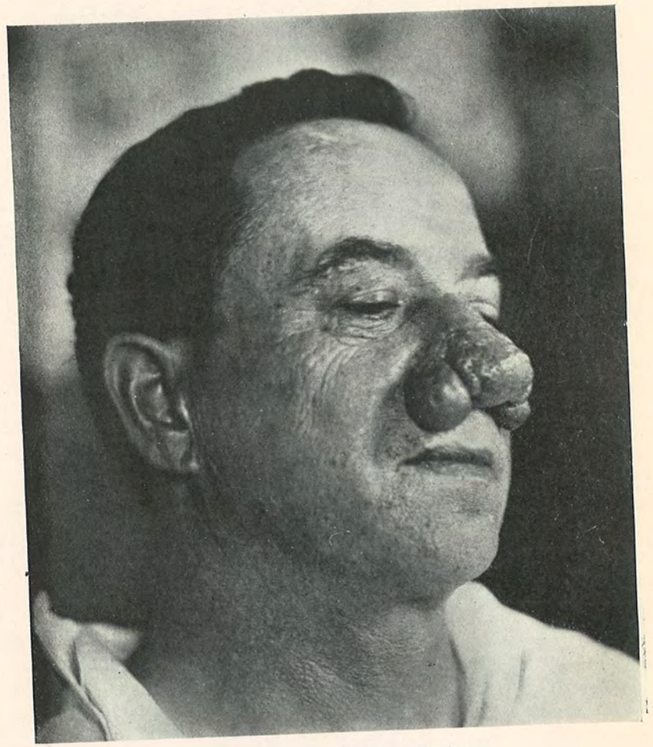

FIG. 1.—Case I before operation.

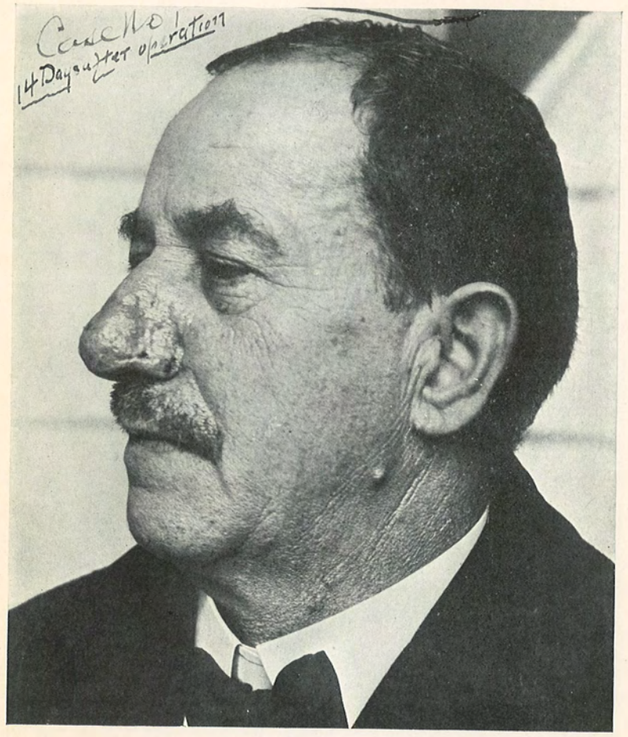

FIG. 2.—Case I, fourteen days after operation.

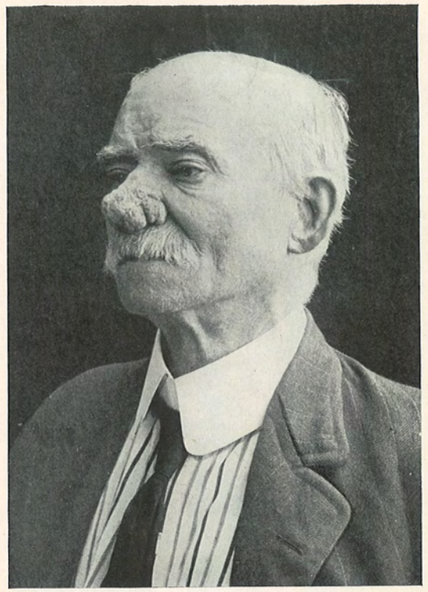

FIG. 3.—Case III, before operation.

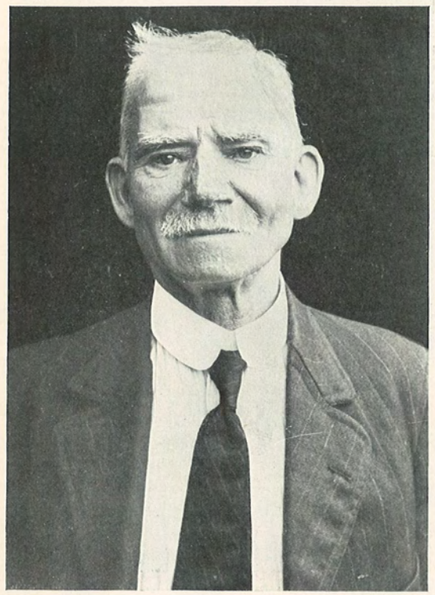

FIG. 4.—Case III, twenty-eight days after operation.

CASE I.—T. H., aged fifty-seven years, operated upon at the Jefferson Hospital, February 2, 1907. Fig. 1 shows the appearance of the nose before operation and Fig. 2 the condition fourteen days later. In this case there were four small points, two on each ala, where the entire thickness of the skin was removed and here epithelialization was delayed about a week.

CASE II.—A. M., aged fifty-five years, operated upon at the Pennsylvania Hospital, October 22, 1913. In addition to the involvement of the nose in this case there were numerous small sessile masses of hypertrophied skin on the cheeks. Some years previous the patient had a large pedunculated mass removed from the right side of the nose. Because of an old chronic inflammatory condition of the lungs, this patient was operated upon under chloride of ethyl anæsthesia. In this case I avoided penetration of the skin and the promptness with which healing took place was very surprising.

CASE III.—J. A., aged sixty-three years, operated upon at the Jefferson Hospital, June 20, 1916. In this case the involvement of the skin extended over nearly the entire nose. The second photograph was taken a month after the operation. This patient was seen within a few weeks of this printing, and he had had no recurrence of his trouble after three years.

EMPYEMA *

By John Stewart Rodman, M.D.

of Philadelphia

recently major m. c., u. s. army, chief of surgical service, base hospital, camp bowie, fort worth, texas

The basis of this report is founded on the author's experience during service in the Army, first, at the Base Hospital, Camp Bowie, Fort Worth, Texas, from September 15, 1917, to April 1, 1918, and General Hospital No. 14, Fort Oglethorpe, Ga., June 5 to October 10, 1918. During this time approximately 240 cases of empyema came under observation in which I either personally was responsible for the surgical management or supervised it.

In passing, a word might be said as to the arrangement for the management of infected cases in general at these two hospitals. Owing to the pavilion system of building these structures and to a comparatively large staff assigned to the surgical service it was possible to entirely separate the infected from the clean cases. Especially was this management entirely satisfactory at Camp Bowie where a separate set of wards, all on one row, a separate operating staff and operating room were used. A surgeon of experience was put in charge of this group of cases and under him a first assistant and eight ward surgeons, two for each ward set aside for this purpose. This staff gave their entire time and undivided attention to this part of the work. A separate operating room personnel worked with this part of the staff. It was my good fortune while in charge of the Surgical Staff at the Base Hospital, Camp Bowie, to have had Capt. L. H. McKinney, of Colorado Springs, assigned in charge of these cases. He personally performed one hundred and six thoracotomies for empyema before being called elsewhere for duty.

Upon entering the Army the author, with most others, held to the opinion that empyema called for immediate operation. This opinion was based on experience in civil practice with pneumococcus empyema and the experience gained in the Army has in no way changed this feeling. However, we were to deal with a very different type of infection, one that demanded a different plan of treatment and in which, no matter what plan was followed, a much greater mortality resulted. I refer to the empyema caused by the streptococcus hæmolyticus following in the wake of a violent epidemic of measles complicated by bronchopneumonia.

Before going into the surgical management of this extremely interesting type of empyema as it developed in our hands, it will be well to mention several of the other features shown by these cases. It was our melancholy distinction to be stationed at the next to the worst camp in

* Read before the Philadelphia Academy of Surgery, March 13, 1919.

the country from the standpoint of virulence of this epidemic. I refer, of course, to the epidemic of 1917 and 1918, during which in a little more than the three months of November, December and January, one-third of the command of the 36th Division, some 8000 troops, suffered from measles. It was a most pernicious type of measles in that the complications of bronchopneumonia leading to empyema, mastoids and other metastatic infections were common. While it is not our province to go into the epidemiology of this epidemic, a reasonable explanation of the severity of the infection at Camp Bowie may be offered in the fact that the troops encamped there were the Texas and Oklahoma National Guard, made up entirely of men from rural districts, for the most part non-immunes to the respiratory infections.

The pathology of this type of pneumonia was interesting and unlike that of the more familiar type caused by the pneumococcus. Pleural exudates were the rule and formed quickly in the course of the disease. In fact, it was not an uncommon occurrence to find that on the third or fourth day of the disease a sufficiently large pleural exudate was present to greatly embarrass respiration. At this time, of course, the pneumonic process was still in full bloom and the fluid while flaky was clear enough not to be called macroscopic pus but smears and cultures always showed the streptococcus hæmolyticus. The character of the fluid and the fact that the pneumonic process was still active played an important part in the development of the plan of treatment which gave the best results as we shall later show.

The diagnosis was interesting and taxed the watchfulness of the medical side of the hospital. X-ray proved of great value in localizing early collections and those that became "walled off" later on. It was interesting to learn by this means that most of these collections of fluid started to form in the interlobar fissure, and it was a distinct help to the operator to see the chest cavity through the fluoroscope and to mark the chest with blue pencil at the point where the fluid was most apt to be adequately drained.

It was during the early part of November, 1917, that the surgical service began to be called in to deal with empyema. Having, as mentioned before, the strong conviction that even microscopic pus in the chest cavity must be evacuated as soon as possible, especially where respiration was markedly embarrassed, the first fifty cases were treated according to this plan. Many of this group were all but moribund when first seen with a view to surgical interference. In fact, some were actually moribund and nothing could be done. This state of affairs was not due to any laxity on the part of the medical staff most ably conducted by Major J. G. Greenway, but to the severity of the infection and the astonishing rapidity of the disease process. In this first group of fifty cases the plan was followed of draining the chest cavity as quickly and in as simple a way as possible. Accordingly, thoracotomy, without rib resec-

tion, was done for the most part under local anæsthesia and drainage provided for with one rubber tube of large dimension. Often this was done in the ward, as it was not thought wise to attempt moving the patient to the operating room. The mortality in this first group was high and not a few died within several hours of the thoracotomy, enough, in fact, to lead us to believe that this plan of treatment, while apparently based on sound surgical principles and civil experience, was not the one best calculated to deal with this particular type of empyema. Of the fifty cases twenty-three died, a mortality of 45 per cent. Such a mortality was alarming and had we not by then begun to hear of even larger percentages being lost in other base hospitals the prospect would have been most discouraging. The explanation for this high mortality may have been in the several factors mentioned by the Empyema Commission at Camp Lee—the opening of raw surfaces with a consequent blood stream infection or relief of compression of the laboring lung. To me the latter seems most plausible since we now believe that there was a physiological reason for the exudate being present—namely, to splint the infected lung.

It is an interesting fact that quite independently of each other and at about the same time some of those responsible for the treatment of empyema at the base hospitals in the army, changed materially the plan of surgical management. Since even thoracotomy without rib resection under local anæsthesia for some reason often added more to the load that these patients were carrying instead of relieving it, there was only one other procedure simpler still, namely, aspiration. Accordingly, after the first fifty cases we decided to aspirate the worst cases and found to our great relief that this procedure was a distinct advance in treatment. As the fluid was thin at first it was possible after diagnostic puncture had been done to aspirate away by means of the Potain aspirator the greater part of the fluid. The improvement in the general condition, as a rule, was marked, the patients appearing less toxic and respiration became easier. Of course, the chest cavity would soon fill up again and aspiration had to be repeated usually after the lapse of three or four days. However, after the second or third aspiration the general condition of the patient had substantially improved and the fluid taken on the character of frank pus. As we then began to be troubled with reaccumulations of fluid in those in whom early intercostal thoracotomy had been done, owing, we believed, to inadequate drainage, thoracotomy with the resection of one rib as low down as possible, usually in the eighth posterior axillary line, became the operation of choice. The patients also after several aspirations were in much better condition to withstand the shock of this more formidable procedure. The surgical treatment of choice then became aspiration, late operation, and thoracotomy with rib resection. To this we added irrigation after one week had elapsed with normal salt solution and later Dakin's solution. I must confess to having

had a prejudice at that time of irrigating an acute empyema cavity which I have entirely lost since.

As a result of this plan of treatment the mortality dropped about half so that in our first hundred cases the mortality, all told, was about 28 per cent., still very high as compared to that experienced in handling pneumococcus empyema.

The plan of aspiration and late operation with rib resection was firmly established with us after trial in our second fifty cases and was not changed in the second hundred. To this plan, however, was added routine irrigation with Dakin's solution every three hours through the permanent drainage tubes, as irrigation with salt solution seemed to add little or nothing to speeding the convalescence. The chest cavity was filled with Dakin's solution and the patient turned on his side for a few minutes and then the fluid allowed to run out. This was a distinct advance in that the character of the discharge changed, lost its purulent nature and assumed more of a viscid appearance. The toxæmia also seemed to more rapidly disappear. Even with the irrigation added our great problem became not so much the mortality as the morbidity. Accordingly, these patients were given open air treatment even more than formerly, and setting up exercises carefully conducted by a medical officer were added as soon as convalescence was established. Such exercises were a material help in shortening convalescence and in leaving expanding lungs, instead of the rigid fixed ones as was the rule before such systematic exercises were established. I now believe that irrigation with Dakin's solution also had a good deal to do with dissolving fibrin and hence preventing adhesions. To recapitulate, then, the plan of aspiration, late operation, rib resection, usually under light chloroform anæsthesia, irrigation with Dakin's solution, and setting up exercises was followed in 133 cases. The mortality had again dropped, it was about 10 per cent. for this group—a vast improvement over 45 per cent. for the first fifty and 28 per cent. for the first hundred. The average period of convalescence was five to six weeks in this series of 133 cases, but some of the early cases despite secondary rib resections persisted in drainage for two or three months. In all there had been some 233 cases operated on by the surgical service of the Base Hospital of Camp Bowie during the writer's service.

In the spring of 1918 it was my good fortune to take the course of instruction in the treatment of infected wounds at the Rockefeller War Demonstration Hospital, New York. I was much impressed by the technic used there and the results obtained in treating empyema. Their mortality was still too high, some 24 per cent. in a comparatively small group of cases, but the morbidity record was much in advance of any I had seen. I believe that the high mortality was not due to the technic used but to the fact that aspiration was not practiced and all cases operated at once.

The technic developed there is briefly as follows: Wide resection, two to three inches of the eighth or ninth rib in the posterior axillary line, introduction of four Carrel tubes, two upward and two downward, each tube having twenty perforations, immediate irrigation with .5 per cent. Dakin's solution (full strength) on the table, leaving the wound wide open and packing with gauze soaked in Dakin's solution tight enough to steady the tubes and protecting the surrounding skin with sterilized vaseline. A rather voluminous dressing is then placed over the wound and the patient returned to bed. Instillation of 100 c.c. Dakin's solution every two hours by the nurse and irrigation daily at the dressing complete the procedure. The results of this treatment were striking, the toxæmia almost immediately disappeared, the character of the discharge became less purulent almost from the start. The Dakin's solution dissolved out the large fibrin masses and the wound could usually be closed after such chemical sterilization in from ten days to three weeks. A normally expanding lung remained and the soldier returned to full duty. The marked shortening of the convalescence and the early return to duty was certainly worth the extra trouble which this technic entails. After leaving the Rockefeller Institute the writer was assigned to temporary duty at General Hospital No. 14, Fort Oglethorpe, June 5. The epidemic of pneumonia was over at that time, but during the summer I had the opportunity to try out this technic in eight cases of streptococcic empyema. Of these one died from an involvement of the other side, the other seven, however, making unusually rapid recoveries. In one it was possible to close the wound in eleven days, in another thirteen days, and the remainder averaged from two to three weeks.

The comparison between these cases and some that had been treated by simple intercostal thoracotomy was striking. Some of the latter had drained for months and were forever incapacitated for further army duty. Before closing the chest wound, in order to be well within safety, I made it a practice not only to have had a count of less than one bacterium to five fields, but also to secure negative culture. After this brief added experience I now believe that this technic, in conjunction with aspiration and late operation, is ideal in spite of reports of hemorrhage and bronchial fistula, mostly from the army overseas. Strangely enough, I have encountered these complications but once, and that in my last case, operated upon at the Presbyterian Hospital, since my discharge from the Army. This patient did develop a bronchial fistula because of which Dakin irrigations had to be stopped, and six days after discontinuing the Dakin's solution, had a rather severe hemorrhage from the lungs which was repeated several times. He made a satisfactory recovery, however, and I am loath to believe that the bronchial fistula and hemorrhage resulted from the Dakin's solution. These complications have not arisen in the series treated at the Rockefeller Hospital and they do occur, we know, in cases where Dakin's irrigations have not been used. Needless to say, if a bronchial fistula already exists the use of Dakin's solution in the chest cavity is contraindicated.

I have not used any of the methods of suction advocated nor made any attempt at preventing pneumothorax, as neither has seemed necessary. Negative pressure as suggested and tried with success by the Empyema Commission, at Camp Lee, may be the final word in the treatment of these cases. It is difficult to see how an improvement can be made, however, in the plan of aspiration, late operation, wide resection, Carrel-Dakin irrigation and secondary closure of the wound.

Before closing it might be well to mention some of the interesting complications encountered in this series of empyema. General blood stream infections were not uncommon and metastatic abscesses were frequently seen. Next to the pleural cavity the place of choice for infection seemed to be the mastoid cells and there were considerably over 100 of such cases operated at the Base Hospital, Camp Bowie, during the epidemic. An interesting metastatic involvement was a suprapubic abscess deep in the abdominal wall. The first case of this sort appeared to have a distended bladder when the tumor was first discovered as there were none of the usual signs of abscess present. Catheter failed to recover more than a negligible quantity of urine, however, and exploratory needle puncture revealed streptococcic pus. Joint involvement was not uncommon and other superficial abscesses were frequently encountered. Post-mortem commonly revealed pericardial involvement.

Altogether we were distinctly impressed with the virulence of the streptococcus hæmolyticus and with its pus producing ability.

STATED MEETING, HELD APRIL 7, 1919

Dr. George G. Ross, Acting-President, in the Chair

CERVICAL MENINGOCELE

Dr. John Stewart Rodman presented a case of cervical meningocele which had been relieved by plastic operation.

Dr. John B. Roberts called attention to the fact that the free flap which Doctor Rodman had used was a graft of fatty fascia from underneath the skin, containing also a portion of tendon of the frontalis above the nose. When the protrusion of cicatricial dura and scar tissue was removed, there was exposed a pit three-quarters of an inch deep with a cranial opening about one inch long and half an inch wide, with the long axis horizontal. Some time ago he took a bone plate out of the girl's tibia and planted it in her right thigh under the fascia lata. This he intends to use later to close the defect in the bone of the cranium, if the tendinous fatty graft recently stitched across the opening fails to prevent protrusion of the cerebral membranes. His idea is to use the fascia lata which was fastened by wire to the bone graft as a patch for the dura mater deficiency.

WAR WOUNDS TREATED WITH DICHLORAMINE-T

Dr. Penn G. Skillern, Jr., read a paper with the above title, for which see page 115.

Dr. J. Stewart Rodman said that he had had a rather unusual opportunity to watch the use of dichloramine-T at General Hospital No. 14 during a term of service of some four months this last year. The use of dichloramine-T was under the supervision of Doctor Lee and in charge of Doctor Furness and, therefore, in the hands of experts. He did not feel that dichloramine-T would ever take the place of Dakin's solution, but that there was a definite field for both. The former did not cleanse the large pus cavities as did Dakin's solution because it has not the solvent action of Dakin's solution. The technic of using dichloramine-T is simpler than that necessary in Dakin's solution. Dichloramine-T was really more valuable in the small wounds than in any other place. In the larger wounds, comminuted infected fractures, etc., dichloramine-T certainly did not do the work that Dakin's solution did.

Dr. Morris Booth Miller said that he had used dichloramine-T throughout the period of our activity in the war. Since September of last year he had seen it used extensively on the wounded soldiers brought back from France. He was entirely convinced that there is no measure

which is quite so satisfactory from several standpoints. It is small of bulk, it is easy to apply, it is economical of dressings, it is painless in application, and the quick healing which follows its use, together with these qualities, makes it of great value. Many cases have been brought aboard ship in the last stage of suppuration or of nearly sterile granulation, and they have healed promptly under the use of this measure. There seemed to be no irritation of the healthy skin. Under service conditions they could easily dress 100 cases in one and a half or two hours; the patients made no complaints, especially when it was used in the form of a spray; and the wounds closed with extraordinary rapidity. In the earlier treatment of wounds he thought the Dakin-Carrel solution to be of especial value, but in the terminal stages he knew of nothing to be compared with dichloramine-T.

Dr. John B. Roberts inquired which is better, the dichloramiue-T prepared with the eucalyptol, or with the chlorcozane. He had wondered if he did not get as good results in his face cases with tincture of iodine with equal parts of 95 per cent. alcohol, as with dichloramine-T. He tells his patients not to wash the face where the wounds are. In the past he believed much harm had been done by wetting the sutured wounds of aseptic operations. The circumstances are very different in already infected wounds.

Dr. John H. Gibbon said that this war has taught surgery that the principal object in the treatment of gunshot wounds is their closure. Between 80 and 90 per cent. of all gunshot wounds, particularly if compound fractures are eliminated, can be closed if operated on within ten hours. Such results depend in turn upon the meticulous care with which this is done. The first operation is the most important step in preventing infection of the wound. If the débridement has been properly performed and for some reason the wound is left open, in a large proportion of cases no antiseptic is required. If infection has occurred some chemical agent must be used. In his opinion there are two criteria by which the efficacy of any agent may be judged: (1) A demonstrated fall in the bacterial count; (2) ability to close that wound by retarded primary or secondary suture. There are thousands of cases that have been thoroughly tabulated showing what can be done with certain agents, particularly Dakin's solution. In the American Army this was used more extensively than any other. It is to be hoped that Doctor Skillern and Doctor Miller will give some figures in regard to primary and secondary sutures done on the bacterial count or on clinical observation. He knew that practically any wound that has been properly débrided, any wound that has been freed of all foreign material and all dead tissue, can be sterilized with the Carrel-Dakin treatment. Any pleural cavity in whch there is no foreign body can be sterilized with Carrel-Dakin solution and closed. If that can be done with dichloramine-T then it ought to be as good as the

Carrel-Dakin solution. The care with which the primary operation is done will determine the ease with which the wound is sterilized afterwards if it becomes infected. In one evacuation hospital in the American Army of 500 consecutive wounds, 300 left the hospital with the wounds healed. This, of course, was done in a so-called "quiet period" and not possible in a big battle.

Dr. Moses Behrend: In an experience of nine months with dichloramine-T as a local antiseptic before operation the results have been better than with the application of iodine. In addition to fewer infections it has been shown experimentally that there are fewer adhesions in the abdomen following its use than after iodine. The use of this agent in abdominal work presents a further argument for the employment of this agent.

Dr. George G. Ross had had opportunity to use both dichloramine-T and the Dakin-Carrel solution. Unfortunately, he was not able to give an opinion of their comparative value because he used the Dakin-Carrel treatment at a period of great stress when it was impossible to learn anything of final result. He saw a great many cases in which the Dakin-Carrel solution dissolved out the slough as no other agent he had ever used would. At Brest there were many bad burns in which dichloramine-T was used for a while until obliged to discontinue it because of the intense pain. They then resumed the paraffine or ambrine treatment. In the infected wounds, dichloramine-T proved so satisfactory that they gave up the use of the more complicated method of Dakin-Carrel. It must be said, however, that the type of wounds and the character of the infections were very different from those seen as the result of battle wounds. There was no gas gangrene infection to contend with.

Dr. George M. Laws had an excellent opportunity of comparing dichloramine-T with Carrel-Dakin solution in the treatment of war wounds. During a period of six weeks they were receiving patients at Base Hospital 31 as soon as they could be evacuated after primary operation performed according to the usual custom, and they had a great many large infected wounds to sterilize preparatory to secondary closure. After using both these agents he was impressed with the superiority of the Carrel-Dakin solution in that type of wound. He agreed, however, with those who advocate the use of dichloramine-T in small wounds and various other types.

Doctor Skillern, closing, replying to Doctor Roberts, said the agent prepared with chlorocazone is what they had on shipboard. It was used by pouring the fluid in and not by spraying; no drain was put in. Referring to Doctor Gibbon's large experience in the Army as compared with the Navy experience, he said that with three or four hundred wounds in various parts of the body and thirty men and three or four surgeons on board, they could not take time to perform débridement, but had to content themselves with simply putting in the dichloramine-T and putting on sterile gauze. Even at the hospital the bacteriological cultures proved sterile. One case was that of compound fracture of the knee-joint and in it there was immediate healing. The fact of not having performed débridement is, I think, a further testimony to the value of this agent.

DERMOID CYST IN RIGHT SUBMAXILLARY REGION

Dr. T. Turner Thomas presented a girl, seventeen years of age, who about three months before coming under observation had experienced some pain in the right submaxillary region, especially on movement, and at this time it was observed that she had a swelling in that locality. Her mother states that at about eleven years of age after an attack of mumps it was noticed that there was a fulness under the chin suggesting double chin, and that this has been present ever since. He saw her first January 21, 1919. He found a non-inflammatory swelling extending downward slightly below the hyoid bone, forward almost to the median line, backward to the sternomastoid muscle and above to the lower border of the jaw. The most prominent portion protruded to about the level of the external surface of the lower jaw. It was not tender but caused a little pain on movement of the head. The skin was freely movable over it and normal in color and feel. On palpation there seemed to be a slight sense of fluctuation.

At University Hospital, January 23, 1919, under nitrous oxide anæsthesia, an aspirating needle withdrew a fluid which looked as though it might have purulent material in it, and an incision about three-quarters of an inch was made about an inch deep and just above the hyoid bone. A finger was then introduced and after it a closed hæmostat, but no pus escaped. The incision was then enlarged outward and upward to about three or four inches and about parallel to the lower border of the jaw. On exposure of the depth of the wound it was first thought we were dealing with a lipoma, but this proved to be the submaxillary gland stretched out over a mass underneath. The gland was separated and retracted upward, exposing a mass which had a smooth, even surface and seemed cystic. An incision was made into it with the escape of a large quantity of yellowish bodies, suggesting something having the appearance of the so-called melon-seed bodies with the consistency of sebaceous or cheesy tuberculous material. It had very little fluid in it. Each little separate body was soft and easily crushed between the thumb and finger. The bodies varied in size from that of a pin head to an ordinary large bean. The total quantity could not be determined but it was probably between a half pint and a pint. The finger introduced into the cavity found it very deep and smoothly lined with no indication of inflammatory thickening. The surrounding tissues had a normal feel, *i.e.*, they were of normal softness and mobility. The tissue between the depth of the cavity and the

pharynx must have been very thin, because it was at first thought the end of the finger was in the oropharynx and against the back of the tongue which could be distinctly felt. At this period of the operation the patient was vomiting and it was thought some of the cavity contents were coming from the mouth, but this was easily found to be not so. Neither did any vomitus appear in the wound.

As the diagnosis had not been made before operation the question of treatment now became very disturbing. It was evident that we were dealing with a cyst and that the contents represented the secretion of the cyst wall. The best treatment of these cysts is to remove the cyst wall, but this would have been a very formidable operation in view of the extent, depth and attachments of the cyst wall to the pharyngeal wall and in the region of the great blood-vessels and nerves inside of and under the jaw. Marsupialization in cysts of the pancreas has been very successful and he concluded to apply this method of operation in this case. The wound was closed to the lower angle by a subcutaneous catgut suture and the edges of the opening in the cyst were sutured to those of the skin at this lower angle. A rubber drainage tube was introduced about two and a half inches and fixed there by a skin suture, and a dressing and bandage were applied. Three days after operation the tube was removed about three-quarters of an inch and entirely in two weeks. The discharge gradually decreased, remained very slight for several weeks and disappeared entirely three weeks ago.

A small section of the cyst wall in the circumference of the opening in it was removed for histological examination together with several of the small caseous bodies found in the cyst. They were studied in the pathological laboratory of the University of Pennsylvania by Dr. F. D. Weidman, who reports as follows:

A section of the specimen of the cyst wall "shows a distinctly squamous lining underlaid by a dense fibrous tissue. The epithelium is of the type seen in skin rather than in the mucous membrane, the basal cells showing nuclei which extend perpendicularly to the basement membrane, the surface ones showing very sharply an arrangement into granular and keratinous layers. The formation of papillæ is not given. The fibrous tissue below is arranged in collagenous bundles similarly to that seen in the skin, and very frequently bundles of involuntary muscle are met. The individual cells are swollen and degenerate. The feature that clinches the idea that this is skin consists in the presence of several rather large areas of highly vacuolated cells that are distinguishable with difficulty from fatty degeneration in the surface epithelium. Their occurrence, however, below the general level of the surface epithelium and the uniform grade of vacuolization in all of the individual nuclei determines that they are sebaceous. A further diagnostic feature consists in the discovery of two or three delicate (lanugo) hairs which lie within the dilated epithelial lined spaces, immediately adjacent to one of these sebaceous groups, and one of the hairs has a faint yellow tint which is so characteristic of this structure.

"Some of the contents grossly submitted was stained by Soudan III, and even the granular parts assumed a deep orange color which indicates a fatty degeneration. Some was also stained with Van Giesen's stain in an extemporaneous wet specimen, the degenerated cells taking on a green color which changed to yellow when washed in water. This indicates their keratinous nature.

"It appears now very clear that this is a dermoid cyst. The presence of hairs clinches the diagnosis, assisted by the presence of the involuntary muscle which doubtless represents an arrectores pilæ. The sebaceous glands are only less valuable because such are known to occur normally in the mucous membrane of the mouth, and because exaggerations of such very frequently occur in the lips in the condition known as Fordyce's disease. Furthermore, the presence of the granular layer in the surface epithelium is useful because the writer belives that this never occurs in a mucous membrane. The failure of the keratinous papillæ is of no moment because this is usually the case in dermoid cysts. Of the two possible sources of this cyst the writer (Doctor Weidman), therefore, feels certain that it sprang from the skin rather than the mucous membrane and that the lesion belongs to the inclusion dermoids."

Dr. Penn G. Skillern, Jr., said that he could add something of definite interest to Doctor Thomas' case of dermoid cyst in that nine days ago he had almost exactly the same experience in a patient operated upon a year ago for a swelling of the neck. The left submaxillary, salivary and sublingual glands were removed. Five months afterward the swelling came back. There was sudden pain with the swelling. The jaw was not tender but there was present a sense of fluctuation upon pressure. The swelling was pointed up like a frog's belly. The history given by Doctor Thomas of sudden pain beneath the jaw followed by swelling suggested submaxillary salivary calculus.

Dr. Damon B. Pfeiffer said that he had seen pathologically and clinically several cases which correspond closely to the case reported by Doctor Thomas. It seemed to him that the case can with perfect propriety be regarded as one of bronchial cyst. Such a cyst arises from the inclusion of a portion of an embryonic bronchial cleft and the type of lining epithelium found in one of these cysts is determined by the portion of the cleft which chances to be cut off. Thus, if the included portion of the cleft possesses an ectodermal lining, the resulting cyst will be similarly lined, as in the case under discussion. It is not improper to call this cyst a dermoid or, if you prefer, an epidermoidal cyst, but this does not exclude its bronchiogenic origin.

He recalled a case similar to the one under discussion in which the surgeon merely incised and drained under the impression that he was dealing with a cold abscess. It was necessary subsequently to remove

the sac to cure the resulting sinus. It should be remembered that the contents of these cysts vary in character from a clear serous material to a thick grumous or cheesy substance like that found in sebaceous cysts. Of it may resemble very closely the contents of tuberculous abscesses. It is important to make the correct diagnosis at the time of operation since the cyst calls for complete excision and the wound may be closed without drainage. Naturally this rule may require modification in the presence of circumstances such as have just been reported or in the rare event that true infection has been implanted in the cyst.

Dr. Henry R. Wharton said that some years ago he reported before this society three cases of sublingual cyst. The tumors were large and extended down from the hyoid bone. Two occurred in children and one in a woman forty years of age. The microscopic examination showed them to be dermoids. He was surprised at the ease with which they were enucleated, one through an incision in the floor of the mouth beneath the tongue; the other two through an internal incision below the chin extending down to the hyoid bone.

RETROPERITONEAL APPENDIX

Doctor Thomas presented a young colored woman, who was operated on at the Philadelphia General Hospital, July 16, 1918, for appendicitis of mild character. McBurney incision. No adhesions. When the cæcum was pulled out of the abdominal wound and retracted inward, the appendix was seen embedded in the retroperitoneal tissue to the outer side of the cæcum and curled on itself. The peritoneum could be picked up by forceps and easily and freely pulled away from the appendix which continued to lie in its original position. It, therefore, had no mesentery and the overlying peritoneum could be made to slip backward and forward over it by a little pressure of the finger. The peritoneum was cut over the appendix between two forceps, its margins were retracted and the appendix brought into the peritoneal cavity through this opening. Some difficulty was experienced in isolating and grasping the appendicular vessels with hæmostatic forceps and also in ligating and dividing them. The peritoneal opening was then closed by catgut sutures over the stump of the appendix which was then again in its original retroperitoneal position. Recovery was uninterrupted. Everything seemed to indicate that this was surely a retroperitoneal appendix.

INTUSSUSCEPTION OF HEAD OF CÆCUM WITHOUT INVOLVEMENT OF ILEOCÆCAL VALVE

Doctor Thomas presented, also, a boy, thirteen years old, strong and healthy until present trouble began. Referred by Dr. Geo., E. Shaffer. Admitted to Northeastern Hospital July 10, 1918. On the day before admission he was seized with an abdominal pain and vomiting. The bowels had not moved for two days when on the morning of admission he had a movement which contained macroscopic blood. There was then marked rigidity of the entire abdominal wall with tenderness in the appendiceal region and a diffuse pain around it. Doctor Shaffer had found on palpation a lump between the last rib and McBurney's point. The interne failed to find it, but when the patient was under ether it was again detected. A diagnosis of appendicitis had been made because of the fever and increased pulse, the severe tenderness and abdominal rigidity, the preceding two days constipation, and a possible mass in the appendiceal region. Operation was done soon after admission. McBurney incision. The appendix was located after some difficulty and only in part, the basal portion being concealed in an ill defined mass which exhibited much induration but no adhesions to surrounding tissues. It had little mobility and could not be brought into the wound and the appendix could not be released from its imprisoned position. The ileocæcal junction was not involved in the mass. A higher incision was made along the outer margin of the rectus muscle, extending upward to about two inches of the costal margin. It was still difficult to outline and determine the character of the mass, and, while it was being manipulated, suddenly the appendix was released and the cæcum took its normal form. It now seemed evident that we were dealing with an invagination of the end of the cæcum which had carried in with it that portion to which the appendix was attached. The cæcal wall was much thickened by œdema which also involved the appendix to such a degree that it protruded rigidly through the lower incision. The whole involved portion of intestine including the appendix had a bluish discoloration indicating the probable threatening of a gangrenous process. This rapidly disappeared after the correction of the invagination. The appendix was removed, both wounds closed and healing was uninterrupted.

In the sixth volume of Keen's "System of Surgery," John B. Murphy calls attention to Moschowitz's detailed report of intussusception of the appendix, and refers to six more recent cases. He felt satisfied that in this case the intussusception of the appendix was only a part of that of the cæcum. If this condition had continued to progress it could only have done so by the development of an ordinary ileocæcal intussusception. This case, therefore, may have been only the earliest stage of this common variety of intussusception.

STRANGULATED OBTURATOR HERNIA

Dr. Edward J. Klopp reported the case of a female, age eighty-eight, referred by Doctor Broadbelt, admitted to the Jefferson Hospital January 28, 1919. Four days before admission she was seized suddenly with general abdominal pain. The bowels did not move but had moved on the

previous day. The following day she vomited from fifteen to twenty times, the vomitus was dark in color and had a very foul odor. Vomiting continued up to the time of operation. Laxatives and enemas were used freely without effect. On examination the patient presented nothing noteworthy except a mitral systolic murmur and marked arteriosclerosis. The abdomen was moderately distended, no engorgement of the superficial veins, tympanitic and soft throughout, tenderness over both lower quadrants and no abnormal masses palpated. No evidence of hernia in the inguinal, femoral, or umbilical regions. Vaginal and rectal examinations revealed nothing of importance. Temperature, normal; pulse, 100; respiration, 24. Diagnosis: Intestinal obstruction, cause unknown.

The patient was operated upon immediately under nitrous oxide and oxygen anæsthesia. The abdomen was opened through a median incision below the umbilicus. A portion of distended small bowel came into view, it was engorged, œdematous, and dark red in color. After following this bowel in the direction of most congestion the obstruction was found in the right obturator foramen. By gentle traction the strangulated loop was drawn out, which comprised an inch and a half of bowel. The hernial sac was removed and the ring closed with chromicized catgut sutures. The abdomen was closed without drainage.

There were two spontaneous bowel movements within twelve hours after the operation, and one or more movements every day thereafter. She vomited on the seventh day following the administration of a Seidlitz powder. She was out of bed on the tenth day. Everything seemed to go well until the night of the eleventh day when there was sudden collapse, and death in two hours. No autopsy was done, but we had no reason to think that obstruction had recurred.

SARCOMA OF SCIATIC NERVE

Dr. Edward J. Klopp reported the case of a male, age eighteen, who was admitted to Doctor Stewart's service, Jefferson Hospital, May 31, 1917. He complained of a painful swelling on the posterior aspect of the thigh. No acute illness since childhood except typhoid fever at ten; no venereal disease and no history of injury. Two months before admission he began to have pain in the left thigh posteriorly radiating down the leg, especially noticed on walking and at times on sitting down. Later the pain became so severe that it was almost impossible for him to walk. About two weeks after the onset of pain he noticed a swelling on the posterior surface of the thigh. Appetite and digestion fair, bowels constipated. The patient is rather a poorly developed and poorly nourished adult male. General examination is negative. On the left thigh posteriorly, six inches below the gluteal fold, is a hard, irregular, tender mass about three by four inches. It is distinctly outlined, can be moved laterally but not vertically.

On June 1, 1917, under general anæsthesia, an incision was made over the mass in the long axis of the thigh. The long head of the biceps was adherent to or perhaps involved by the growth, hence a portion of the muscle was cross cut above and below, about an inch beyond the growth. After exposing the sciatic nerve it seemed to tunnel the growth. Separation was impossible, therefore the sheath, with probably one-half of the nerve cord, was excised for a distance of two inches. The adductor magnus and the semitendinosus were apparently free. A small wick of gauze was inserted for drainage. He left the hospital eight days after the operation with the wound healed.

Dr. E. D. Funk made the following laboratory report:

"Specimen weighs 180 gms. and measures 13 by 5 by 5 cm. The principal portion is composed of dark red muscle, œdematous and somewhat flabby. Attached to it and surrounded by a grayish, œdematous membrane is an oval mass measuring 5.5 by 4 cm. This tissue is quite resistant, yellowish-gray and incised with resistance. The outer portions of the incised surfaces are porous, somewhat brittle and resemble cartilage. The rest of the tissue is grayish in color, tough and resistant.

"Fixation in Zenker's solution; staining by usual laboratory methods."

Diagnosis.—Osteosarcoma.

Histology.—The section shows only tumor structure which consists of immature bone. The lamellæ stain lightly and contain many osteoblastic cells. The cells within the lacunæ and canaliculi are large and oval or spindle-shaped. Between the strands of immature bone are many irregularly shaped cells, loosely arranged and very vascular.

A month after operation he had pain again. Shortly after this a mass appeared in the region of the scar. He was readmitted to the hospital and on Angust 6, 1917, the growth was removed. The sciatic nerve seemed to be involved as before, the growth was approximately the same size as that of the former operation. The growth, with attached muscle, and the nerve for a distance of four inches, were excised. The wound was closed with silkworm-gut drainage.

On August 11, he received one-fourth minim of Coley's fluid. He had twenty-eight injections representing a total of seventy minims, the maximum dose being four and one-half minims. The injections were given at intervals varying from one to four days.

He received six X-ray treatments under the direction of Doctor Manges.

Dr. E. D. Funk made the following laboratory report: "Specimen is a tumor removed from the left thigh measuring 9.5 by 7 by 4 cm. and weighing 148 gms. Tissue is dark red in color and very firm, having muscle attached. The main tumor mass measures 3.5 cm. in diameter and is the

consistency of bone. A small mass attached to one end is of cartilaginous consistency and yellow in color."

Fixation.—Zenker's solution. Usual laboratory staining.

Histology.—Fibrosis is marked, the nerve sheath is thickened. Many of the fibrous cells are embryonic in character. In the intervening tissue are many thick-walled blood-vessels.

Diagnosis.—Fibro-neuroma.

We believe this to have been a case of sarcoma of the sheath of the sciatic nerve, because of the clinical appearance and laboratory findings and because of the prompt recurrence before the nerve was excised.

A SERIES OF WAR WOUNDS TREATED WITH DICHLORAMINE-T *

By Penn G. Skillern, Jr., M.D.
of Philadelphia

On the morning of August 17, 1918, at eleven o'clock, in latitude 42° 56′ N., longitude 30° 08′ W., a depth bomb exploded prematurely on board the U. S. S. ————, bursting into thousands of fragments, which peppered alike objects animate and inanimate, killing four men and injuring twenty-three others. Stretcher-bearers transported the injured to the sick bay, where they were undressed, turned into fresh, clean bunks and given restorative measures, including heat, opium, and fluids. First aid dressings were hastily applied, and when the patients were out of shock tetanus antitoxin was administered.

To cope with this situation there were on board three medical officers, of whom Lieutenant Commander C. K. Winn, U. S. N.—the Senior Medical Officer at that time—directed the author to take charge of the operating room, whilst he and Lieutenant R. M. Krepps, U. S. N., supervised the work in the sick bay. In order to determine the location, nature and extent of the injuries the author had each man in turn placed on the operating table, stripped. He then examined minutely each man from head to foot, dictating to a hospital corpsman standing by the location, nature and extent of every injury as soon as it was encountered. This search revealed injuries, of which those included in the following list were the most important:

List of the More Important Injuries.—Perforation of bowel, 4; penetration of lung, 7; laceration of femoral vessels, 2; laceration of penis and scrotum, 2; laceration of eyeball (extensive), 1; rupture of ear drum, 8; fracture of skull (occipital), 2; fracture of mandible, 1; fracture of humerus, 2; fracture of radius and ulna, 1; fracture of femur, 1; fracture of femur (incomplete), 1; fracture of patella, 1; fracture of tibia and fibula, 2; fracture of tibia, 1; fracture of tibia (incomplete), 2.

This list by no means represents all the injuries, for there were numerous punctured and lacerated wounds of various soft parts. The fractures were for the most part compound and many were comminuted. It is now evident that in the entire group of patients several hundred injuries had to be discovered and dealt with. This search consumed twelve hours from the time of the accident—from 11 A.M. to 11 P.M. After the last man had been examined those who had been set aside for operation were taken up, and the operations were finished by two o'clock the following morning.

* Presented before the Philadelphia Academy of Surgery, April 7, 1919.

The importance of such a minute, painstaking examination from head to foot in this series of injuries is shown by the following case:

> P. A. S., seaman, was carefully and minutely examined from head to foot, but the only injury found was a small punctured wound just below the navel—a puncture whose diameter was no greater than the cross section of a matchstick. The patient complained of no symptoms, yet the probe when introduced reached a depth that corresponded to the whole thickness of the abdominal wall. Exploratory celiotomy revealed in the small bowel two perforations of matchstick diameter, while in the mesentery near by there was found a small scale of metal no larger than a grape seed.

In the second case of bowel perforation the two apertures were larger, being jagged holes with at least the diameter of a lead pencil. In this case the jagged edges were inverted, and the two sutured sites were reinforced by free grafts of omentum. The portion of bowel involved was jejunum, and for a few days after operation the patient presented signs of dynamic ileus. This was attributed, however, to reaction œdema of the inverted bowel edges: after several stomach washings the lumen of the bowel restored itself and the ileus disappeared.

In the third case of bowel perforation it was the cæcum that was involved. No operation was attempted because the missile had entered well laterally in the right lumbar region and on its way to the right iliac fossa injured the outer portion of the cæcum, whose contents could freely reach the surface through the large hole made by the missile: a cecal fistula in this situation does not imperil the patient's life. This patient had, in addition, a penetrating wound of the right lung and extensive lacerated wounds of the left thigh and right axilla. He eventually made a complete recovery.

The only fatal case of bowel perforation did not come to operation because the patient was instantly killed, the result of multiple extreme injuries.

Of the seven patients with penetrating wound of the lung six recovered, aspiration of hæmothorax being required in several cases. The fatal case never reacted from the shock of the accident, two hours after which he died, the result of multiple extreme injuries. There was a hole in the left side of his chest through which a fist could be introduced, and it was impossible to seal this hole owing to the patient's precarious state.

One patient had a deep laceration of the dorsum of the penis, just behind the corona glandis. The wound itself was packed to check brisk bleeding from the corpora cavernosa. To prevent subsequent phimosis from reaction œdema of the foreskin, the prepuce was slit transversely just distal to the corona glandis, and the head of the penis was drawn through this slit like a button through a buttonhole, the foreskin dropping posteriorly. A gum catheter was passed into the bladder and retained. The foreskin proved useful later, when it came to plastic repair of the penis. The wound healed without producing angulation.

The patient with extensive laceration of the eyeball came eventually to enucleation. He was the nephew of a prominent Philadelphia oculist.

There was no operative mortality in this series. The four men who died either were killed outright or succumbed to shock, the result of multiple extreme injuries, within a few hours of the accident. The twenty-three survivors ultimately were either sent to duty or honorably discharged from the service.

The chief purpose in reporting this series, however, is to attest the value of dichloramine-T. Stimulated by the paper on the use of dichloramine-T read before this academy by Lee and Furness on October 1, 1917, the author used this preparation and became a stanch advocate of it and carried with him a quantity to sea. The primary dressing of each wound after the accident consisted solely in filling the wound with dichloramine-T and inserting a short length of rubber dam to maintain the patency of the drainage orifice of the wound. Then over all there was applied and secured a dry, sterile gauze pad. The ship reached port on the twenty-second of August—five days after the accident. The patients were then transferred to a hospital. At the time of transfer *not a single one of the numerous wounds had become infected*—no patient's chart showed elevation of temperature. And several months after the accident the author was told by the surgeons who attended these patients at the hospital that *not a single wound developed the slightest evidence of infection:* what cultures were made from wound discharge invariably proved sterile.

The author wishes to express his appreciation of the action of the surgeons of the U. S. Naval Hospital, Brooklyn, in reserving for him the privilege of reporting this interesting and in many ways unique series of cases.

STATED MEETING, HELD MAY 5, 1919

Dr. George G. Ross, Acting President, in the Chair

RECOVERY AFTER OPERATION FOR TRAUMATIC LACERATION OF THE LIVER.

Dr. John B. Roberts presented a little girl about seven or eight years old who had rupture of the liver the result of an automobile accident which occurred about the middle of February. The child was sitting on the curb when the automobile struck her on the legs throwing her on her abdomen upon the pavement. She was brought into the Polyclinic Hospital suffering great pain in the upper abdomen. Percussion showed that there was fluid in the abdominal cavity. Upon opening the belly he found a tongue-shaped flap about 2½ inches long and 1½ inches wide had been torn off from the lower surface of the liver near the gall-bladder. The pedicle was posterior. There was blood in the abdominal cavity, the retroperitoneal space and in the layers of the gastrohepatic omentum. By turning the flap up and pressing a thumb upon it, it was held in place and the bleeding was checked. He put against the replaced liver tissue a packing of two yards of bandage 1½ inches wide. This he held in place by an old-fashioned glass drainage tube with its bell-shaped outer end against the packing and brought the end of the tube obliquely through the abdominal wall. The child was in the hospital for about two months and has now been out for two weeks. There will probably be a hernia where the packing was allowed to extend outwards. It was gradually removed in about three weeks. He presented the case because traumatic rupture of the liver with operative recovery is rather unusual. The fortunate result was due to getting the abdomen opened promptly and the torn piece of liver replaced before a large amount of bleeding had occurred. He reported some years ago to the College of Physicians of this city a case in which he lost a patient after traumatic rupture of one of the hepatic veins upon which he had operated.

Dr. George G. Ross said that he had had two cases of rupture of the liver from traumatism. Both were ruptures of the right lobe and both were treated by packing, without attempting to suture. The first case recovered after a stormy convalescence. In the second case after the rent had been successfully packed it was reported that one piece of gauze was missing. In order to account for this it was necessary to search the abdominal cavity and in so doing the gauze which had been packed into the rent of the liver was displaced and before it could be put back the man bled to death on the table. In rupture of the liver with excessive hemorrhage and shock, a minimum amount of surgery is all that should be attempted. In three cases in which there was rupture of the spleen,

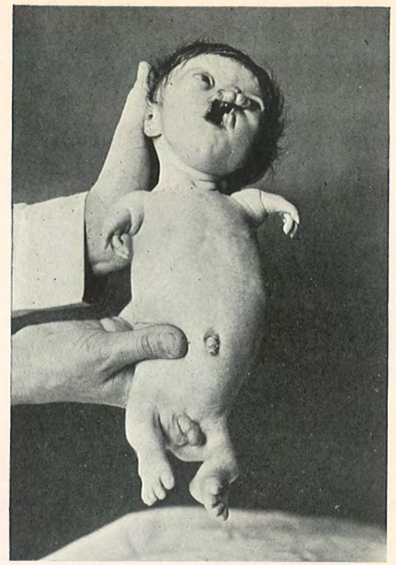

Fig. 1.—Louis M. Case of cleft palate and other congenital deformities of bones.

Fig. 2.—Same patient as Fig. 1, one week old.

instead of taking the spleen out, he used packing, with recovery in all three cases. In a case seen recently the patient was wrestling with another boy weighing 200 pounds who fell across his abdomen, causing a rupture of the spleen. The abdomen was opened by a left rectus incision and the rent in the spleen felt. Packing was inserted and the boy put to bed. He reported four or five months afterward apparently in perfect health.

A CHILD WITH DOUBLE CLEFT OF LIP AND PALATE, PROTRUSION OF THE INTERMAXILLARY PORTION OF THE UPPER JAW AND IMPERFECT DEVELOPMENT OF THE BONES OF THE FOUR EXTREMITIES.

Dr. John B. Roberts showed an infant of Italian parentage, belonging to a family in which there was a good deal of intermarrying. The parents of this child are first cousins. There are two living children, one eleven years; one, three, both girls. The first child, born in Italy, was a monstrosity and is dead. The two next children are normal in development. Three years ago a girl was born almost identical in deformities with this male child shown the Academy. The girl just mentioned died shortly after birth and this boy will probably not survive many days. He is now about a week old. (Note.—The child did die when fifteen days old.)

The X-ray pictures taken show that the femurs were quite well developed, but the bones of the leg proper on both sides are almost absent. The bones of the arm are apparently absent, though both upper extremities have the radius and ulna. The photographs accompanying this report show the peculiarity of the child better than any description that can be given in a short communication. Doctor Roberts expects to deposit the infant in the Mütter Museum. There is now in the Anatomical Laboratory of the Polyclinic Hospital the preserved body of the sister, born three years ago, belonging to Dr. Addinell Hewson's collection. The two children are almost identical in appearance, and the sister died when only a few days old as has previously been reported.

THE METHOD OF RECORDING SURGICAL OPERATIONS AT THE FRONT

Dr. Astley P. C. Ashhurst read a paper with the above title, for which see page 122.

Dr. Thomas F. Mullen, Major U. S. A., of Pocatello, Idaho, said that he had had some experience with French and American records and he was absolutely in accord with what Colonel Ashhurst had said about the completeness and the good appearance of the French cards. The American cards are usually written in pencil which is apt to be rubbed off and the cardboard breaks easily. It is interesting to hear what happens to the cards after reaching Washington, because in the midst of their work they

received a general order that the surgeon in charge of the service must personally see that all field cards were kept, giving diagnosis, clinical, operative and final notes. Before leaving Paris an attempt to do that was made. Colonel Hutchins made very complete records, at his own expense in employing stenographers. In some instances he detailed their own clerks, but the records made in the operating room by the anæsthetist or assistant operator necessarily often proved unsatisfactory. The French record card was very good because it needed only a check or underscoring of one of the printed forms accompanying it. Usually they were enclosed in their envelopes and not apt to get lost. Often the American cards did not belong to the soldier of whose case they were supposed to be a record.

Dr. Charles F. Mitchell said that the British field card is a much smaller card than the French with four sides and is pretty much the same as Doctor Ashhurst described. It gives the name of the patient, when he was injured and other data, and is very satisfactory in every way. If an X-ray had been taken at the field ambulance or casualty clearing station all the data were on the card. If a case remained for some time at the field hospital some extra temperature charts accompanied the card. It seemed to him a great advantage to have everything on one card rather than to have a lot of papers with the card. It was a simple matter to make these memoranda and while working at the casualty clearing station Doctor Packard was with him, and while sewing up a wound he would take the notes dictated to him. He never felt that they needed a clerk. As a matter of fact, their quarters were so small that they would not have had room for more people. The English card is really the ideal one.

Dr. Edward B. Hodge said that he felt a good deal as did Doctor Mitchell. The French card looks like a good one, but he would prefer the British. An advantage of the British card was that it did not have loose slips of paper which could be easily lost. He never worked with the French but he could appreciate their thoroughness. Most of the trouble, in his opinion, was due to inexperience of operating teams. The British card is complete and thorough and, when well worked, went through in good style. All that was needed was there and, like everything else, when properly worked, gave good results.

Dr. George G. Ross asked Doctor Ashhurst whether he had seen the German field record card, which is made of material something like linen paper and is difficult to tear and has a series of perforations by which certain portions of the edges can be detached. There were five or six different headings, giving time of injury, character of wound, when first aid treatment was given and whether operation had been performed. For simplicity and general outline of what had been done the card seemed to him nearer the ideal than any other seen. He happened to get one from a wounded German who was brought into the field hospital where

he was working. Probably Doctor Ashhurst's approval of the French card may be due to the fact that he was able to read, talk and live French, which many others could not do. He asked whether about the time of the 18th and 19th of July at Soissons, when the men were coming back by the hundreds and the surgeons were working from twelve to thirty-six hours, they could be held morally responsible for not keeping accurate records.

At Field Hospital No. 12 there were three teams to start with, later increased to seven. There were three tables and one scribe to take all the notes dictated by the surgeons and the assistants. During six days 3500 patients passed through this unit. The notes were taken with pencil in bad handwriting and no doubt worse English. Copies were made of the data so that after all most of the material was preserved. In certain times of stress it was not possible to do this.

THE METHOD OF RECORDING SURGICAL OPERATIONS AT THE FRONT*

By Astley P. C. Ashhurst, M.D.
of Philadelphia
sometime colonel, medical corps, u. s. army

"They do these things better in France," is a phrase which had passed into history many years before the great German War, but the truth of which has been verified anew in many respects during the experiences of the last four years. Especially, from the military point of view, did I find this to be the case with the methods of recording surgical operations during the hurry of work in advanced posts. Surgical Team No. 23, U. S. Army, of which I was the senior member, with Lieut. Henry S. Kerchner as my Assistant, together with two nurses, an anæsthetist, and two enlisted men as operating room assistants, worked for three months in a French "Autochir," and it became our duty to put on record in French an account of each operation as it was done. So explicit is the French language, and so nicely does it lend itself to terse and accurate expression, that when later our activities were transferred to an Evacuation Hospital of the United States Army, we carried along with us certain habits of expression which might well be officially adopted into the military code of armies other than the French.

In order for any statements, spoken or written, to be clear and intelligible, it is first and foremost necessary for the speaker or writer to know definitely in his own mind the points he wishes to have recorded and the order of their statement, and for him to employ definite and fixed terms of expression. These habits the French surgeons have acquired, and they gladly pointed out to us the important facts which should be recorded, as well as the value and significance of certain habitual abbreviations.

The patients would arrive at the operating room of the autochir with their "pochette" (the diagnosis envelope) already made out. This had been done at the "Triage" (sorting centre) of the autochir, the patient's name, rank, etc., and the "diagnostic sommaire" (summary diagnosis) being recorded on the outside of the envelope (Fig. 1). Here also was recorded the *date and hour of injury,* whether or not the *injection of antitetanic serum* had been given; and when the patient was dismissed from the operating room or later when discharged from the ward, other notable facts were added on the outside of the envelope, such as the *nature and date of any important operation;* how the patient was to be *transported* (sitting or recumbent); whether he was to be transported only a short distance, or to the intermediate zone, or to the interior; whether he was an officer, a member of one of the allied armies, a Musselman (important because no wine could be taken by such

*Read before the Philadelphia Academy of Surgery, May 5, 1919.

patients), etc.; as well as *treatment required during transport* (diet, *i.e.,* regular, special, or liquid); whether or not *catheretization* was required; the *date of the last dressing* of the wound, and the date when it should be dressed next; and finally the special service to which the patient was to be assigned on arrival at the rear. Most of these facts could be indicated by underscoring or striking out with a colored pencil.

Inside the pochette, on arrival at the operating room, was a slip of paper on which the radiologist had recorded the results of his fluoroscopic examinations. These radioscopic diagnoses were models of accuracy and neatness, considering the great speed with which the examinations had to be made.

For the space of one minute or thereabouts, intervening between the time the surgeon could turn his attention from the last patient to the patient next in order, opportunity was afforded to scan the summary diagnosis on the outside of the envelope, and to read the radiologist's diagnosis. Toward the conclusion of each operation the surgeon would then dictate in French (or, if an American surgeon, then in patois), what was to be recorded for the information of the surgeon into whose care the patient should come at his next station. This dictation, taken down by a clerk (or in emergency written by the surgeon himself, or by any of his staff who understood French), was written on another scrap of paper (paper was valuable and scarce); this also was placed in the *pochette,* and accompanied the patient to his permanent hospital, where "fair copies" could be made of all the scraps of paper which had accumulated on the journey. When time permitted, this fair copy was made in the office of the autochir, in manuscript, on the "Billet d'Hôpital à Coupons" (a folded form on which the Field Medical Card of the United States Army is modelled), and this also was placed in the *pochette,* and was signed by the "Médecin Traitant" or Ward Surgeon.

The French surgeons made a habit of keeping for their private records a copy of their dictation, and needless to say this habit also was gladly adopted by the American teams working with the French. A small notebook, carried in the pocket, furnished all the scraps of paper required; alternate pages were written on, and the intervening carbon copies were torn out and placed in the *pochette.* It is true that the Médecin-Chef had occasion once to complain that the carbon copies placed in the pochette were "presque illegibles," but it is believed this applied to copies furnished by one of the French teams, at a time when the supply of carbon paper had been nearly exhausted.

The points to be recorded on these scraps of paper were the following, and in the following order, as near as might be: The formation where the operation was done, the patient's name, rank, etc., the date and hour of injury, the date and hour of operation, the summary diagnosis, including the nature of the missile; the X-ray report (this was always repeated in condensed form under the description of the operation, in addition to the original report furnished by the radiologist); a concise account of the operation and the condition of the wounded parts; the dressing of the wound;

whether the patient was to be evacuated at once or to be held for further observation; and the means of his evacuation (*i.e.,* by hospital train, by motor ambulance to the nearest hospital centre; or, if a trivial injury, to the centre near the front where such patients were sent for recuperation before immediate return to the lines); and, at the end, the operator's name.

The autochir with which we were longest associated (Ambulance Chirurgicale Automobile No. 6, of which the Médecin-Chef was M. le Professeur Agrégé J. Guyot, of the University of Bordeaux) was situated in the outskirts of a village called Crève-Coeur-le-Grand, in Picardy, in back of Montdidier (and Cantigny), south of Amiens, and about 20 kilometres north of Beauvais, the nearest large town, which before the war had a population of about 20,000. The slightly wounded ("minima") were evacuated usually to Songeons, a town toward the west, in the intermediate zone ("Zone des Étapes"); but if the railroad happened to be cut by the German bombing expeditions, they were sent to Grandvilliers, nearer at hand; the severely wounded, including almost all the fractures, were sent by ambulance to Beauvais, which was a large hospital centre, and a flourishing one until the German bombing expeditions made life there, even in hospitals, rather precarious; while those patients who could travel to the interior of France were taken by ambulance to the H. O. E.[1] (Evacuation Hospital) about a kilo and a half distant on the Froissy road, and were there loaded on the Train Sanitaire.

Appended are a few typical records in Americanized French, from our service at Autochir 6, and some corresponding records, in Gallicized English from our service at Evacuation Hospital 6, U. S. A. (Souilly, south of Verdun). Explanations of the abbreviations are given in tabular form, for convenience of reference.

The United States Army did well to copy their Field Envelope and their Field Medical Card from the French; but in one essential point the American surgeons were inferior to the French in training: they did not know, and they had not been taught the important points which should be recorded. And the Field Medical Card was faulty in that it did not contain any place for recording the *hour of injury*. Space was provided for recording the hour *first aid* was given, but it is of no use to know the time of this unless it is known how long a period elapsed between injury and first aid. Moreover, experience has shown that "first aid" was very much less important as a factor in preventing infection of the wound than the first operation—excision, debridement, and extraction; and in the future it is the hour of injury, rather than that of first aid, which should be carefully recorded. The patient almost

[1] The formula H. O. E. is derived from the term Hôpital d' Evacuation, which in the early days of the war was abbreviated as Ho. E., and by the corruption of sign painters subsequently degenerated into H. O. E. At least this is the explanation given by the French themselves.

always knows approximately the hour of his injury, even though he may not know the day of the week or month, and these latter can be supplied by the surgeon. The American Field Medical Card is also troublesome because too long to fit snugly in the Field Envelope; and, being made of cardboard, it is impossible for the surgeon to take a carbon copy from it, if he makes his record directly upon it, as was evidently the intention, and as was the practice as long as the supply of Field Medical Cards lasted.

The habit of the American army in recording all war wounds as "gunshot wounds" (G. S. W.), is another stumbling block to an accurate and terse statement of facts, unless it be considered of extreme importance (which it is not) to distinguish between these and the almost unknown bayonet or sabre wounds. The important point for record is the *nature of the missile,* and especially whether it was a shell fragment or a ball; the difference between a wound by a rifle ball and a machine gun bullet is negligible, except for medico-legal investigations, but the difference between a wound by a shell fragment and any kind of a bullet may mean the difference between gas gangrene and rapid healing, and this fact (nature of the missile) should always be recorded. Likewise the difference between wounds by shell fragments, grenade fragments, and fragments from aeroplane bombs, is negligible, except in a sentimental or historical sense. The habit of marking all these wounds merely as g. s. w. makes the surgeon in too many cases feel he is absolved from any further record. It is more satisfactory in every way, for the clinical history of the case, if the injury is recorded as "wound by ball" or "wound by shell fragment." It is worth while to note that wounds by "shrapnel" are quite rare, and that the term is carelessly and erroneously used as equivalent to shell fragment. It is also important to distinguish in the record between penetrating and perforating wounds: in the former the missile has lodged, in the latter it has passed all the way through. After this initial formula "Wound by shell fragment penetrating right thigh" or "Wound by ball perforating left forearm," should appear, in the summary diagnosis, the main complication, as "with fracture of femur, middle third," or "with section of ulnar nerve and artery above wrist."

Next should come a statement of the positions of the wounds of entrance and of exit, if the latter exist. If either wound is abnormally large and ragged it should be so stated. A concise and abbreviated description of the operation follows: In most cases it is sufficient to state "excision, débridement, extraction," as these terms denote definite and well-recognized procedures. If the foreign body is not found, this fact should be noted; or if it was so small as to be negligible and was not searched for, it should be so stated. If counterincision is made to facilitate extraction of the missile, or for the purposes of drainage, the fact should be noted. If arteries have been sectioned, the fact that they have been ligated should be a part of the history; or if a nerve has been injured its condition (contused, or sectioned) and the treatment adopted should be indicated. In cases of fracture the treat-

ment of the fragments should be recorded, especially whether or not fragments have been removed, and the extent of the esquillectomy (large, medium, or parsimonious). The antiseptic employed also should be noted. It is sufficient to record it very summarily—as iodin, Dakin, Mencière. The method of drainage (tube or wick), the dressings and splints should form a part of the record.

Now to get all these facts in the record requires not only systematic dictation, but it requires a clerk with a reasonable knowledge of surgical terms, a good general education, and above all a good handwriting, and speed and accuracy. It is important to get through with as many operations hourly as is humanly possible. To demand this clerical work of the anæsthetist or of one of the surgical team needlessly delays the commencement of the next operation. The French reckoned that the utmost speed conceivable would not permit the surgeons to average more than four patients in an hour, and they were quite well satisfied when a speed of three hourly was maintained. This requires not only that the patients be supplied to the operating room at that speed (which demands machine-like working of the triage, the preparation rooms, the sterilizing plant, and the fluoroscopic examinations), but it requires also that the patients leave the operating room at the same speed. While we were with the French it was possible at most times to maintain this average (three patients an hour, or about 24 patients in the eight-hour period of operating), with the aid of the clerks they supplied and the wonderful coördination maintained in the accessory services mentioned above. But with the American army we never could average more than two patients hourly except for very short periods at a time.

I would recommend, therefore, that before the next war the following modifications of the methods now in use of recording surgical operations at the front be adopted:

1. A field card of thin, tough, non-bibulous paper, of a size to fit easily inside the field envelope.

2. A space on the field card for recording the time of injury.

3. The records to be made in indelible pencil, and the surgeon encouraged to keep for his personal use a carbon copy of the records.

4. The abolition of the cumbersome term "gunshot wound" and the substitution for it of the term "wound by shell fragment (or ball, or grenade fragment, or shrapnel, or airplane bomb, etc.)."

5. The adoption of the French terms "Orifice of Entry" and "Orifice of Sortie," abbreviated as O. E. and O. S., as more terse than "Wound of Entrance" and "Wound of Exit" which cannot be so intelligibly abbreviated.

6. The provision of trained clerks for recording the surgeon's dictation. These clerks could be trained under the auspices of the Red Cross and would prove a valuable addition to the surgical teams for work in the advanced area.

EXAMPLES OF OPERATIONS RECORDED IN FRENCH

A.C.A.6.
Peruy, Charles, Cpl. 49 Inf., Cie. 3
Bl. 8. 6. 18, 12 h.
Op. 8. 6. 18, 1/2 h.
Plaies multiples par E. O.
Radiog.: Bras g.: petit éclat superf., face ext.
Main g.: plusieurs tres petites éclats.
Cuisse g.: éclat face int. du femur niveau trochanter minor.
Region lombaire et pied g., neg.
1. Excis. et débrid. d'un plaie region lombaire g., hematome; projectile non trouvé; excision d'un bouillie des muscles lombaires. Mèches iode.
2. Débrid. O. E. niveau troch. major face post. Fracture découpée de la troch. minor. Extraction d'un projectile tranchant. Drain et mèches iode.
3. Débr. O.E. et S. region malleolaire post. g. Trajet a passé en avant du tendon d'Achille et il y a section de l'artere et veins tib. post. Ligatures. Nerf intact. Mèches de part en part, iode.
4. Débr. et extr. d'un projectile de la muscle triceps au dessus du condyle ext. de l'humerus g. Mèch iode.
5. Nettoyage de la main.
A Garder.

A. C. A. 6.
Hoffman, Carl, Soldat, 1e. Eng., U. S. Army.
Bl. 28. 4. 18, 12 h.
Op. 29. 4. 18, 17 h.
Plaie penetrante epaule gauche par E. O. O. E. 2.5 cm. en avant de l'acromion.
Radio: Petit projectile (grosse tête d'epingle) repère à 3 cm. de profondeur (bras le long du corps). Ce projectile se profile entre l'acromion et la tête humerale, au contact de la tête, probablement intra-articulaire.
Incision, extraction du projectile sous l'ecran, logé dans la capsule au dehors du tendon bicipitale. Suture des muscles et de la peau.
Evacuer, T. S. Crèvecoeur.

A. C. A. 6.
Naouar, Oub Abder Kader, 2e. Cl., 7e Tir.
Bl. 26. 4. 18
Op. 27. 4. 18, 22 h.
Plaie perforante cuisse gauche par balle, entré en avant, sortie posterieure en dehors du femur.
Débridement, excision large. Drain de part en part. Mencière.
Plaie en seton region lombaire gauche.
Débr., excis., Mencière.
A Garder.

A. C. A. 6.
Hains, Theodor, 34e. Inf. Allemand.
Bl. 9. 6. 18, à nuit
Op. 13. 6. 18, 14 1/2 h.
Plaies penetrantes, crâne, épaule et bras g., par E. O. Les plaies de la tête et du creux axillaire g. sont infestées par des vers.
1. Plaie pen, pli post. de l'aiselle g. Exc., débr., extr., du projectile par contreouverture au pli anterieur de d'aiselle. Drain de part en part.

2. Seton du bras g. Excis. Mèche de part en part.

3. Grande plaie du cuir chevalu, region parietale gauche. Excision, extraction du projectile fixé dans le crâne. Autoplastie du cuir chevalu.

4. Éclatement oeil g. Enucleation et esq., fracture orbitale.

5. Plusieurs plaies superficielles de la face g., excision et sutures.

A Garder.

EXAMPLES OF OPERATIONS RECORDED IN ENGLISH

E. H. 6.
Switzer, Joseph, 61st Inf., Co. C.
Wd. 10. 12. 18, 6 h.
Op. 10. 12. 18, 19 h.

Wd. by ball entering outer face l. thigh, leaving inner face l. thigh, middle 1/3, traversing penis with rupture of corpus cavernosum and laceration of foreskin, then causing tangential wd. r. thigh.

X-ray neg.

Op. ether. Nett. of wds. Suture of penis. Iodin.

Evacuate.

E. H. 6.
Ricotte, Antonio, 61st Inf., Co. F.
Wd. 10. 16. 18, 18 h.
Op. 10. 17. 18, 17¼ h.

Wd. by S. F. perforating face and skull, with F. C. C. rt. mastoid region. Patient has been in shock ward since admission. Has cerebral symptoms, some rigidity of neck. Rt. eye marked exophthalmos. Punctured wd. to left of root nose. Brain oozing from external auditory meatus. Missile probably entered at nose and made its exit through mastoid. X-ray neg.

Op. Ether. Excision of scalp wd., of prolapsed brain, and of all depressed and soiled fragments of bone. Complete closure of scalp by autoplasty. Iodin.

Hold.

E. H. 6.
Carden, Stanley, 316th Inf., Co. C.
Wd. 10. 11. 18, 13 h.
Op. 10. 13. 18, 2h.

Wd. by S. F. penetrating rt. buttock.

X-ray, buttock: F. B. 20x15 mm., 70 mm. deep.

Op., ether. Debr. and extr. from beneath sciatic nerve. Persistent bleeding from branch of gluteal artery controlled with great difficulty by suture and ligature. Tube. Iodin.

Evacuate.

E. H. 6.
Clavridge, Gilford, 39th Inf., Co. K.
Wd. 10. 10. 18, 6 h.
Op. 10. 10. 18, 21 h.

1. Wd. by S. F. perforating rt. leg, with fracture of tibia and fibula.
2. Wd. by S. F. penetrating calf rt. leg.
3. Wd. by S. F. tangential, left calf, lower 1/3.

X-ray: fracture of leg, F. B. 10x15 mm., 40 mm. deep.

Op., ether: 1) O. E. ant. face middle 1/3. O. S. through Tendo Achillis. Debr., Esq. parc. 2) Extr. of S. F. from wd. of calf. Cabot splint by Lt. Moore. 3) Nettoyage.

Nom — Prènoms — Grade — Corps, Compagnie, etc.

Diagnostic sommaire

Ci-dessous, souligner au crayon de couleur les mentions utiles

Blessé le.....

Injections antitétan.: 1re (faite le..... / à faire.....) 2e (faite le..... / à faire.....)

Transportable: assis (courte distance / zone des étapes / interieur) couchè (courte distance / zone des étapes / interieur)

Catèg. speciales: Officier / Allié / Musulman / Indigène / Ennemi

(Opération importante)

.....faite le.....

Soins à donner en cours de route

Règime.....

à sonder

Pansement: faite le.... / à faire le..

Services Destinataires:
A.—Chirurgie générale: *grands blessés ou soins op.*
B.—Chirurgie générale: *petits blessés ou soins non op.*
C.—Chir. spéc. *Maxillo-faciale.*
D.—Chir. spéc. *Urinaire.*
E.—Chir. spéc. *Orthopédie.*
F.—Chir. spéc. *Syst. nerveux.*
G.—Chir. spéc. *Oʼhth lmologie.*
H.—Chir. spéc. Oto. rhino-lar.
I.—*Prothèse dentaire.*
K.—*Physio* ou *Mécanotherapie.*
L.—*Médecine générale.*
M.—Méd. spéc. *contagiou*
N.—Méd. spéc. *Vénériens*
O.—Méd. spéc. *Aff. cut.*
P.—Méd. spéc. *Psychiat.*
R.—Méd. spéc. *Aff. nerv*
S.—*Hôpital sanitaire.*
T.—*Convalescents.*
Z.—*Eclopés* ou petits malades (zones des étapes)

FIG. 1.—The "Pochette" or French Field Medical Card.

Name .....
Rank .....Unit .....

CAN WALK — SLIGHT
Litter Case — SEVERE
(Strike out words not applicable)

DIAGNOSIS (briefly)

(Special attention needed in transit)

Ambulance Label
Ambulance Train (Motor) No. .....
Date .....Hour .....
Destination .....
Arrival, Date .....Hour .....

Hospital Train Label
Hospital Train No. .....
Date .....Hour .....
Destination .....
Arrival, Date .....Hour .....

NOTE.—To be SECURELY tied on patient's clothing over breast. To contain field medical records, and other papers relative to patient.

FIG. 2.—Face of U. S. Field Envelope.

APPROVED ABBREVIATIONS

Morphia	M.
Anti-Tetanic Serum	A.T.S.
Gunshot Wound	G.S.W.
Fracture, Simple	F.S.
Fracture, Compound	F.C.
Fracture, Compound, Comminuted	F.C.C.
Not yet diagnosed or Undetermined	N.Y.D.
Fever of Unknown Origin	F.U.O.
Disordered Action of Heart	D.A.H.
Slight	O.
Severe	S.

FIELD MEDICAL CARD

Name .....
(Block letters)
Rank .....No. .....
Regiment or Staff Corps .....Co....

Sick Wounded
Line of Duty—Yes or No
(Strike out descriptions which do not apply)

Field Hosp. No. .... Evac. Hosp. No. ....
Dressing Station No... Camp Hosp. No...
Date of Admission .....
Morphia
Dose and Time
A. T. Serum
Dose and Date
Diagnosis

Base Hospital No. .....
Diagnosis (if altered from above)

Base Hospital No. .....
Diagnosis (if altered from above)

FIG. 3.—Outside of U. S. Army "Field Medical Card" (adopted from the French "Billet d'Hôpital de Coupons") to be folded in three and carried in Field Envelope.

Date of entry and medical unit receiving patient must be recorded immediately on admission and signed by M. O.

Brief Clinical Notes

Field Evacuation Camp Hospital No.....
Date of Entry .....

Base Hospital No. .....Base Hospital No. .....
Date of Entry .....Date of Entry .....

This card must accompany the patient, attached to his clothing. It must not be destroyed. It will be transmitted with the patient if he is evacuated to the U. S. Temperature charts or additional clinical notes may be sent with this card in the same envelope.

FIG. 4.—Reverse of U. S. Army Field Medical Card.

ABBREVIATIONS OF FRENCH TERMS

A.C.A. = Ambulance Chirurgicale Automobile ("Autochir")
Abs. = Abstention (no operation done)
Bl. = Blessé (wounded)
Debr. = Debridement

E.O. = Eclat d'Obus (shell fragment)
Esq. = Esquillectomie (removal of bone fragments, as distinguished from sequestrotomy, which is removal of sequestra)
Ev. = Evacuer (to evacuate)
Exc. = Excision
Extr. = Extraction
H.O.E. = Hopital d'Evacuation
Nett. = Nettoyage (mechanical cleansing)
O.E. = Orifice d'Entrée (wound of entrance)
O.S. = Orifice de Sortie (wound of exit)
Seton = Superficial perforating wound, not extending beneath deep fascia
T.S. = Train Sanitaire (hospital train)

ABBREVIATIONS OF ENGLISH TERMS, INCLUDING THOSE RECOMMENDED FOR ADOPTION FROM THE FRENCH

Abs. = Abstention, *i.e.*, examined, and no operation deemed advisable
Debr. = Debridement, wide opening of wound to make all parts easily accessible
A.T.S. = Antitetanic serum
Esq. = Esquillectomy, removal of bone fragments
Ev. = Evacuate
Exc. = Excision
Extr. = Extraction
F.S. = Fracture, simple
F.C.C. = Fracture, compound, comminuted
M. = Morphin
Nett. = Nettoyage, mechanical cleansing
O.E. = Orifice of entry
O.S. = Orifice of sortie
S.F. = Shell fragment
Ball = Machine-gun or rifle bullet

STATED MEETING, HELD OCTOBER 6, 1919

The President, Dr. George C. Ross, in the chair

ADVANCED CARCINOMA OF BREAST; NO RECURRENCE SEVEN YEARS AFTER OPERATION

Dr. Astley P. C. Ashhurst presented this patient as an encouragement toward doing thorough and wide-spread excisions for carcinoma. If in such a case as the present cure can be obtained by such means, how much more certainly should cure be anticipated if the same type of radical operation were uniformly adopted in early cases? He added that he had had occasion recently to operate on a case of wide-spread local recurrence in a case of carcinoma of the breast, one year after another surgeon had done a very incomplete operation, although the clinical diagnosis had been carcinoma from the first. This fact seemed to indicate that some surgeons were still so skeptical of cure ever being attained that they considered it not worth their while to expend the time and skill necessary for a complete extirpation. In the case of recurrence to which reference had just been made, the surgeon at the first operation not only did not excise the pectoral muscles, but he did not expose the axilla at all, nor did he even remove all the glandular tissue of the breast; yet the clinical diagnosis, confirmed by histological study, had been carcinoma from the first! He desired also to make a plea for habitual röntgenization of carcinoma patients after operation. In the case of the patient now presented, post-operative röntgen therapy was continued a long time.

The patient, a woman, forty-five years of age, was admitted to the Episcopal Hospital, August 3, 1912. There was a typical "rose ulcer" 7.5 by 5 cm. in diameter in the upper outer quadrant of the right breast. This ulcer had commenced six months previously, and for two years before that time the woman had known she had a tumor in her breast. When examined there was a hard tumor, the size of a goose egg, beneath the ulcer. This tumor was freely movable in all directions. There was a palpable and visible mass of lymphatics in the axilla, which also was movable. The ulcer was covered with an adherent gray slough. No lymph-nodes were palpable above the clavicle. There was tenderness over the liver, but no evidence of metastasis to this organ. The left breast was normal.

Operation, under ether anæsthesia, was done August 5, 1912, including a clean dissection of the entire axilla, and removal of its contents, both pectoral muscles, and a wide area of superficial and deep fascia (beyond mid-line at sternum, and down almost to umbilicus) in one mass. It was possible to close all the wound except for a space 5 by 2.5 cm. below the clavicle. The time of the operation was three and one-half hours, and

at its conclusion the patient received one litre of saline solution intravenously, being almost pulseless. (The excised specimen is illustrated in Plates V and VI of the speaker's text-book of surgery.)

By the second day after operation convalescence was established. Many of the sutures did not hold, some of the skin edges became necrotic, and six weeks after operation there was a clean granulating area the size of two palms. On September 30, this had contracted to an area the size of one palm, and this was covered with Thiersch grafts. Meanwhile röntgen ray treatment was pursued for a number of months.

The patient was kept under observation:

March, 1914: Her health was feeble, and she could not do much work. There was still an unhealed area, 2 cm. in diameter, which scabbed over from time to time. There was no swelling of hand or forearm, and only slight œdema of the upper arm; but the œdema increased if the arm was used much. She could get her hand to her head and back to her buttocks, but both motions were weak, and the latter painful. The extensive cicatrix sometimes caused a sticking pain in her lung, but there was no evidence of pulmonary metastasis.

August, 1915: Condition about the same.

September 24, 1919: Since the last note the patient's general condition has markedly improved. She does her own housework and looks after an epileptic son. The entire right anterior thorax is covered by skin tightly adherent to the ribs, but there is no evidence of recurrence locally or of metastasis. She has good use of her arm, raising her hand easily above her head, and putting it without difficulty to the small of her back. Except for slight weakness she thinks it as useful as her left arm. There is scarcely appreciable swelling of the hand and none of the forearm or arm. During the past year her appendix was removed at the Philadelphia General Hospital.

Dr. D. B. Pfeiffer called attention to the picture circulated by Doctor Ashhurst in which the outline of the tumor is very sharply defined from the surrounding fat and breast parenchyma. If this is a fair representation of the growth it would indicate a rather different type of tumor pathologically from the kind that are ordinarily met with. It is well known that tumors which well merit the name of carcinoma still show the most remarkable variations in character, and particularly in the most important characteristics of infiltration and spread. He had seen many cases in which there was a comparatively huge primary mass and but little spread and *per contra* others that produced large and early metastasis from an insignificant appearing primary growth. He recalled one case with axillary metastasis so extensive as to defy complete removal, which required the most minute search through the breast before the primary growth could be found. It seemed to him—without wishing to detract from Doctor Ashhurst's excellent result—that the underlying pathology is more influential in the result than the completeness of the

operation, for has it not been the lot of all surgeons to operate in earlier and seemingly more favorable cases only to find that they have not been able to get beyond the carcinomatous permeation? Of course, he believed, as does every one, that radical operation for carcinoma of the breast should be as extensive as possible, and this case teaches that we should not lightly consider any case as inoperable. It will be more unfortunate, however, if any should consider that by punctilious completeness of operation the handicap of late surgery could be overcome.

Dr. J. Stewart Rodman recalled two cases in which his father operated. One was a sloughing tumor and the patient when last heard from was well eleven years after operation. The other was one of a growth of each breast. This patient was well eight years after the first operation and seven years after the second. Undoubtedly cures do occur even in these advanced cases if the operation is carefully and thoroughly done.

Dr. John B. Roberts recalled one case of malignant tumor of the breast which he removed about 1899, in which the woman died about three years ago, making the period of cure somewhere about seventeen years. The tumor was not a sloughing growth, but was quite as big as a woman's fist. He did a thorough operation, removing the glands in the axilla and he thought above the clavicle. He did not remember whether the tumor was examined microscopically, but clinically it had every appearance of being a large malignant growth. The patient was about sixty to sixty-five years old.

Dr. J. Leon Herman said that a tabulated list of the reported instances of late recurrence of carcinoma after radical amputation of the breast is given by Doctors Deaver, McFarland and himself in their book on "Diseases of the Breast." A period of thirty years was the longest interval of time intervening between the time of operation and the reappearance of the cancer. There were, of course, all varieties of carcinoma included in this series.

The excellent result obtained by Doctor Ashhurst in this case illustrates the possibility of cure in mammary cancer by radical operation, even though the local appearance of the tumor indicates an advanced state of the disease.

It is of interest to recall that Doctor Halsted devised the radical operation and advised its routine employment with the knowledge that Volkmann and others had obtained far better results in advanced cases by removal of the pectoral muscles, together with the breast, than had been obtained in early cases by simple amputation of the diseased breast.

Doctor Ashhurst, closing, said that he had no doubt that the malignancy of different specimens of cancer varies a great deal. He thought also that diminished lymphatic activity is to be taken into consideration. In patients nearly eighty years old it seems useless to do an extensive operation. If we merely amputate the breast there is not likely to be subsequent trouble. But it ought to be remembered how far the mammary

gland extends beyond that which one sees. If one thinks the glandular tissue occupies a very small area, he shall be deceived: it extends nearly up to the clavicle, out into the axilla, and down toward the epigastrium. The entire mammary gland should be removed even in these incomplete operations on *very aged* patients.

HYSTERECTOMY FOR CHORIO-EPITHELIOMA; NO RECURRENCE SIX YEARS AFTER OPERATION

Doctor Ashhurst said that the two following cases were presented especially to emphasize the value of certain *measures of routine:*

1. Pathological examination of uterine scrapings in cases of abortion or miscarriage.

2. Removal of the cervix along with the uterus in abdominal hysterectomy. In 3 out of the last 17 hysterectomies he had done for fibroids there had been coincident carcinoma of the cervix.

Chorio-epithelioma, or deciduoma malignum (Sänger, 1888), is an exceedingly malignant tumor growing in the body of the uterus after pregnancy. The pregnancy frequently is terminated before term, and the most favorable cases are those in which the diagnosis is made by the pathologist from examination of retained tissues removed in such cases. Such examination never should be neglected. The tumor probably arises from the chorionic and not from the decidual tissues; it behaves like the most malignant types of sarcoma, giving early venous metastasis, especially to the lungs (78 per cent.) and vagina (54 per cent.), according to Dorland.

Agnes H., forty-two years of age, was admitted to the Episcopal Hospital August 9, 1913, for a recent abortion after a few weeks' pregnancy. The uterus was curetted, and the scrapings sent to the laboratory for examination, as a matter of routine. The pathological report (Dr. C. Y. White) showing a chorio-epithelioma, abdominal panhysterectomy was done August 19, 1913. The appendix vermiformis, and left tube and ovary, the latter being cystic, were removed with the uterus, but the right tube and ovary were left. The uterus was slightly enlarged, and when opened, a papillomatous tumor was found at the fundus. (The specimen is illustrated in Fig. 1031 of the speaker's text-book of surgery.)

The patient has been kept under observation since operation, and is still in excellent health. Examination in August, 1919, six years after operation, disclosed no evidence of recurrence or metastasis. She was forty-eight years of age, and for the last year had complained of symptoms of the menopause.

Panhysterectomy for Fibroids; Carcinoma of the Cervix Discovered in the Laboratory; No Recurrence Three Years After Operation

Cora L., thirty-six years of age, negress, was admitted to the Episcopal Hospital September 18, 1916, for profuse metrorrhagia. This was

checked in the Receiving Ward by twisting on its pedicle a polyp which was protruding from the cervix. The patient's hæmoglobin was only 25 per cent. On September 22, because slight fever persisted, she was etherized, the soft and dilated cervix was caught in volsellum forceps, drawn down to the vulva, and the pedicle of the polyp, about 0.75 cm. in diameter and 6 cm. long, attached just above the cervix, was divided with scissors. The polyp itself was about 6 cm. in diameter. Very moderate bleeding occurred from the attachment of the polyp. The uterus was the seat of numerous fibroids.

October 6, 1916, two weeks after removal of the polyp, the patient's fever having subsided, and her hæmoglobin having risen to 35 per cent., the abdomen was opened, and complete panhysterectomy was done (*i.e.*, the uterus including the cervix and both tubes and ovaries were removed). The uterus was of medium size, containing several subperitoneal fibroids the size of hen's eggs or larger. Recovery was uneventful.

The laboratory report (Dr. C. Y. White) was that the cervix was the seat of *advanced epithelioma.*

The patient has been kept under observation and now, three years after operation, pelvic examination discloses no symptoms of recurrence, nor is there any evidence of metastasis.

GUNSHOT WOUNDS OF THE VASCULAR SYSTEM

Dr. Astley P. C. Ashhurst reported the following cases:

Case I.—*Dry lesion of axillary artery from bullet wound; death ten hours after ligation.*

Tony P., twenty-six years of age, was admitted to the Episcopal Hospital December 31, 1916, immediately after having been shot, while an innocent bystander in a street fight. The wound of entrance was at the posterior edge of the right deltoid, close to its humeral insertion, and there was no wound of exit. X-rays localized the bullet lodged against the second right rib. His radial pulse was equal on both sides, and apart from slight pain and swelling in the axilla, there were no serious symptoms. On the day after admission, however, weakness of the muscles supplied by the median nerve and paralysis of those supplied by the musculospiral nerve were noted. It was determined to explore the axilla to ascertain the nature of the nerve lesions.

Operation, January 5, 1917, by Doctor Ashhurst. Ether anæsthesia. An incision was made from the middle of the clavicle downward and outward, in the space between the deltoid and pectoralis major, exposing the pectoralis minor. A finger was then passed under the latter muscle, preparatory to its division, for exposure of the axillary plexus. As soon as the finger emerged at the lower border of the pectoralis minor a gush of arterial blood burst through at both borders of the muscle. It was evident that the bullet had injured the axillary artery and the primary bleeding had been

checked by a clot, or that a slough in the wall of the artery had been separated only when the finger entered the axilla. The profuse hemorrhage was checked temporarily by the operator compressing the axillary artery with his left finger just below the clavicle, and with his right finger below the pectoralis minor. Removal of either finger released a perfect flood of arterial blood. Doctor Spruance, who was assisting in the operation, was then intrusted with digital control of the distal end of the artery, thus releasing the operator's right hand. Attempts were then made to clamp the artery above the lesion, but these proved ineffectual, owing to the depth of the wound and the inability to distinguish the structures. Doctor Spruance then compressed the subclavian against the first rib, controlling hemorrhage from the proximal end of the axillary, while the operator compressed the distal end and tried to clamp it; this also proved ineffectual at first, it being impossible to clamp the artery without pinching one or other of the nerve trunks; but finally the clamp was properly placed and the distal end ceased to bleed. Doctor Spruance then compressed the axillary just below the clavicle, while Doctor Ashhurst ligated (with a double strand of No. 2 chromic catgut) the third portion of the subclavian by the usual incision above the clavicle. This at once stopped the pulse at the wrist. After suturing the cervical incision, the axillary wound was again exposed and found to be dry. The axillary incision was then enlarged, dividing the tendons of the pectoralis major and minor. Removal of the hæmostats still in the axillary wound then was begun; removal of the last hæmostat was again followed by profuse hemorrhage which was not controlled by digital compression of the axillary below the bleeding point. It was now found that this profuse hemorrhage came as recurrent bleeding from the subscapular artery, there being a bullet hole in the axillary just opposite the origin of this artery (Fig. 1). Therefore the axillary artery was tied above and below the hole, and the subscapular artery was tied also. The axillary plexus of nerves was then examined: the median nerve had been bruised by hæmostats; the musculospiral nerve was contused, presumably by the bullet; the ulnar and musculocutaneous nerves were undamaged. The divided muscles were repaired and the wound closed. The patient was in a precarious condition as the result of hemorrhage, and died ten hours after operation, in spite of stimulation. It is possible that blood transfusion might have saved his life, but no donor was available.

Case II.—*Recent bullet wound of right axillary artery, with diffuse traumatic aneurism; ligation of first portion of subclavian artery and of axillary artery above and below the wound. Recovery.*

Charles W., a private of the 104th Infantry, U. S. A., was hit by a machine-gun bullet in the Argonne Forest November 9, 1918, at 4 A.M. He was brought to Evacuation Hospital No. 6 at Souilly, and operated on twenty hours later. Fluoroscopic examination by Captain Angell showed the bullet superficially placed in the right pectoral region. The wound of entrance was over the right shoulder pos-

teriorly. There was an immense pulsating hæmatoma occupying the entire right pectoral region, which was discolored by the extravasated blood. The bullet was palpable just beneath the skin, and the hæmatoma appeared on the point of rupture. There was no pulse at the right wrist.

Under ether anæsthesia, immediate operation was undertaken, with the skillful assistance of Captain Morse and Lieut. H. S. Kerchner. It was determined to do preliminary ligation of the first portion of the subclavian, as the immense size of the hæmatoma rendered the third portion inaccessible through healthy tissues, and then to expose the axillary artery where wounded. Accordingly an incision was made along the inner end of the right clavicle and downward for 7 cm. over the sternum, and the inner end of the clavicle (2.5 cm.) was resected. The pleura was accidentally punctured. The first portion of the subclavian artery was then exposed, and the pneumogastric nerve and its recurrent laryngeal branch were identified. Owing to the large size of the hæmatoma, these structures lay at an abnormal depth. A ligature of No. 2 chromic catgut was passed around the artery distal to the nerve (Fig. 2). On tying this ligature pulsation in the hæmatoma stopped at once, and the mass decreased in size. The operative incision was closed in layers, without drainage. A second incision was now made in the line of the axillary artery from the clavicle to the anterior axillary fold, dividing the pectoralis major and minor muscles. The bullet was removed from beneath the skin, and the clots evacuated. Free arterial bleeding then occurred from the proximal end of the axillary artery just distal to the clavicle, evidently recurrent through the thyroid axis and other branches of the subclavian distal to the ligature. This bleeding was checked by the finger and then by hæmostatic forceps, when it was seen that the bullet had clearly and completely divided the first portion of the axillary artery, without injuring the vein (Fig. 3). Both ends of the artery were ligated with No. 2 chromic gut and the wound was left wide open, and drained by rubber tissue. It was directed that the patient be not evacuated.

The next day the patient's hand was warm, and the circulation appeared to be reëstablished. He could flex his fingers, and the axillary plexus of nerves apparently had escaped injury. He has been very hoarse since the operation, perhaps from operative injury of the recurrent laryngeal nerve. The wounds were dressed: the sternal wound was healthy, but the pectoral wound smelled of gas gangrene, and a smear showed the presence of the B. aërogenes capsulatus. It is to be remembered that the tissues in the axilla were widely lacerated by the escaping blood and had been under increasing pressure from the hæmatoma for twenty hours before operation, and after operation were still deprived of their normal blood supply. At the time of operation the patient's condition did not warrant an excision of all the muscles which were infiltrated with blood. French anti-gas gangrene serum was administered, and the wound was treated with Dakin's solution according to Carrel's technic.

On the third day the patient was still very hoarse, but the pectoral wound looked better, though the muscles were still very spongy. It was noted that he was unable to extend his fingers or wrist, but it was not determined whether this was due to weakness or to a nerve lesion.

Five days after operation the patient appeared convalescent; though he was still very hoarse, and had a little cough; the wound was doing very well.

Six days after operation he was evacuated in good condition: the sternal wound had remained clean, and the pectoral wound was doing well.

Inquiries from the War Department as to the patient's subsequent history have been unanswered.

CASE III.—*Direct arterio-venous fistula of the axillary vessels following wound by shell fragment. Excision of vein, suture of artery. Recovery.*

George W., private, 39th Infantry, U. S. A., sustained a penetrating wound by a shell fragment August 1, 1918, in France. The wound of entrance was in the left deltoid region. He was taken to a hospital and put to bed. No operation was done. He did well, presenting no noteworthy symptoms. After a few days he got out of bed, and soon began to work about the ward. One night (about 2 A.M.), eight or ten days after injury, he was awakened by pain in the left subclavicular region and down the left chest. Examination by the ward surgeon revealed a blowing murmur in the left subclavicular region. Previous examinations, he said, had shown a heart murmur, but nothing abnormal in the axillary region.

This patient first came under Doctor Ashhurst's notice seven months after his injury, in the Walter Reed General Hospital, Washington, D. C., where he was in the service of Major E. M. Jones, who asked Doctor Ashhurst to operate. The disability consisted in inability to raise the arm above the head, this motion being only two-thirds of normal. There was a buzzing and whirring on palpation below the left clavicle, but the radial pulse on the two limbs was equal and synchronous, and the blood-pressure was normal on both sides. Skiagraphic examination showed a shell fragment 3 cm. anterior to the vertebral end of the fourth left rib. This fragment, of medium size, was producing no symptoms and its removal was not indicated.

On March 27, 1919, with the skillful assistance of Major Jones and Lieut. J. C. Lawlor, Colonel Ashhurst operated under ether anæsthesia; as the site of the lesion evidently was high in the axilla, it was determined first to control the circulation by clamping the third portion of the subclavian artery, which was done through the classical incision. Next an incision was made, convex toward the greater tuberosity of the humerus, from the middle of the clavicle to the anterior axillary fold near the chest wall. After ligating the cephalic vein, the tendon of the pectoralis major was divided, and the axillary artery was clamped just proximal to the origin of the

subscapular artery. The tendon of the pectoralis minor was then cut, and the clavicular origin of the pectoralis major divided for about 3 cm. The lesion could then be identified, after dissection of scar tissue, as a direct arterio-venous fistula of the axillary vessels, involving the first portion of the axillary artery. The outside diameter of the fistula was about 1 cm. (Fig. 4). Artery clamps were now applied just proximal and just distal to the lesion, and the clamps which for about one hour had been on the subclavian and on the third portion of the axillary were removed. The axillary vein was carefully cleared, ligated above and below the lesion, cut across between the respective ligatures and the lesion, and dissected free as a pouch attached to the artery (Fig. 4). A grooved director passed across the venous pouch through the fistula into the lumen of the artery, demonstrated completely the nature of the lesion. Three interrupted sutures of fine linen were now passed through the arterial wall at the site of the fistulous opening, and were tied after cutting away the venous pouch from the artery. Then a continuous through-and-through linen suture was applied to the artery, and the arterial clamps were removed. There was absolutely no leakage from the suture line as the artery filled out and pulsated, but a branch of the acromio-thoracic artery below the lesion spurted actively and was tied. The pectoralis major (not the minor) and the skin were closed separately with chromic gut, a small tube being left at the lower angle of the large wound. The neck wound was closed without drainage. The duration of the operation was three hours.

Recovery was uneventful, no abnormal symptoms of any kind being observed, and function of the arm being gradually restored. The patient returned to his home and has recently been carefully examined by Dr. Lucian H. Landry of New Orleans, one of Doctor Matas's associates, who courteously wrote to me September 15, 1919, that after a careful examination he considered the result a complete cure.

Case IV.—*Circumscribed traumatic aneurism of sural artery following wound by shell fragment; obliterative endo-aneurismorrhaphy; recovery.*

Richard B., first lieutenant, twenty-four years of age, U. S. A., suffered a perforating wound of the right popliteal space by a minute shell fragment September 26, 1918. The punctured wounds of entry and exit healed without any operative treatment, but after some weeks, while walking, he felt a sudden sharp pain in the bend of the knee and a pulsating tumor appeared. He came under Doctor Ashhurst's notice, more than five months later, in March, 1919, at the Walter Reed General Hospital. Low in the right popliteal space was a tense, hard, not tender swelling, 7 by 5 cm., its long axis corresponding to that of the limb. This swelling exhibited distinct expansile pulsation and bruit. There was no appreciable difference in the pulse below the knee in either leg.

Operation was undertaken March 6, 1919. Under Esmarch anæs-

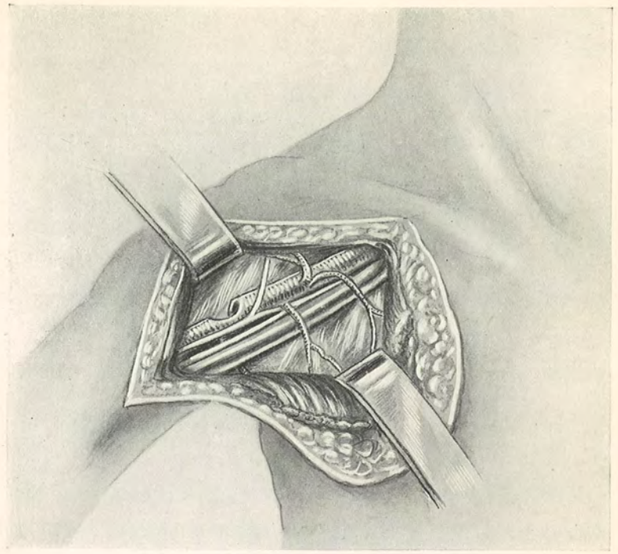

Fig. 1.

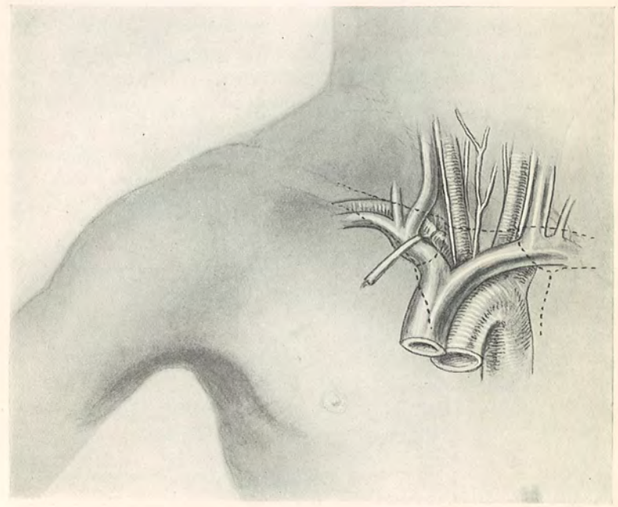

Fig. 2.

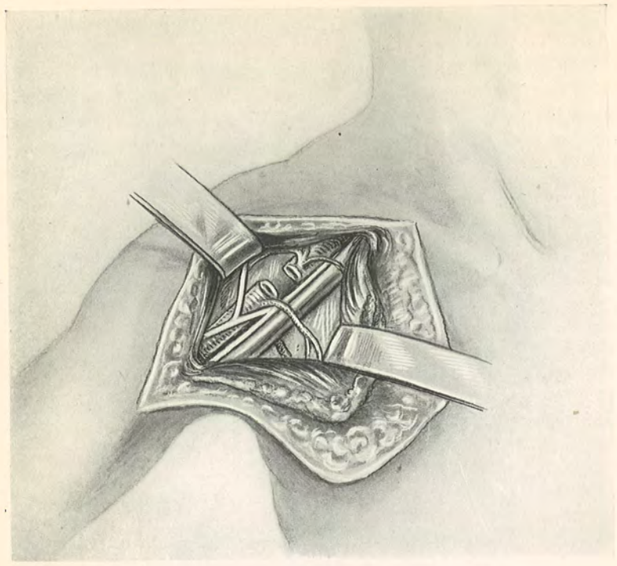

FIG. 3.

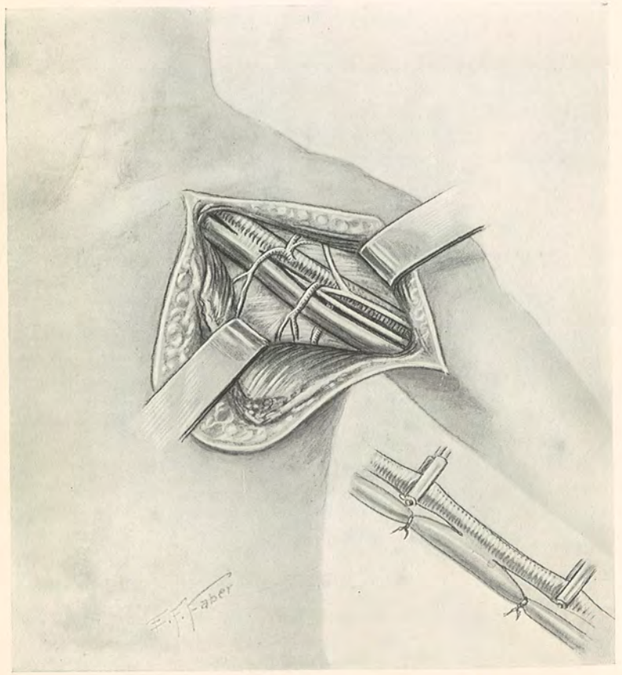

FIG. 4.

thesia a longitudinal incision, 16 cm. in length, was made over the popliteal space, and the deep fascia and heads of the gastrocnemius muscle, as well as the internal popliteal (posterior tibial) nerve, were dissected off the sac, all of these structures being densely adherent. The sac was opened on its median side, and some well organized clots were evacuated. The sac was found to be of the size of a large hen's egg: its walls were formed of organized granulation tissue, except for an area about 3 by 2 cm. on the median and anterior surfaces, which was white and glistening, representing the original intima of the wounded artery, now spread out to form part of the sac wall. This patch of typical intima contained two minute orifices—one proximal, the other distal—about 2.75 cm. apart, evidently representing the afferent and efferent channels for the blood. The proximal opening bled a little. There were no other openings in the sac. Most of the posterior wall of the sac was dissected free and excised; the arterial orifices were closed by linen sutures; and the remainder of the sac, which was too adherent to be excised easily, was obliterated by No. 000 chromic gut sutures. The fascia and skin were closed separately. The time of the operation was about one hour.

Recovery was uneventful, all the symptoms being relieved.

PERFORATING GUNSHOT WOUND OF THE ABDOMEN WITH INVOLVEMENT OF LIVER, KIDNEY AND SECONDARY INFECTION OF PLEURA

DR. JOHN H. JOPSON reported the following case: B. R., private, Company L, 61st Infantry, was admitted to Evacuation Hospital No. 1, A. E. F., on September 6, 1918, at 3.30 P.M., with the diagnosis of gunshot wound, perforating, of the right abdomen. He had been wounded at 5 A.M. of the same day. On admission he was suffering from the effects of hemorrhage and was in poor condition. He presented on examination a large wound, probably of entrance, below the lower border of the thorax, about the nipple line on the right side, and a wound somewhat larger at a corresponding point posteriorly. Preparations were made for immediate operation. To render this possible blood transfusion was necessary, and was started at the commencement of the operation. The anterior wound first received attention, and was débrided, and the abdomen opened by a free incision. There was an extensive laceration of the right lobe of the liver, which was bleeding freely, and was the source of most of the abdominal hemorrhage. This was packed. The tract of the éclat was followed backward through the posterior peritoneum and the retroperitoneal space was opened widely. The right kidney was palpated, and found to be badly lacerated. It was delivered through the opening into the peritoneal cavity, the pedicle ligated, and thus removed transperitoneally. The patient was then turned on his face, after partially closing the abdominal wound and packing the remainder down to and through the posterior peritoneum. The wound in the back, from which

much of the blood which we had been pouring into the vein was meanwhile pouring out, was then widely débrided, exposing in the process a comminuted fracture of the eleventh rib, fragments of which were removed, and a large wound thus established traversing the entire upper abdomen. The posterior wound was also packed, the two packs, anterior and posterior, meeting, and the operation concluded. Contrary to expectations, the following day found the patient in very fair condition, and with undiminished pluck and cheerfulness. There were no evidences of peritoneal infection, and he was suffering from the effects of hemorrhage only. In spite of this, however, his after-course was most stormy, and not lacking in complications. It was not deemed wise to remove the packs after twenty-four hours, and begin Carreling as was our custom in ordinary gunshot wounds not permitting of primary suture. We have not been in the habit of using this method of treatment in wounds with a wide communication with the abdominal cavity, and it was decided to leave the packs in place for a longer time. Some of the gauze was removed on the third and the remainder on the fifth day, the latter date gas being administered. The anterior wound was found infected, and all sutures were removed. The general condition was good; there was a superficial infection of the posterior wound, as well as the anterior, streptococcal in nature, and two days later the wounds were Carreled. Under this treatment they cleaned up rapidly, and the wound was steadily reduced in size by granulation. The temperature, however, gradually rose after a few days, and on the 5th of October he had a chill and a fever of 102°. He was still decidedly anæmic, and an annoying symptom appeared in the form of vomiting at intervals of once or twice a day, of a considerable amount of bile-stained fluid. At the time there appeared evidences of effusion in the lower part of the right chest, which aroused suspicion of an ascending subphrenic infection, for which there was ample explanation. The first aspiration of the pleural cavity was negative, but the second, on October 9, was positive, and 600 c.c. of light brown but sterile fluid were withdrawn. On the same day an exploration of the subphrenic space was made. A vertical incision across the twelfth rib exposed the same, and it was resected for three inches. The edge of the diaphragm was divided, underlying adhesions separated, and the subphrenic space exposed without opening the pleura. The wound of the liver, still gaping and covered with lymph and granulations, was uncovered, and the right upper abdomen, above and below the liver and over as far as the stomach, was examined, but with negative results. After this operation he was somewhat depressed, and my assistants, who were all deeply interested in the soldier, and pessimistic and hopeful by turns, were correspondingly lugubrious. Carrel again after two days. By the fifteenth the pleural fluid had reaccumulated and its presence was confirmed by examination of Lt. Col. George W. Norris. Aspiration at this time yielded a fluid, which while still amber colored, showed the

presence of streptococci, and on the following day the patient was again sent to the operating pavilion, and the chest drained by resection of the eighth rib in the mid-axillary line, and the insertion of drainage tubes. Following this procedure there was a slow but steady improvement marked by subsidence of temperature, cessation after a time of the vomiting, which we had been inclined at one time to view as a possible result of duodenal obstruction by some collection, and a slow improvement in the general condition. About this time, however, the patient developed a most harassing and troublesome cough which resisted all medication, but which, like the vomiting, finally subsided. A small fecal fistula had appeared, possibly as a result of the second operation, but by the first week in November this, too, had closed. Slight elevation of the temperature persisted from time to time until December. Finally, on January 13, as the thoracic sinus still persisted, and improvement seemed slow in the local findings, as far as the chest was concerned, although the abdominal wounds were by this time long cicatrized, the seventh rib was resected under gas-ether anæsthesia, and eight days later he was evacuated.

After leaving the evacuation hospital, he passed through two base hospitals, was sent back to the United States in March, and after another transfer was sent to the Walter Reed Hospital, from which he was discharged on October 4, 1919. The drainage tube was removed and replaced several times during this period of his hospitalization, but when examined on October 6 the wound was solidly healed, and had been so since May.

At present there is slight discomfort in the right side on deep breathing. Hæmoptysis, slight in amount, has been noted after unusual exertion. There is some limitation of expansion on the right side, no râles, a slight lateral curvature, a much depressed scar over the site of resection of the seventh rib, the other scars, anterior and posterior, solid and showing no signs of hernia. The man weighs nine pounds more than on entering the service, and looks to be in splendid health.

That this man survived was mainly due to the fact that in him we were dealing with a type of patient that unfortunately, while the rule in the army, is not the consistent type in civil life, as one quickly finds when one resumes wonted work. The healthy young male human animal, with unimpaired organs, and a marvellous reacting power, is possibly the nearest approach to the laboratory animal in responding to all of the measures for the treatment, operative or otherwise, for traumatic conditions and their concomitant complications of shock, hemorrhage and infection. We are enabled to follow the problem to its solution in a far larger percentage of cases than we can in an equal number of adults representing a cross-section of the community in general. In their ability to react completely and rapidly from an apparently hopeless state due to pure shock or shock and hemorrhage combined, they resemble a healthy child, while able, of course, to take an amount of physical pun-

ishment far in excess of the latter. With them it is much less frequently a case of the operation being a success but the patient dying, their undamaged viscera and whatever portion of the nervous mechanism or undiscovered physiologic reservoir which is called into action in the production and the reaction from shock *per se,* standing them in good stead at every step in the pathway from the time the injury is inflicted until convalescence is complete.

STAB WOUND OF DIAPHRAGM AND STOMACH

Dr. James H. Baldwin reported this case to emphasize a fact well known to all surgeons, but not so well known to those who do not do surgery—that the earlier an abdominal perforation is treated, the more likelihood that the patient will recover and that most patients operated on in the first few hours after a perforation do recover.

E. B., aged twenty years, was admitted to the Methodist Hospital at midnight, August 26, 1919, with a history of having received a self-inflicted stab wound of the left chest at the eighth costal cartilage region, about one-half hour previously. The patient, on admission, was intoxicated, vomited freely, with a report of "no blood in the vomitus." The temperature was 98°; pulse, 80; respiration, 20. The wound, from which very little blood came and which did not look dangerous, was dressed by the interne, Doctor Harding, and orders given to watch the patient, making frequent chart records. In a short time the pulse rate began to increase, upper abdominal rigidity with marked pain and tenderness developed. I was sent for and operated at once, four or five hours after the receipt of the wound. A left rectus incision was made from the costal margin downward. On opening the peritoneal cavity, there was a gush of air and blood and the whole abdominal cavity seemed filled with bright red blood. This obscured the field, but with the use of large wet packs, the field could be cleared sufficiently to see a wound about one inch long in the greater curvature of the stomach, a few inches from the cardiac end. This was easily closed and the hemorrhage controlled. No other wound was found in the stomach or intestines. There was an opening through the diaphragm about one inch in length. By retracting the abdominal wall, this could be sutured and was closed with catgut. The abdominal wall incision was then closed as usual with two cigarette drains at the upper angle. The chest wound was then examined and it was found that the knife had severed the cartilage of the eighth rib.

The post-operative recovery was uneventful. Hot water was given in small amounts about twelve hours after the operation. The temperature and pulse were slightly elevated for a day or two, but soon dropped to normal, and the patient was discharged on the sixteenth day fully recovered.

Dr. John H. Jopson said that transthoracic penetration of the abdomen is a frequent injury in war surgery. Most of the cases are due to high explosives. He recalled four cases on which he operated, in which

the missile or weapon went through the pleura and diaphragm, and in which he operated through the same route. In three of the cases the wounds were produced by shell fragments; in the fourth the injury was a bayonet wound, and in this case there were some points of similarity with the one reported by Doctor Baldwin. The soldier was going up to the trenches at night with a small group of men in a new area. They were mistaken in the darkness for Germans by another party of Americans, and in the mêlée this soldier received two penetrating bayonet wounds in the right chest, one in the second interspace, nipple line, and the other in the eleventh interspace, behind the post-axillary line. He was brought into the hospital in a few hours later in good condition. The upper wound in the front of the chest was first sutured. The lower and posterior wound was then explored. The chest was widely opened in the eleventh interspace, débriding the wound in this procedure, and a wound of the diaphragm discovered one and a half inches from its costal attachment. This was easily reached and sutured. The lung was collapsed, but not bleeding. Air-tight closure of wound was made. The patient was then turned on his back, and the abdomen opened through the right rectus muscle. Little blood was found in the abdomen; there was no injury of the hollow viscera, but another wound of the diaphragm was discovered near the mid-line and behind the dome of the liver, and so far back as to be inaccessible to suture through the abdominal wound. We therefore closed this wound, and reopened the wound in the thorax, resecting the eleventh rib to give a better exposure. The bayonet had gone through the diaphragm, probably wounding the liver slightly on the retroperitoneal surface, and re-entered the pleural cavity near the mid-line, passing along the arc of the diaphragmatic curve. By pushing down the diaphragm and liver, after excision of the rib, we were enabled, with some difficulty, to suture the oval opening in the diaphragm and without the aid of negative pressure. The patient breathed well in the prone position, except when the downward pressure was made as described. Air-tight closure of the pleura for a second time. The man developed a streptococcic infection of the pleura, which demanded reopening of the chest on the sixth day, and the insertion of Carrel tubes. Chest irrigation was not well borne, and simple drainage was substituted for it. The patient reacted well to this plan of treatment, and was evacuated in good condition five weeks after admission, with a sinus remaining. Such experiences were rare, and we seldom saw bayonet wounds of any kind, and these usually accidental. The advantages of the transthoracic route for certain lesions in the subphrenic space is well recognized. Two cases of shrapnel wounds of the liver with lodgment of the foreign body in that organ were treated in this way. In another case the wound in the liver was exposed transpleurally and packed; no foreign body was found, although the abdomen was opened again from in front, and explored. All of these cases recovered.

Dr. Morris Booth Miller said that in the spring of 1917 he had a case similar to Doctor Baldwin's, except that the stab wound was farther to the left and hence an interspace higher up. There was a transpleural wound of the abdomen. He opened the pleura and sutured the diaphragm from above. The wound was made by a stiletto in the hand of an Italian who had evidently meant to make a thorough job by turning his hand as he struck. This gave a substantial slash of the diaphragm. After suturing the diaphragm he opened the abdomen but found no visceral perforation; one or two little cuts had been made in the omentum. He was not so fortunate as Doctor Baldwin, because his man developed a virulent infection of the colon bacillus type and in spite of the fact that early drainage of the pleura was instituted the patient succumbed to the infection.

STATED MEETING, HELD NOVEMBER 3, 1919

The President, Dr. George C. Ross, in the Chair

BONE TRANSPLANTATION FOR OLD UNUNITED FRACTURE

Dr. A. B. Gill presented L. T., a girl ten years of age, from South Carolina, admitted to the Orthopædic Hospital June 5, 1917. The brief history that was sent with her stated that she had a fracture of both bones of the leg above the ankle at the time of birth, that the fractures had never united, and that the patient had never walked on her foot but had always gone on crutches. Examination showed an ununited fracture of both bones of the leg above the ankle (Fig. 1). The foot could be placed in apposition with the leg in any direction. There is a shortening of four inches.

June 18, 1917: First operation. The tibia was exposed and an inlay bone graft from the same tibia was placed to span the fracture. The graft was taken from the upper fragment of the tibia, and was turned around so that the upper portion of the graft was embedded in the internal malleolus. This was done in order that the normal bone from the upper portion of the tibia should bridge the gap between the fragments (Fig. 2).

The leg was dressed in plaster for twelve weeks. On October 8, 1917, the case was removed. It was found (Fig. 3) that the graft was broken at the site of the fracture. A second case was applied for another month at the end of which time non-union was still present (Fig. 4).

November 16, 1917: Second operation. On exposure of the tibia it was found that the first graft had healed in, but had not been large enough; therefore, at the second operation another bone inlay of the entire width of the tibia was placed in a manner similar to that employed at the first operation.

Three months later it was found that no union had occurred. Radiograph examination showed a complete absorption of the graft and thinning of the tibia with an absorption of the lime salts. Patient was fed on bone marrow and had daily treatment by baking and massage to increase the nutrition of the leg.

April 12, 1918: Third operation. Tibia was exposed and tunnel drilled in the head of the tibia, and a second one in the inner malleolus. The surface of the shaft of the tibia of both fragments was planed off with osteotome, so that there might be fresh bleeding bone the entire length of the tibia. A large transplant was then taken from the other tibia. Its ends were buried in the tunnels already prepared, and the medullary surface was held in contact with the shaft of the tibia by means of catgut ligatures. The leg was dressed in plaster. A new case was applied on the first of June. It was found that fairly firm union was present. A high shoe was

fitted to the case and the patient permitted to walk and bear her weight on the case. When the second case was removed six weeks later firm union was present. The patient was fitted with a brace and a high shoe. September 25, 1918, patient was discharged. She had good union (Fig. 5) and she was walking well by means of the brace and the high shoe.

This case is of interest because it demonstrates that union may be secured in an ununited fracture after a lapse of almost any number of years, and second, because it shows the futility of using too small a transplant. This patient would have been saved two operations if a large transplant had been taken from the other tibia at the first operation. This child has a shortening of four inches in her extremity which can never be made up. This shortening is due to the lack of development of the extremity because she did not bear weight on it. Had union with the fracture been secured earlier she would not have so much of a deformity and would not be so severely handicapped.

SPRENGEL'S DEFORMITY (CONGENITAL ELEVATION OF THE SCAPULA)

Dr. A. B. Gill also showed R. T., a girl three years of age, who was born with a congenital elevation of the scapula. There is no history of similar deformity elsewhere in the family.

Examination on admission: The left scapula is elevated about 1½ inches with only ¼ inch motion up and down, and with but slight motion on rotation. The upper angle lies in the posterior cervical region 1¼ inches below the mastoid process. The upper angle and the upper margin are distinctly hooked forward. The posterior margin has a marked angulation at its centre and forms an angle at this point of almost 90 degrees. From this point of angulation a distinct firm band can be felt extending to the sixth cervical vertebra. The scapula rotates about this angle where the band is attached. The child is unable to elevate her arm above her head, nor can the arm be placed in this position passively. The hand cannot be placed behind the neck.

At operation October 8, 1919: A curved incision about three inches in length was made just behind the posterior border of the left scapula with the lower end of the incision slightly below the middle of the scapula. Skin and fascia were divided. A plate of bone was found extending from the point of angulation at the middle of the posterior border of the scapula obliquely upward to the sixth cervical vertebra. The scapula in the region of this posterior angulation was cartilaginous. The angle of the scapula was excised with the plate of bone attached. A distinct articulation occurred at this point. It was then found that the bony plate could be moved freely through an articulation with the spine. It was detached from the vertebra.

The scapula could not be brought down to a normal position.

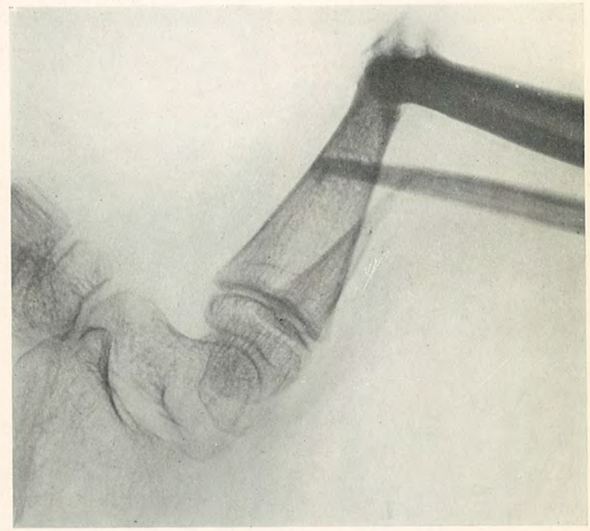

Fig. 1.—Before operation.

FIG. 2.—Transplant b

FIG. 3.—Showi

FIG. 5.—Five months after third operation, showing union between transplan

FIG. 4.—Showing non-union still pre

The trapezius muscle was separated from the posterior portion of the spine and the two rhomboids and the levator anguli scapulæ were also detached from the scapula. It was found that the supraspinatus was made tense on attempting to move the scapula downward. It was therefore loosened from its posterior attachment. The angle and the upper portion of the scapula as far as the suprascapular notch was found to be sharply hooked forward. This portion of the scapula was excised. The scapula could then be brought down into almost normal position and there seemed to be no tendency for it to return. Wound closed. Child was put to bed on a Bradford frame with the left hand fastened to the upper part of the bed to maintain the arm in extreme abduction, and to rotate the scapula and hold the posterior border down.

November 3, 1919: Wound is healed, and the scapula is in almost normal position, the lower angle being but very slightly above the lower angle of the opposite scapula. The child's arm can be held above her head, and placed behind her neck. There is free rotation and up and down motion of the scapula. Daily active and passive exercises must now be given in order to develop and maintain free motion of the scapula and the upper extremity.

Dr. J. Torrance Rugh presented three specimens from cases of Sprengel's deformity upon which he had operated and all of which had the same characteristics as shown in Doctor Gill's case. He had operated on four cases in twenty-seven years. Three had had the extra piece of bone running in from the top or from the side of the spinous process, usually of the seventh cervical vertebra, and attached to the posterior superior angle or the posterior border of the scapula. The most recent one had been done that morning in a child three years of age in the Methodist Hospital. The long bony process coming from the side of the spine of the cervical vertebra or from the side of the lamina (the posterior aspect) extended down along the posterior border of the scapula. It was attached to the scapula about one inch above the lower angle; that is, it was on the ventral side of the scapula. The scapula was deformed much as the one Doctor Gill has shown, there being no posterior superior angle. It was necessary in this case, because of hooking over of the posterior border of the scapula, to separate all muscular attachments and then cut off the upper border of the scapula. After this it was easy to draw the scapula well down over the chest wall.

The specimen shows a large piece of bone running from the spine down to the scapula and shows a reversion to one of the primitive types of the lower animals. There have been a number of operations advised for correction of this deformity, but each case must be cared for in accordance with the conditions present. Recently, one operator advised cutting a V-shaped piece up into the body of the trapezius muscle and drawing the scapula down. That would be absolutely useless in a case such as Doctor Gill's, because the attachment or elevation is not due to

shortening of the trapezius muscle, but due to the attachment between this bony growth and the scapula.

Doctor Gill, in closing, stated that he detached the trapezius from the posterior portion of the spinous process of the scapula and did not notice whether there was any accessory process of the muscle or not. He did not dissect out the muscle as he wanted to do as little injury to the parts as possible.

The etiology of this deformity as mentioned by Doctor Rugh is interesting. It is known that the upper extremity develops in the cervical region, and during fœtal life descends to the position which it occupies at birth. In Sprengel's deformity there has been an arrest of the normal descent of the upper extremity. The cause of its failure to descend is not absolutely clear, but in cases such as the one shown to-night it is possible that the presence of the suprascapular bone will account for it.

TREATMENT OF NON-UNION IN COMPOUND FRACTURES

Dr. De Forest P. Willard read a paper with the above title, for which see page 162.

Dr. John H. Jopson said that non-union in gunshot fractures is, like suppuration, one of the reproaches of military surgery. We have learned much as to its prevention in the course of the war. The principles of prevention are much the same as hold true in the case of the industrial injuries of civilian life, and the knowledge we have gained is especially applicable to this class of cases. Whereas in the early years of the war widespread excisions were done in the continuity of bones, the site of gunshot fractures, with a relatively large percentage of cases of non-union, it was soon clearly demonstrated that the solution of continuity of the periosteum in these cases was seldom complete, and the old principle of removal of totally detached splinters and the preservation of those only partially separated was, when combined with careful cleansing in the course of débridement, followed by much superior results in the way of prevention of non-union. Satisfactory healing at the same time could be obtained. The introduction in modified form by Leriche of the old Ollier technic, by which a subperiosteal resection was performed of such portions of bone as required removal in the course of débridement, raising with the detached periosteum a thin layer of bone cells, was of distinct value in certain classes of cases in which the fracturing missile had penetrated or perforated the bone, carrying with it, in the case of missiles of low velocity, an infection which may or may not have been present with missiles of other types. In fractures involving the joints we also found it of advantage. With Leriche's special form of elevator this was a simple matter. In gunshot fractures, as in compound fractures of other types, the introduction of metallic plates is fraught with risks that constitute contraindications to its adoption as a safe and acceptable procedure. In a few cases of oblique fracture, as

Blake has shown, a Parham band, or in a smaller bone a silver wire, can be placed around the bone ends as a temporary splint, with the expectation of removing it later. In the latter case it may "heal in" even when the superficial wound is not closed. Compound fractures of large bones were, of course, left open until demonstrated sterilized sufficiently for suture, and treated in the meantime by the Carrel-Dakin technic. Efficient traction and fixation are the factors, in addition to the proper operative handling of the wound, in the prevention of non-union. The employment of skeletal traction has been amply demonstrated to be of great value in this connection. We used it in the form of the tongs, with much satisfaction. Where there has been a considerable loss of substance the tongs must be retained in use for a correspondingly longer time, to avoid buckling of the bone at the site of excision, which we have seen occur following their early removal. The after treatment includes the care of the muscles and the preservation of the function of neighboring joints. In the treatment of non-union itself, the bone graft, judiciously used, is, as Doctor Willard has emphasized, the most generally accepted, and apparently the ideal form of treatment. Bad results have occurred by its too early use as well as by its indiscriminate application in the hands of partly trained surgeons. Another and simpler form of fixation, the results of which were very satisfactory in the hands of Doctor Graves of the orthopædic services, was in the use of kangaroo tendon for fixation in operations for non-union. Two sutures were used, the bone ends each being drilled in two places, at right angles to each other, and the sutures being knotted in the same fashion. Satisfactory fixation was thus obtained even in the femur. Has Doctor Willard had any special experience with this method?

Dr. W. Hersey Thomas stated that he favored the Chutro graft but that at the time of treating these cases he was using intramedullary aperiosteal grafts. In one particular instance a tibial transplant had been placed in a radius to bridge a 6 cm. defect following a gunshot wound. The case did well and one month later was transferred to another general hospital where his splint was inadvertently removed almost immediately after his arrival. When next seen, two weeks later, the graft had slipped out of the lower fragment and the condition was that shown upon the plate. In a second operation (twelve weeks after the first), the upper end of the graft was so firmly incorporated with the proximal fragment that it was difficult to tell the original graft from the proximal fragment itself. The lower end of the graft was brought back to its original bed in the distal fragment but fractured while it was being laced in position with kangaroo tendon. A second graft was then taken from the tibia and one end fixed in the distal fragment. The other end of the graft was laced to the original graft which had become incorporated in the proximal fragment. It is now three months since the second operation. The man has good union and can pronate and supinate.

The next case was that of an intramedullary bone-graft for a gunshot fracture of the upper third of the humerus. This man's wound had been healed for over a year and he had had a long course of massage and physiotherapy. Shortly after the operation the wound became infected with a hæmolytic streptococcus. The wound was laid open at once and Carrel-Dakin treatment instituted. Despite the infection and open treatment, this patient speedily gained a firm union and a good strong arm. Several sinuses remained for a few months, but he has now been solidly healed for six months and is enjoying the most active use of his upper extremity.

Doctor Willard, in closing, said that regarding the use of the kangaroo tendon in the femur cases, he had seen the cases of Doctor Graves at the Aberdeen Hospital in Scotland and they seemed to be healing remarkably firmly. He had treated a case of malunion in which refracture of the femur was done in which the fragments were held by that method. The forearm fractures were put in plaster of Paris, with a window for six or eight weeks. The cast was then cut in two, leaving a plaster-of-Paris mould; then began the treatment of light massage on the forearm, light motion to the fingers was started immediately and further motion as soon as possible. The mould is kept on so long as the X-ray shows there is need of it, perhaps for four months. In a femur case in which the operation was done in October, the cast was not taken off until December. Yet distinct bowing in that femur occurred. In another case the cast was kept on for at least four months.

ABSCESS OF THE PROSTATE

Dr. Alexander Randall read a paper with the above title, for which see page 155.

Dr. D. B. Pfeiffer stated that it had always seemed strange to him that prostatic abscess was not more frequent than is the case. That when one examines the prostate microscopically as he had done several years ago in many cases, one is impressed with the number and narrow calibre of the glands that ramify deeply within the stroma of the prostate. Often the signs of chronic inflammation with cellular infiltrate are found, but it is seldom that the cellular deposit is within the lumen of the glands and the polymorphonuclear leucocyte is much less common than the round cell. In other words, the microscopical evidences of acute inflammation and pus formation are usually lacking. This corresponds with the relative infrequency of abscess as observed clinically, while chronic inflammation and indeed acute inflammation without abscess are commonly found. It would seem that the muscular stroma possesses in common with muscular structures elsewhere in the body special facility in dealing with infective processes whether by rapid absorption or by its ability to keep the ducts open by intermittent contraction.

In view of the relatively uncommon character of the condition, this

series reported by Doctor Randall is in reality an extensive experience. He had recently seen a report of 30 cases of prostatic abscess by two French observers which were the number encountered in 10,000 consecutive cases of genito-urinary conditions. The conclusions reached by a study of this series approximate very closely those stated in the paper we have just heard. The majority of the cases were very closely related to antecedent venereal disease, but instrumentation did not play any marked rôle in exciting the attack. The striking feature of these cases is the severity of the local and general symptoms, and there can be no difference of opinion as to the necessity of early incision and drainage.

Dr. Leon Herman said that he was interested in the small proportion of cases of prostatic abscess in Doctor Randall's series due to specific cause. Undoubtedly, the majority of such abscesses originate as complications of gonorrhœal urethritis. He could not agree in all respects with Doctor Randall's viewpoint regarding the treatment of these cases. The mere suspicion of pus was not in his judgment sufficient justification for perineal incision. In the absence of systemic symptoms sufficient to warrant the diagnosis of the presence of pus, he believed the great majority of these cases should be treated palliatively.

If the local examination reveals the presence of abscess, however, these cases should be operated upon regardless of the absence of systemic reaction. Acute retention of urine occurring during the course of acute posterior gonorrhœal urethritis is usually considered pathognomonic of prostatic abscesses, but to this rule there are important exceptions. One case occurred which necessitated catheterization for a period of three weeks. There was in this instance an enlarged and tender prostate, but the local findings were not characteristic and the systemic symptoms were very slight. This individual recovered without operation and he felt sure that rupture of an abscess into the urethra did not occur.

Periurethral or periprostatic abscesses can be drained perineally only after traversing an approximately normal prostate gland to reach them; a procedure of doubtful propriety. True prostatic abscesses should, of course, be operated upon without delay. There is, however, little justification in my judgment for operation in cases where the symptomatology and physical findings are indefinite and inconclusive.

He agreed thoroughly with Doctor Randall that these abscesses should be drained perineally where the necessity for evacuating them arises. The majority of them can be ruptured intra-urethrally by the passage of a sound and at least 65 per cent. will rupture into the urethra spontaneously. Not only in chronic disease the aftermath of this supposedly happy termination of the abscess but the danger of rupture into the other areas is too great to justify procrastination.

He had recently seen at the Pennsylvania Hospital a patient with a urinary fistula of the left inguinal canal. The left testicle had been removed for tuberculosis epididymitis, following which he developed an

abscess of the prostate. This ruptured spontaneously both into the prostatic urethra and through the abdominal wall with the formation of a urethro-abdominal fistula.

Prostatic abscesses of gonorrhœal origin have been known to terminate in this same manner.

Doctor Randall, in closing, said that he felt that these cases should be operated and operated early. The important element was to save the patient from urethral rupture. It is almost a daily experience to see cystoscopically the after results of bad prostatic infections with the picture of deep sinuses leading down into the prostatic gland. Conditions are presented which on the first view tell you that you cannot rid the man of infection with its attendant symptoms. He thought, therefore, that in any case with symptoms of prostatic abscess the earlier incision was done the better.

ABSCESS OF THE PROSTATE *

By Alexander Randall, M.D.
of Philadelphia, Pa.

The subject of abscess of the prostate may seem to many but a trite one, and undoubtedly the majority look upon it as principally a condition limited to the category of a complication of acute specific urethritis. That such is not the case but a cursory review of the literature is necessary. The interesting case of Lydston where the condition so closely simulated prostatic hypertrophy that even at suprapubic cystotomy it was unsuspected, and spontaneous rupture took place during a period of bladder drainage; or Harlow Brooks's case with its course so typical of enteric fever that for four weeks the true condition was completely masked, and more recently Bugbee's report of five cases seen as a complication of influenza during the recent epidemic, all show the deviation from the usual that prostatic abscess can manifest and broaden the field of possibilities calling for differential diagnosis.

Similarly in the short series of sixteen cases that it has been my opportunity to study, there have occurred certain features of unusual interest in diagnosis, making them worthy of a report at this time.

Prostatic abscess calls, in the first place, for an acute infection of the acini of the gland by a virulent organism of the pus-forming type, and we recognize in the beginning that this infectious process may manifest itself in four different degrees of severity, leading on the one hand to a limitation of the infection at any one of the stages, or, on the other hand, to a continuation of the process to a breaking down of tissue and the formation of an abscess cavity. These four forms of involvement from the time of the entrance of an infectious agent are: (1) The catarrhal, (2) the follicular, (3) the parenchymatous, (4) the periprostatic; and it is only when the infecting agent is overcome at an early stage that the process does not proceed from the one to the other with a culmination in the formation of an abscess instead of resolution.

During these periods of acute involvement we have but the palpating finger to guide us in interpreting the stage of the disease, and to determine when an actual pus cavity has formed. Here I cannot but feel that a close parallel can be drawn to a somewhat analogous infection; *i.e.*, acute epididymitis, where it was long considered that only infrequently did actual abscess cavities form, until Hagner, in operating upon all such cases, demonstrated that pus, in macroscopically visible quantities, was present in 80 per cent.; and as in epididymal so in prostatic infections, especially when gonorrhœal, is it probable that macroscopic pus is present much earlier than now believed, and that early and free incision with

* Read before the Philadelphia Academy of Surgery, November 3, 1919.

drainage should be instituted as soon as diagnosis is made, so as to conservate the vital function.

It is the tendency of most physicians to feel in regard to prostatic abscess much as they do towards every acute ailment of the active generative organs in the male, that any infection of a pus-forming character is, *ipse facto,* of gonorrhœal origin: the contrary being shown by this short series of cases that I have personally observed is one of the interesting features to which I draw your attention.

The series comprises sixteen cases, eight of them were associated with the presence of the gonococcus and a history pointing to this infection being the cause of the abscess formation. An equal number, eight, were non-specific in their origin and from an interesting diversity of causes. Surveying first those that were definitely post-gonorrhœal, we find that they, too, have interesting features that I will enumerate but briefly.

In one an interval of twelve years had passed since his acute urethritis, the patient had been married and left a widower, had during this time suffered from a mild, though chronic discharge, and after an alcoholic debauch, devoid of sexual exposure, he developed an acute urethritis. Gonococci were present, and shortly thereafter he developed a prostatic abscess. Of these eight post-gonorrhœal cases but **one was operated upon with drainage of the abscess. In four patients the course** was practically uneventful, and early subsidence of all acute rectal and urinary symptoms was followed by an apparent complete resolution without rupture. This was a most happy outcome for one of them, for he had multiple œsophageal strictures of small calibre from typhoid ulceration, and a urethral stricture of almost filiform size. In two others, who went to complete resolution, an acute epididymitis was associated and the prostatic involvement was especially marked on the same side as the epididymal. The remaining one where resolution took place was first seen under circumstances that countermanded operative interference. In the sixth post-gonorrhœal case, spontaneous rupture into the urethra occurred twelve hours after diagnosis was made, with a rapid subsidence of all symptoms. In the seventh, the abscess was **purposely ruptured by a sound in the urethra—a most unsurgical procedure—and the eighth case was seen in consultation and lost to further study, although reported to have resolved without rupture.**

So we have eight cases clinically diagnosed as prostatic abscess, secondary to an active gonorrhœal urethritis. One was operated and drained perineally; one was ruptured on a sound in the urethra; one ruptured spontaneously; four passed to complete resolution under local treatment, and one was lost to further observation. The series is too small to draw deductions from, but it does point out that there are varying degrees of pathologic involvement from this infecting organism. That in some with good judgment you can save your patient an operation, while in others resolution cannot be expected, and for them we know that it is better to operate and drain perineally than to allow urethral rupture. This group includes one where personal desire countermanded an operation definitely indicated. There was a large fluctuating mass in the left lobe, temperature of 102.5, white blood count 15,600, urinary strangury, chills, etc. Local treatment was instituted, two days later the temperature was falling, and

the white blood count was 14,200; the following day the temperature was normal and the white blood count 12,400; and the next day it was down to 11,000 with the temperature remaining normal. His subsequent recovery was perfect, complete resolution followed, with certainly no rupture, and it has been surprising to see in the four cases so treated what rapid and complete resolution can take place. The right lobe was affected twice, the left lobe a similar number of times, and four times the involvement was general. Gonococci were present in seven cases from the urethral discharge, and were demonstrated in the one case operated upon.

Though the course pursued in these cases, with the exception of one, was non-operative, and though the results could possibly be used as an argument in favor of local, palliative treatment, the after-results ofttimes seen at intervals of years from cases which were allowed to rupture spontaneously into the urethra, or to resolve with a chronic prostatic infection present, have convinced the writer conclusively that here, as in similar conditions elsewhere in the body, where pus has once formed, surgical intervention and proper drainage afford the patient a surer chance of a complete physiological restitution of function.

Frequently we see cystoscopically a condition in the prostatic urethra, first pointed out by McCarthy, where large scarified prostatic duct orifices penetrate to unknown depths into the gland tissue. These are now known to be the residiuum of just such infectious processes and form almost permanent foci of infection due to poor drainage and scar tissue, and incapable of ever returning to a normal state. Without doubt, such permanent damage may be avoided by early operative interference, and the degree to which such injury may develop will be illustrated by two of the cases about to be reported in the non-specific group.

In the second group of eight cases gonorrhœa played no antecedent rôle. These are by far the more interesting cases, and in that they each bring out some special feature, possibility, or symptom of such an infection, I will give them in the detail that I think the case warrants. The possibilities as to origin of infection, the type and virulence of the organism, the ofttime complete masking of all symptoms pointing to the actual seat of the disease, the rapidity of some cases and the latency of others, make an ideal field for differential diagnosis.

Of these eight non-specific cases, instrumentation was responsible in four of them.

The first consulted a specialist for a slight mucoid discharge. For a month he was given prostatic massage and "deep injections." Following one such treatment he developed within forty-eight hours all the symptoms of an acute infection of the prostate—there was a chill, fever, with a temperature of 103, hæmaturia, and vesical tenesmus. The diagnosis of an abscess was easily made by rectal examination. An acute epididymitis developed the following day. Palliative treatment was requested, and under local applications complete resolution took place slowly and without rupture of the abscess.

In the second case, age twenty-eight years, there had been a gonorrhœa nine and two years previously. Three weeks before hospital admission, after a

walk in the cold, he developed a chill and fever, with a temperature of 103, and pain in the right chest. Treatment was given by his physician and two days later the chest pain was gone. Ten days before admission he developed retention of urine following the passage of a sound, which had been unsuccessful and had caused bleeding. Pain began within twenty-four hours and steadily increased. On entrance to the hospital his temperature was 104, and his white blood count 19,600. The entire prostate was involved in the abscess formation and presented a mass extending as high up as the finger could reach. Operation showed a large pus cavity especially located in the right prostatic lobe, with a marked indurated cellulitis extending all the way down into the right crus penis. The organism was the staphylococcus pyogenes aureus.

The third case was seen while in the field with the A. E. F.—a man, fifty-two years old, who had been told that he should have a sound passed every month because of an old stricture. His medical officer did this for him, and five days following the third passage of a sound there was a very gradual onset of acute symptoms, which in six days developed a fluctuating mass in the prostatic region. On account of surrounding conditions a palliative course was pursued for seven days in the hope that resolution would take place. However, at the end of this time the patient's condition demanded intervention, so under morphia and cocaine anæsthesia perineal incision and drainage were performed, and a complete recovery was obtained in seventeen days. This was a most satisfactory case, as an invaluable officer was saved to the division for tremendously important work at the front in the September and October campaigns. Unfortunately the organism was not identified.

The fourth gave a most unusual history. He was doing some heavy work in the army when seized with a sharp pain in the right groin. Hernia (according to him) was diagnosed, but unoperated, and in three weeks he was well. Before leaving the hospital in October, 1917, he was ordered to take a permanganate of potash irrigation. He remonstrated, not seeing its necessity, and was ordered to do as told. Some bleeding followed this, and he had complete retention for five days, having a catheter passed only once in each twenty-four hours. On the fifth day he was seized with chill, fever and severe pain in the rectum, and was immediately operated upon for prostatic abscess by a perineal incision. The patient states that he "came to" six weeks later in December, 1917, and was told that he was a bleeder, and had had two transfusions to save his life. He was then voiding through his perineal incision and his urethra. In January, 1918, a sudden hemorrhage from his incision called for a third transfusion. In March a catheter was passed and again bleeding occurred of such alarming character that a fourth transfusion became necessary. Following this he developed a left epididymitis, which suppurated and was incised, and following this operation he first passed urine per rectum. Typhoid at fourteen, scarlet fever at eight, several teeth pulled as a child with no hemorrhage, but in 1908 an extraction of a tooth was followed by bleeding requiring packing, and in 1915 had a severe "nose bleed," brought on by sneezing, which lasted four days. Had had an appendectomy the same year without incident. This patient had a fistula certainly a centimetre in diameter extending directly through his prostate into his rectum. Three-quarters of his urine went through the fistula. He had bladder continence. So with such a history and a coagulation time of thirteen minutes, he was left alone.

Again we have a case of a boy of twenty-three years, who entered the dispensary complaining of his inability to properly control his urine. For many years, in fact, as far back as he could remember, he dribbled urine, which he now says he knows to have been due to the overflow of retention. This he has relieved during the past few years by the judicious use of a catheter. One and a half years ago he developed a swelling in the right lower abdomen, practically symptomless,

which finally ruptured and discharged a large quantity of pus through the urethra. During the healing of this condition there developed an opening into the rectum, for since that time, when he gets over-distended, urine in small quantities passes into the rectum. There is never any fæces or gas mixed with his urine. He has rectal control, in fact, is constipated.

Cystoscopy (May 4, 1916): Bladder normal, urine slightly cloudy, left ureteral orifice not demonstrable. In the posterior urethra a large cavity was found extending back into the region of the right prostatic lobe, from which can be seen protruding a mass either fecal or calcareous. There is a small pocket on the left also.

Cystoscopy (May 12, 1916): Two calculi were found in the bladder. They were crushed with the cystoscopic rongeur. The prostatic cavity was clear.

Cystoscopy (May 19, 1916): Two more small stones seen in the prostatic pouch. These were picked up with the cystoscopic rongeur and placed in the bladder, where they were crushed at leisure.

Cystoscopy (May 24, 1916): Last calculi crushed. Reëxamined January 17, 1917. Condition as before, no further stone formation. Patient is still using a catheter.

This boy's condition was due to *spina bifida*, demonstrated by X-ray, his sphincteric inhibitory fibres being undeveloped. His abscess was caused by his catheterization.

These last two cases illustrate the unfortunate results that may ensue from injudicious instrumentation, and the most distressing complication from prostatic abscess. In the former it was felt that so long as his vesical control was perfect from the good action of his internal sphincter, he had best be left alone, in the face of his history of bleeding. In the second, the patient's undeveloped nervous system, though responsible for his trouble, was likewise considered his saving, as his spastic internal sphincter controlled his urine and any operative interference might make a persistent dribbler of him.

Again we have a student, thirty years of age, who during the preceding summer used to row a great deal, and as a result had a series of boils. The first were undoubtedly due to the rubbing of the boat seat—a condition so frequently seen in oarsmen—but they were succeeded by a series of similar infections elsewhere about the body, in several of which on culture the staphylococcus pyogenes aureus was the causative agent. About two and a half months after the first of these local infections he was suddenly seized with rectal pain, chills, fever and a high leucocyte count. Prostatic abscess was diagnosed and operation proved the same to be the cause. The infecting agent was still the staphylococcus pyogenes aureus. There had never been any venereal infection.

The fifteenth case was that of a young physician, married, and the father of four children. No venereal history. He had been in slightly lowered condition of vitality and health from his active rural practice. While attending church one day, he suddenly felt faint and had to seek the open air. Later that day he had a chill and was feverish. The only other promonitory symptom was that on the day before he had noticed some scalding on urination and found his urine scant and highly colored. He had been constipated for several days prior to these symptoms. His temperature was elevated on the above day of onset, and the following day it had reached 102, with pains down the legs, in the back and headache. There was a gradually increasing pain in the rectum, and digital examination found an acutely swollen and tender prostate without evidence of fluctuation. The following day, forty-eight hours from onset, after strain-

ing at urination there was a slight discharge, which increased rapidly at each urinary effort, and towards evening after one urination there was passed out a lump of mucus, followed by a profuse purulent discharge and blood. His condition from then on improved to complete cure. Smears from the discharge and also a culture showed *B. Coli Communis.*

The last case was seen on the Urological Service at the Johns Hopkins Hospital. The man was seventy-two years of age and gave a very typical history of gradual vesical obstruction due to enlargement of the prostate gland over a period of eight years' duration and with gradually increasing symptoms. Four days before his admission complete urinary obstruction occurred, associated with an elevation of temperature and very severe chill. Catheterization was easily performed, but without greatly easing the patient's discomfort. For fifteen days the regularity of recurrent diurnal chills of the most intense type and subsequent fever elevation made the medical consultants feel practically certain that the patient had malaria, no matter what else he harbored, and this assumption was strengthened by the Virginia home of the patient, as also his past history. An elevated white-blood count was against this diagnosis. Catheterization was easy, and even cystoscopy was performed. By rectum there was a large smooth prostate in no wise especially symptomatic or suspicious. He was treated expectantly, while his temperature chart broke all the high and low records. At one time it varied from 96 at noon to 107.2 at 7.30 P.M., falling from there to 96.8 by 8 A.M., an excursion upward of eleven and two-tenths degrees and a fall of ten and four-tenths in the space of twenty hours. It was at this point that the surgeon stepped in, and knowing that there was urinary obstruction present—everything else being uncertain—started to perform perineal prostatectomy and drained a large prostatic abscess. The culture in this case showed *B. Coli Communis.*

Summarizing the non-gonorrhœal cases: one underwent resolution; one ruptured in forty-eight hours into the urethra; four were operated upon by perineal incision; and two presented the sad after-results of such infections poorly handled in having a urethro-prostatico-rectal fistula. In two cases B. Coli was the infecting organism, and in a similar number staphylococcus pyogenes aureus.

In regard to the mode of approaching a prostatic abscess for drainage, there are four possible and recommended routes: First, the purposeful rupture on a sound in the urethra, a procedure blind, dangerous, hemorrhagic, destructive, and non-surgical in the extreme. Secondly, the drainage into the rectum, again non-surgical, and because of the tension of the parts offering very poor drainage. Thirdly, there has been recently proposed a perineal incision into the urethra, followed by the introduction of the finger into the posterior urethra and digital rupture of the abscess through the posterior urethral wall. As above pointed out, the future repair of such openings is ofttimes the cause of persistent sinuses in the prostatic urethra and the cause of chronic prostatic irritation; moreover, the author of this recent article advocating such an approach drains by passing a tube into the bladder and allowing the purulent discharge to drain around this to the perineal dressing. Again I cannot refrain from calling this method non-surgical, for it certainly opens up avenues for the infection to spread that are absolutely unnecessary.

The choice, then, remains to expose the posterior surface of the prostate through the perineum, incise directly and under the eye's guidance the actual seat of infection, place therein tube and gauze drainage; the whole performed without injury to either the urethral or the rectal surfaces, they being left to perform their respective functions as usual, and without danger to their normal continuity.

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TREATMENT OF NON-UNION IN COMPOUND FRACTURES*

By De Forest P. Willard, M.D.
of Philadelphia, Pa.

The treatment of non-union in fractures of the long bones has interested surgeons for many years. Since 1914 both our interest and our knowledge have greatly increased. At the present time there is still considerable controversy as to the proper methods of treatment. It would be impossible in any short paper to cover the various opinions that have been brought forward and it is my purpose only to give you some more or less related ideas on treatment of non-union following compound fractures due to war wounds. Although these cases differ from many that are seen in civil surgery, yet they closely resemble the type found in industrial surgery in that both show infection and marked destruction of bony and soft parts, combined with great functional loss. During the last half of the year 1917 I had the good fortune to be attached to the R.A.M.C. and to be stationed at the Military Orthopædic Hospital at Shepherd's Bush and at St. Katharine's Hospital, London. At these hospitals were gathered the British war casualties that needed reconstructive work. Here were old cases dating back to the 1915 campaign on the Somme, as well as the fresh casualties of the Ypres and Passchendale battles. Here we saw the compound fractures in every stage of their treatment and of every sort—those that were healing by primary union, those showing delayed union, as well as the older non-union cases.

At both the hospitals it was our policy to classify a case as non-union only after every effort had been made to procure the results without surgical interference. And it may be mentioned in passing that many of the cases of delayed union, even those in which there was considerable separation of the fragments, united after prolonged fixation.

Many cases of non-union could have been prevented by better methods of fixation during the earlier stage of their treatment. Although I can give no definite figures, I feel convinced from the work that I saw first in England and later in France and in America, that the percentage of non-union in the casualties of the 1918 campaign was very much smaller than the cases injured in 1915 and 1916, and this is unquestionably due to the better surgical technic used at the C.C.S.'s, and especially to the use of Thomas splints, which gave such accurate alignment by fixation and extension and which were capable of being well applied by any of the enlisted personnel of the medical corps as well as by all medical officers. These two things, a skilful débridement with careful preservation of all possible fragments of attached periosteum and bone, and the accurate and

* Read before the Philadelphia Academy of Surgery, November 3, 1919.

prolonged maintenance of proper alignment, were the main factors in the prevention of non-union.

The cases of true non-union were due to infection or to extensive loss of bone substance caused either by the missile itself or by over-enthusiastic removal of bone fragments at the primary operation The treatment of the cases divided itself into two distinct parts: First, the restoration of the function of the disabled limb, and, second, the treatment of the fracture. Both parts of the treatment are equally important, and I believe that we often neglect the rather monotonous and long-drawn-out functional restoration in our interest in the treatment of the fracture itself. An arm or a leg may be entirely useless from a false joint occurring in one of the long bones, but it may also be as much or even more disabled by the loss of a joint or muscle function that is usually found as a complication of the fracture. Good examples of this were the infected fractures of the arm. Finger motion and pronation and supination were almost invariably lost in these cases, even when the wounds were in the upper arm, and it was with the utmost difficulty that we obtained functional efficiency. Manipulation under an anæsthetic seemed to increase rather than decrease the disability. Prolonged treatment with splints that gradually forced motion combined with hot baths and massage gave us the best results. If this part of the treatment is delayed until after firm bony union is established, free motion of the joints distal to the fracture is almost impossible to obtain, and from the patient's standpoint his long stay in the hospital has been valueless because restoration of motion is the goal for which he was aiming.

Much of this disability can be avoided by early exercise—active whenever possible, passive only when the fracture is so low that active motion is prohibited. The good results of this early motion are well shown by the difference between the old cases of fractured humerus at Shepherd's Bush which had little or no attention paid to finger motion in the early stages of their treatment and similar cases which were treated at the Neuilly Hospital in Paris during the summer of 1918, and which had proper treatment started within a few days of their primary operation. At Shepherd's Bush 30 cases out of 40 showed marked loss of hand motion; while in France we had 100 consecutive cases of compound humerus fractures unite without loss of finger function.

During the pre-operative period in non-union cases, all systemic conditions which might interfere with union may be discovered and corrected, also the general nutrition of the injured limb can be greatly benefited by massage and hot bath treatment. In this period a short course of deep, heavy massage may be of great value in determining whether or not the scar tissue in the old infected areas is permanently healed. If a scar can withstand this heavy manipulation and can become less adherent and less red, it is safe to believe that operative procedures will not reawaken the infection.

In regard to the length of time that should elapse between the closing of all sinuses and the operation for non-union, there is still a great divergency of opinion. During our first contact with these cases we were told by our British colleagues that it was unsafe to operate for at least one year after the infection had healed. Naturally both the patient and surgeon were anxious to cut down this period as much as possible, and we finally adopted a procedure which we believed would give the best results. Usually we allowed six months to elapse before considering operation. If the primary infection had been mild and of short duration, this six-months interval can safely be shortened to four or five months. On the other hand, if the infection had been severe and prolonged, nine or even twelve months should elapse before operation is considered. At that time a ten-day course of heavy massage of the scar was carried out. If the scar showed no reaction, operation was done. At this operation the scar tissue was dissected away both from the soft parts and between the bone fragments. Smears were made from the deep tissues and the wound was closed. If the infection was reawakened as it was in a moderate percentage of cases, the wound was widely opened and the infection was controlled by Carrel-Dakin, so that the period of the patient's convalescence was not appreciably lengthened. If, however, the bacteriologic report was negative for virulent pathologic organisms, and if the wound remained closed, a second operation was done within eight or ten days. This second operation consisted of the actual repair of the fracture. For this no one procedure can be advocated. However, it can be said that the simpler the operation, the better the result. If the bone ends can be freshened and brought into apposition without disabling shortening and can be held there by the use of catgut or kangaroo tendon, it is better to stop without the use of more elaborate procedures. If this is insufficient we have a wide choice of various types of metallic or bone plates, of many kinds of bone graft, and of wire, screws, pegs, etc. In making a choice from these various materials, it should be remembered that the tissues of these patients have not the resistance that is normally found in cases in civil surgery. Both general and local vitality has been lowered by the long battle against infection, and these operative wounds must be handled much more considerately than those in normal healthy individuals. Personally, I object to all forms of metal, either wire or plates. They act as irritants and cause bone atrophy at the place where we want bone growth. There can be no doubt that bone plates cause atrophy. Any series of X-rays will prove it. While at Shepherd's Bush I removed or saw removed at least a dozen bone plates which had been inserted for non-union. Not one of the cases had united. Four of the plates were entirely covered in by abnormal callus and were found lying loose in a cavity of the bone just as we so often found sequestra. I can remember only one case that succeeded in uniting on account of—or, perhaps, in spite of—his bone plate. I can also remember two cases that

were plated a year or more after their sinuses had closed, that became very septic after operation. Both of these operations were performed by a surgeon whose technic was above suspicion. Major Kinder states that on his service in England he did a series of over 20 bone plates, and that "careful investigation later revealed that over 60 per cent. of these cases were complete failures either because active sepsis was stirred up or because the bones would not grow."

When some mechanical fixation is needed or when there is a bony gap to be bridged, the autogenous bone graft offers the best chances of success. Theoretically, the sliding type of graft is the best, but practically the graft from another healthy bone, such as the tibia or rib, seems to be of greater service. A graft to be successful must be snugly imbedded for a considerable distance in the healthy bone in both fragments. It should reach to the medullary cavity, it should preserve both its periosteum and endosteum, and it should be of healthy non-sclerosed bone throughout its whole length. It is hard to fulfill these conditions with a sliding graft. Therefore, a graft from healthy bone seems preferable. In the larger bones, as the tibia and femur, such large heavy types of graft work exceedingly well.

In the smaller bones, such as the radius and ulna, the small thin graft does much better. In the earlier parts of our war work we used a moderately heavy graft in these bones. Healing proceeded normally, and at the end of four or five weeks the operation seemed very successful. But at the end of the second or third month four out of my first five cases began to show thinning of the graft area, and this absorption continued until after the graft between the fragments had disappeared and the non-union had re-occurred. Whether this was due to a very low grade infection, or whether the graft was so large as to interfere in the blood supply, I am unable to say. I only know that the operations at the end of four months were failures. I have had reports from other surgeons who have had similar results. In subsequent cases, at the suggestion of Doctor Chutro, I have used a very thin, flexible graft, approximately ⅛ of an inch thick, covered with plenty of periosteum, and laid sub-periosteally in a shallow channel dug in cortex of the bone ends. Whenever possible this graft extended for two inches beyond the sclerosed portions of fractured bone ends. The graft is held in place by suturing the periosteum of the bone over it. This type of graft does not give good bony fixation, but this is hardly necessary in fractures of the lower arm. It does give a bridge that stimulates bone repair more readily than does the larger type of graft. I have been able to check up only a few of my own cases, but have succeeded in retaining bony union for periods of at least six or seven months. From conversation with some of the British and French surgeons who were interested in this work, I feel sure that the thin, flexible type of graft in the smaller long bones is advocated by them.

I have made no attempt to cover the whole subject of the treatment of non-union. I have desired only to mention certain details of the treatment for your consideration and discussion, emphasizing especially, first, the need of early and efficient restoration of function of the whole disabled limb; second, the advantages of the two-stage method of operation on the old infected cases, and third, the usefulness of the Chutro type of graft in fractures of the smaller bones.

STATED MEETING, HELD DECEMBER 1, 1919

The President, Dr. George G. Ross, in the Chair

USE OF FREE SKIN GRAFTS TO REPLACE LOSS OF MUCOUS MEMBRANE OF MOUTH AND NOSE

Dr. George M. Dorrance read a paper with the above title, for which see page 173.

Dr. Robert H. Ivy said as to the success of the skin grafts in the mouth, such grafts had been used at the Walter Reed Hospital in some types of cases in which there was loss of mucous membrane. He showed four slides, giving a general idea of the operation and the appliances used in connection with it. The first showed a wire splint attached to the teeth with a loop to carry the modelling compound down into the buccal sulcus after the adhesions had been divided. The next slide showed the temporary appliance replaced by an artificial denture after the graft had taken. Another slide showed one of the grafts in the mouth. This was a case in which the upper lip was bound down to the jaw bone. An artificial plate bearing teeth was made of vulcanite. The scar tissue was then divided and the plate with its upper edge covered with the Thiersch graft was inserted and retained in the mouth for several days, by which time the free skin had become adherent.

Dr. John B. Roberts said that in carrying Thiersch epithelial grafts into the mouth, one of the difficulties is getting the graft to fit perfectly against the surface. If there is air underneath the graft, it is apt to fail to live. The important thing is to first have a model made of the surface in modelling compound, or wax, as Doctor Dorrance has used. The compound at ordinary temperatures is hard; but by moistening it with warm water it softens and, pressing it down to the surface, there results an exact negative. The skin side of the graft is placed against the negative which is then pressed into place and fits every little detail of surface. The important thing is to get the raw surface of the epithelium pressed right down upon the place where it is wanted to adhere and grow fast. This applies also in the eye socket or in ectropion operations for burns. As Doctor Dorrance and Doctor Ivy have said, it is of the greatest importance to have perfect contact of the raw surface of the Thiersch graft with the raw surface. It is easy to see that quick union will take place if the parts are not disturbed.

Doctor Dorrance, in closing, emphasized the fact that he made the cavity larger than he expected it to remain. The plate is not removed for three weeks after it is introduced. He particularly impressed this point

also, because there have been many failures due to taking the plate out before this time.

OPERATIVE TREATMENT OF UNUNITED FRACTURES OF THE MANDIBLE

Dr. Robert H. Ivy read a paper with the above title, for which see page 176.

Dr. A. P. C. Ashhurst said that, while on duty at the Walter Reed Hospital, he had many opportunities to watch the work of Doctor Ivy and of his predecessors, and was very much impressed with the amount of improvement which can be obtained by the combination of prosthetic and surgical skill. It is a long and tedious process to get these jaws sufficiently aseptic for an operation; in the second place, to overcome any deformity that may be there, and then to secure union, the final stage of the operation. From what he saw at the Walter Reed Hospital and in other places it is evident that there has been a very great advance in surgery of this kind during the war.

Doctor Ivy, in closing, said that in these cases he felt that he must sometimes feel the ends of the bone with his gloved fingers. He did not touch the graft with his fingers, but he did not see how it is possible to keep the fingers absolutely out of the jaw wound. He had had no experience with the rib graft, but had seen cases later in which the operation had been done by Doctor Dorrance with uniformly good results.

FRACTURES OF THE PELVIS

Dr. William J. Ryan read a paper with the above title, for which see page 182.

Dr. George G. Ross said that fracture of the pelvis when the femur is driven into the acetabulum, or so-called central luxation, is not such an uncommon injury. It occurs in three degrees: First, when the floor of the acetabulum is split; second, when the head of the femur is through the acetabulum; third, where the entire head has entered the pelvic cavity and the neck rests on the fractured edge of the acetabulum. It occurs as a result of force applied to the great trochanter, transmitted through the neck. There were several instances of this fracture in the hospital at Brest, and they all occurred as a result of falls down hatchways or from smokestacks. Some years ago such an injury came to him at the Germantown Hospital. Altogether there were six lines of fractures of the pelvis; one being central, luxation of the second degree. This case was treated by a circular band of adhesive plaster, taking in the pelvis and making pressure on the great trochanter. The patient made a very satisfactory recovery and is able to walk without support and without a limp.

Dr. Henry R. Wharton expressed himself as much impressed with the high mortality in fractures of the pelvis mentioned by Doctor Ryan. His experience had been that the mortality of fractures of the pelvis, unless there are severe associated injuries, is rather low. He had seen cases recover in which there had been multiple fractures of the pelvic bones, with rupture of the bladder. He had recently under his care a case of fracture of the pubis, in which the patient had been caught between heavy pieces of iron and a wall, and in whom the urethra was torn from the bladder. Recovery occurred in this case after suprapubic cystotomy, retrograde catheterization, and perineal drainage. With regard to fracture of the pelvis in which the head of the femur is driven through the acetabulum, he had a case at the Presbyterian Hospital in which this occurred with other injuries in which the man made a good recovery. In this case, examination two years later showed that the patient walked easily and had no apparent shortening. With regard to the primary treatment, he had used a stout muslin binder, and, in some cases, plaster of Paris to immobilize the fracture. When the patient was able to get about he used a heavy canvas belt with straps and buckles to give good support in walking. He had been much impressed with the frequency of fracture of the pelvis in the last few years. It may be that routine X-ray examination discloses fracture of the pelvic bones formerly unsuspected.

Dr. A. P. C. Ashhurst said that his experience agreed with what Doctor Wharton had said, that the mortality is not as high as the figures of Doctor Ryan would indicate, unless one considers only the cases diagnosed without the aid of skiagraphy. Looking up the records in the Episcopal Hospital about ten years ago, he found that the mortality was about 30 per cent. (*Trans. Phila. Acad. Surg.*, 1909, xi, 225), but within the last few years he doubted if it much exceeded 10 per cent. Thirteen years ago, when he wrote an article on rupture of the bladder, he called attention to the danger of overlooking rupture if one injects so small a quantity as one pint. While he was a resident physician at the Episcopal Hospital, Dr. Harry Deaver had a patient who had been injured in the abdomen. Doctor Ashhurst injected a pint of fluid into the bladder and all of it was recovered; nevertheless, at autopsy, an intraperitoneal rupture of the bladder was found. He made it a rule, therefore, to inject a quart; and sometimes even when one injects a quart, one may recover a quart and a half—showing that the fluid has gotten out of the bladder into the abdominal cavity, and that the catheter is draining the abdominal cavity. So that he has come to the conclusion that, unless the injected fluid causes the formation of a suprapubic tumor with the characteristics of a distended bladder, one cannot be sure the bladder is intact. He had come to the conclusion that in extraperitoneal rupture of the bladder, low down near its neck, it is safe to drain through the perineum. If there is a distinct rupture of the bladder easily found in the space of Retzius, one

would naturally drain there; but he was sure it is safer, where the lesion is deep in the pelvis and extraperitoneal, also to drain through the perineum.

Dr. George P. Muller said that he had had two interesting experiences in connection with the diagnosis of rupture of the bladder by means of bladder injections. Several years ago, a patient was admitted to the University Hospital with the history of having been injured in the abdomen. A routine examination failed to show anything. He was catheterized and clear urine obtained; the interne stated that a measured amount of boric solution had been injected and recovered. Twenty-four hours later symptoms of peritonitis ensued and again he injected boric solution into the bladder and recovered the same amount. There was no blood. However, the abdomen was opened and a vertical tear in the bladder found exactly opposite the urethral orifice. They had been catheterizing the pelvic cavity. Recently, a case of fractured pelvis was admitted to the University Hospital, in which the symptoms of the ruptured bladder did not appear for twenty-four hours, at which time toxic symptoms were accompanied by a bulging mass above and to the right of the pubis. He had a tear in the bladder about ½ inch above the urethral orifice and opening into the space of Retzius.

From his observations of certain of the cases reported by Doctor Ryan, together with other cases, he believed it would be best if they would develop a method of drainage through the perineum. Doctor Wharton has spoken with surprise of the mortality. As he remembered the fatal cases, most of them died within an hour or two from shock caused by the associated injuries; the remainder occurred weeks after from slow sepsis. In connection with this mortality should be remembered Doctor Moschcowitz's remark that "statistics from memory are often lower than statistics from analysis of case records."

Doctor Jopson said that in the examination of these cases the importance of rectal examination should never be overlooked, both for diagnostic purposes, and to determine whether injury of the rectum is present or threatened by the presence of spicula. In fractures of the rami of the pubis and ischium, there may be noted a reflex spasm of the adductor muscles of the thigh on the same side, as shown in movement of the thigh on the pelvis, which is of some diagnostic value. One of his former assistants, Dr. Douglas P. Murphy, devised an ingenious method of treatment for a case under their care, utilizing the principle of overhead extension. A heavy canvas sling, wide enough to include the entire pelvis and trochanters, was passed beneath the patient, a bar of corresponding length was passed through loops attached to the ends of the sling, and was attached in turn by cords to a longitudinal bar directly over the centre of the bed in a modified Balkan frame; the bar being only a short distance above the patient. In this manner the patient's pelvis was lifted clear of the bed, and the weight of his body furnished counter-pressure, which was conveyed through the sling to the sides of the pelvis

and trochanters, pressing on them and effecting reduction and fixation of the vertically-separated fragments. This position was exceedingly comfortable, and the care and nursing of the patient were much simplified. The result was entirely satisfactory, and the method was a decided improvement over that which we were accustomed to use, *viz.*, circular compression and support by a heavy duck binder, fastened by straps and buckles, or pinned around the pelvis.

Dr. D. B. Pfeiffer said that he saw a case this summer, in the service of Doctor Wharton in the Presbyterian Hospital, which illustrated the statement made by Doctor Ryan that certain cases need drainage in anticipation of suppuration, and the further report of one case which did show suppuration and sepsis presumably secondary to infection of a hæmatoma. The case referred to was a young man who had been brought to the hospital after an accident in which he had been struck by a trolley car while in an automobile and rendered unconscious. He soon regained consciousness and was brought to the hospital in an ambulance. He was placed in bed and examined by the interne, who found nothing alarming in his general condition but suspected an injury of the pelvis. The patient did not seem to be in pain. In a short time, however, he began to complain of pain in the lower abdomen, which became more and more severe. The temperature remained approximately normal, but the pulse rate had risen markedly, being about 140 per minute and of poor quality. The face was pale and the expression anxious. The abdominal muscles over the whole lower abdomen were tense and pressure was painful. Dullness over this area was pronounced. Any motion or disturbance of the pelvis was painful and it was concluded that a fracture existed. There was no blood in the urine. The probability of hæmatoma formation, as a cause of the general and local symptoms above stated, was considered. However, the intensity of the abdominal symptoms, together with the existence of a contused abrasion of the abdominal wall above the symphysis, suggested an intra-abdominal injury. The abdomen was opened through a right rectus incision. On splitting the fibres of the rectus, the preperitoneal tissue was seen to be infiltrated with a huge amount of blood which was for the most part held in the meshes of the areolar tissue. However, between the peritoneum and the region of the internal aspect of the acetabulum on the right side there was a cavity filled with approximately 250 to 300 c.c. of blood clot. This was evacuated and with the finger a complete fracture of the superior ramus of the pubis was felt. Active hemorrhage seemed to have ceased. The peritoneum was opened and no visceral injury found. The pelvic cavity was not more than half its normal size, due to the massive subperitoneal infiltration which surrounded it on all sides. A rubber tube was placed just through the abdominal wall into the preperitoneal space and the wound closed. Considerable serosanguinous exudate drained for three days, when the tube was removed. Healing and recovery were unevent-

ful. It is probable that in this case there was a direct rupture of a vessel of considerable size, and while he would not have operated for this reason alone, there can be no doubt that the danger of infection of the hæmatoma was materially lessened by the evacuation of the clot and drainage of the preperitoneal space under all aseptic precautions.

Dr. Walter G. Elmer reported a rather unusual type of injury in a boy who was admitted to the Orthopædic Department of the University Hospital for tuberculosis of the hip. X-ray examination revealed that the head of the bone had been driven through the floor of the acetabulum and tuberculosis of the hip had followed.

Doctor Ryan, in closing, remarked in regard to the mortality, which, according to Doctor Wharton and Doctor Ashhurst, seems to be high, that three patients died within two hours of their admission, one in three hours and one in thirty hours.

USE OF FREE SKIN GRAFTS TO REPLACE LOSS OF MUCOUS MEMBRANE OF MOUTH AND NOSE*

By George M. Dorrance, M.D.
of Philadelphia, Pa.

Free skin grafting, particularly in the replacement of the mucous membrane of the mouth, received during the late war an impetus which has carried it out of the class of operations which usually fail, and what may even be termed the experimental stage, and established it as a definite procedure from which an almost positive assurance of success can be given.

Before proceeding to describe a new method, it is always advisable to review the methods that have been used, past and present:

1. Free Ollier-Thiersch grafts have formerly been tried in the mouth, but have usually failed.

2. Mucous membrane flaps from other parts of the mouth. This is the method of choice, when there is sufficient membrane to spare, and there is no danger of producing contracture or shortening of the mucous membrane at the place from which the flap is taken.

3. The taking of a flap from the skin surface to replace oral mucous membrane is a difficult procedure, causing a large amount of scar tissue, and only too frequently the flap will be hair bearing, which is a very disagreeable complication. However, it has a decided place in closing a large defect or in making an entire lip.

4. *The Free Ollier-Thiersch Graft, Held in Place Under Pressure.*—To Esser (Annals of Surgery, Philadelphia, 1917, lxv, 297) belongs the credit for introducing the buried free skin graft. In seeking a means for applying Thiersch grafts evenly and maintaining them immovable under equal pressure on the wound for several days, Esser conceived the idea of stretching the skin graft on an impression of the wound made in dental modelling composition, inserting this in the hollow of the wound, and suturing the edges of the wound over it. It is interesting to note the evolution of the present operation from this. To correct certain deformities or contractures in which there was a loss of mucous membrane, Esser incised the skin over the contracture, and dissected down to the contracture but not into the mouth. Of this cavity he made an impression in modelling compound. Upon the impression he placed a Thiersch skin graft, with its raw surface out, and then introduced it into the cavity and sutured the skin edges over the compound. Ten days later he incised the scar tissue from within the mouth, and removed the compound, leaving the graft in place, lining the cavity which was then con-

* Read before the Philadelphia Academy of Surgery, December 1, 1919.

tinuous with the mouth cavity. Now why did the graft take? Let us try to give the reasons why grafts on the skin surface often fail: (1) An accumulation of serum under the graft. (2) Formation of crusts around the grafts. (3) The grafts are not kept warm and at uniform temperature. (4) They are frequently moved or pulled off in changing the dressing or when the dressings are moved by muscular action. The success of the modelling compound support depends upon the correction of all these defects. In general skin grafting, we have found a greater number of takes could be obtained by covering the grafts with an accurately fitting layer of modelling compound. This is brought about by taking an accurate impression of the area and one inch of the surrounding skin in modelling compound, before applying the grafts. Then the grafts are applied and covered by the modelling compound. This method was first seen by me at the Queen's Hospital, Sidcup, England, on Major Gillies' service. The modelling compound employed in this work is the ordinary impression material used by the dentists, which is readily softened in hot water.

Major Waldron, R.A.M.C. (Canadian Forces), at the Queen's Hospital, Sidcup, modified Esser's procedure by dividing the scar tissue through the mouth instead of externally, making a cavity into which he introduced an accurate impresion of modelling compound covered with a Thiersch graft. He then sutured the incision in the mucous membrane. The compound usually remained in place for several days, then came out or was removed, the graft, however, remaining as a lining for the cavity. The objection to this plan was that there was too much movement. The compound could not be kept in place as long as desired to prevent subsequent contracture. The staff of the Queen's Hospital, Colonel Newlands, Major Gillies, Major Waldron, and Major Pickerill, modified and improved Waldron's method by attaching the compound to a splint fastened to the teeth. In this manner the graft covering the compound was held firmly pressed in place. An impression of the cavity produced by dividing the scar tisue was taken in compound which was then attached to the splint, the compound being covered with a Thiersch graft and pressed down firmly in place. The compound was allowed to remain for ten days, and at the time of its removal, to avoid secondary contracture, was replaced with a vulcanite piece, worn for several weeks. Lt. Col. G. C. Schaeffer, M. C., U. S. A., holds the modelling compound in place by passing sutures through the cheek or the floor of the mouth and tying them over gauze on the skin surface. This is a simple method, but should be used only where it is impossible to obtain a dental appliance.

In the Maxillo-Facial Service at U. S. Army General Hospital No. 11 at Cape May, I used the method employed at the Queen's Hospital, but found several minor changes desirable:

1. We dissected out the scar tissue, enlarged the cavity much beyond what was desired, then put the jaws in an open-bite splint (Figs. 1 to 5).

FIG. 1.

FIG. 3.

FIG. 6.

FIG. 2.

FIG. 4.

FIG. 7.

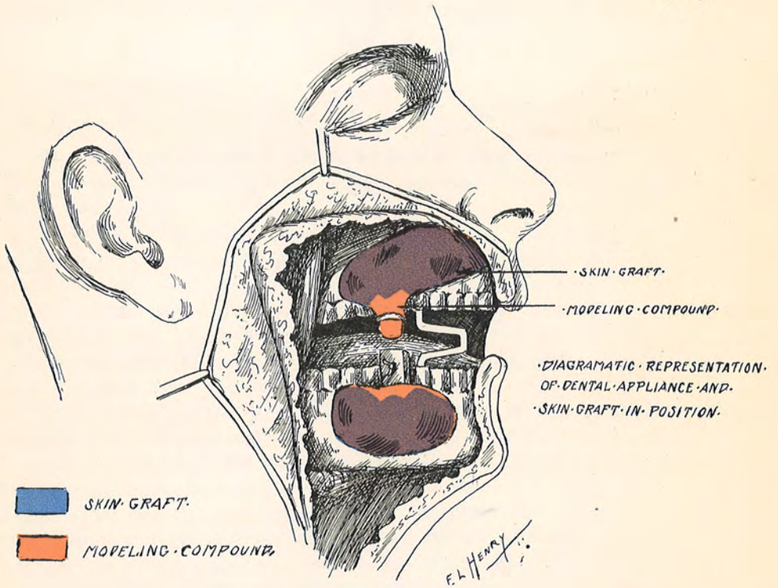

FIG. 5.

FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

I find others do not use this splint as much as we did. Its advantages are that it keeps the mouth in one position and in an over-corrected one, so that the final result will not be interfered with by subsequent contracture. I strongly advise the open-bite position for these cases.

2. We retained the original compound in place for fourteen to twenty-one days and always followed its removal by the insertion of a vulcanite model for several weeks. The graft should not be sutured over the compound as it defeats the object desired; that is, the compound is only supposed to hold the graft against the raw surface. The point to be remembered is that the compound should be held in place under pressure. If any of the graft extends over normal mucous membrane, it does not do any harm.

FIG. 13.

FIG. 14.

FIG. 15.

In lining a skin flap with Thiersch graft as in Figs. 7 and 8, the appliance is put in place, the flaps are made, and then the compound is covered with the graft; finally, the flaps are sutured over the compound, in contact with the graft. The lining of skin flaps in this manner was entirely satisfactory, but where possible a full thickness skin flap is preferable. One would frequently see the patient vomit over the grafts immediately after the operation. No harm resulted.

The Thiersch grafts in the mouth were pale in color, but several months later changed and became much the same as normal mucous membrane. In lining the nose with epithelium, which is an essential in rebuilding a nose, it is frequently impossible to obtain sufficient skin to make a flap for this purpose. To overcome the difficulty, we had an attachment connected to an appliance on the teeth bearing a mould of wax or modelling compound over which the outer skin flap would fit accurately (Figs. 10 to 15). On the inner surface of the skin flap was applied a Thiersch graft. So long as the flap accurately covered the mould, just so long did one get the grafts to take. A Thiersch graft will take in any part of the nose if held accurately in place.

OPERATIVE TREATMENT OF UNUNITED FRACTURES OF THE MANDIBLE *

By Robert H. Ivy, M.D., D.D.S.
of Philadelphia, Pa.

This report is based upon observation of twenty-two patients with non-union following gunshot fracture of the mandible, in the writer's service at the Walter Reed General Hospital. These cases came to operation after the lapse of periods ranging from six to seventeen months following the original injury. In all cases a thorough trial had been given to conservative methods of treatment. In twenty-one there was free mobility between the fragments; in one a rather firm fibrous union in very bad position had occurred, complicated by large loss of substance. The non-union in these cases was primarily not due to lack of early fixation, but was principally caused by the large loss of bone substance and inability on the part of nature to bridge the gap resulting when the collapsed fragments were drawn apart and fixed in proper position. The loss of bone was due not so much to primary destruction as to extensive shattering followed by infection and necrosis. If the fragments had not received early attention in the form of reduction and fixation, we should have had a much larger number of cases of union in bad position, requiring two separate operations of surgical reduction and bone grafting, instead of grafting alone. At the present time exact figures are not available giving the percentage of cases of non-union in gunshot fractures of the mandible seen in the recent war, but the writer would roughly estimate it at ten per cent.

Of the twenty-two cases operated upon, eleven involved the body, three the symphysis, two the symphysis and body, three the angle, one the angle and ramus, and two the ramus.

The object of treatment in these cases is primarily restoration of the function of mastication. This is attained by restoring the normal occlusion of the teeth and filling in the lost continuity of the bone. One is of little value without the other.

The *preoperative* treatment of these cases was that applied to all fractures where union without operation is expected, namely, removal of all septic foci, reduction, and fixation in such position that the normal occlusion of the teeth is restored.

Septic foci include roots of teeth projecting into the seat of the fracture, other teeth showing evidence of periapical and peridental disease, bony sequestra, metallic foreign bodies, and infection in the soft tissues overlying the seat of fracture. No operation should be attempted to restore the continuity of the bone until all sources of infection have been

* Read before the Philadelphia Academy of Surgery, December 1, 1919.

removed and until at least six weeks have elapsed after all sinuses and septic wounds have healed.

Reduction is brought about in cases of non-union by manipulation and the immediate insertion of a previously made splint which fits on the teeth and maintains the normal occlusal relationship between the upper and lower teeth. Occasionally, where there are many sound teeth it is possible to fix the fragments by means of wire ligatures attaching the lower teeth to the upper. The interdental splints are cast in silver after accurate impressions and plaster casts of the teeth of the individual cases have been prepared. In some cases the splints are made in segments, one for each mandibular fragment, connected by an adjustable screw-bar whereby reduction can be gradually brought about. Where there are sound teeth in each fragment, it is frequently only necessary to splint the mandible (Figs. 1 and 2). This has the great advantage of permitting mastication and also allows enough motion to promote bone growth. In other cases, and always where there are no teeth in the posterior fragment, as in the case of fracture at the angle, it is necessary to splint the upper teeth as well as the lower and lock the two splints in occlusion by means of removable bolts on each side (Fig. 3). The upward and forward tilting of the ramus of the mandible by the action of the masseter and internal pterygoid muscles is gradually corrected by means of a vulcanite saddle covering the soft tissues of the ramus, backward and downward propulsion being obtained by a threaded rod connecting the saddle to the upper splint (Figs. 4 and 5). It has been found advisable to remove the saddle after reduction has been accomplished and before performing the bone graft operation, because it causes some irritation to the soft tissues and may lead to infection of the graft. Acknowledgment is due to my associates Major Joseph D. Eby and Captain Roy L. Bodine, of the Dental Corps, for their most efficient and necessary cooperation in handling the problems of reduction and fixation in these cases.

In cases of firm fibrous or bony mal-union, operative reduction must be resorted to. The skin is divided, the seat of fracture exposed, and the line of union cut through to permit complete separation of the fragments to their normal position, which is maintained by the application of previously prepared dental splints. If the mucosa of the mouth has not been opened by this procedure, a graft may be at once inserted. If the mouth cavity has been made to communicate with the external wound, the bone graft operation must be postponed until complete healing has taken place. This applies also to accidental opening of the mucous membrane of the mouth in preparing a bed for a bone graft. The graft will not live in the presence of infection from the oral secretions. I was unfortunate enough to have this accident occur in two cases of the present series, necessitating immediate discontinuance of the operation and postponement of the bone grafting for several weeks.

Operative Procedures.—Anæsthesia. In all cases ether anæsthesia was

used. It was given intrapharyngeally through nasal tubes. The bottle containing the ether was attached to an oxygen tank, the bubbles of oxygen carrying the ether to the patient, there being thus no necessity for a foot bellows or motor pump. It was never found necessary to use the intratracheal method. The technic employed permitted continuous administration of the anæsthetic and at the same time complete isolation of the field of operation by sterile towels which covered the entire head and face, except the seat of fracture.

Types of Graft.—Three different methods of restoration of the lost bone substance have been used in the present series, as follows:

(1) Pedicled bone graft from the mandible itself.

(2) Osteoperiosteal graft from the tibia.

(3) Graft from the crest of the ilium.

(1) *Pedicled Graft.*—The method followed is that described by Cole (*British Journal of Surgery,* July, 1918), in which a piece of the lower border of the anterior fragment is removed by means of an electrically driven saw, with a pedicle of digastric muscle and fascia left attached to it below for nourishment. This is carried back to fill the gap and fastened to the ends of the fragments by means of silver wire.

(2) *Osteoperiosteal* method of Delangenière (*Bull. et Mém. Soc. Chir.,* Paris, May, 1916). This consists in first exposing the ends of the fragments and preparing a pocket around each by stripping back the periosteum and soft tissue for a distance of about 1 cm. The graft is made by the removal of a thin shaving of bone from the antero-internal surface of the tibia with a chisel, leaving the overlying periosteum attached to the graft. One piece of this is inserted in the pockets beneath the ends of the mandibular fragments and another in a similar manner over the fragments, with the bony surfaces of the grafts facing each other. It is necessary that the grafts be in contact with the previously freshened bone ends. No fixation is used beyond suturing the deep tissues over the grafts and ends of the bone, dependence in this respect being placed entirely upon the splints. The osteoperiosteal graft is flexible, easily adjustable to the size and shape of the lost bone substance, and contains all the elements necessary for osteogenesis.

(3) *Crest of the Ilium.*—After first thoroughly exposing the ends of the fragments they are trimmed off and freshened, and a hole is drilled in each through which a silver wire is passed. An incision is now made along the crest of the ilium, beginning at the anterior superior spine, the muscles attached to its inner and outer surfaces are stripped down, and a piece of bone of sufficient length and depth removed to fill the gap in the mandible. A hole is drilled in each end for passage of the silver wires for connection to the mandible. The detached muscles are brought over the site of removal of the graft, and sutured together with catgut, and the ilium wound closed.

Space will not permit the giving of many of the details of these opera-

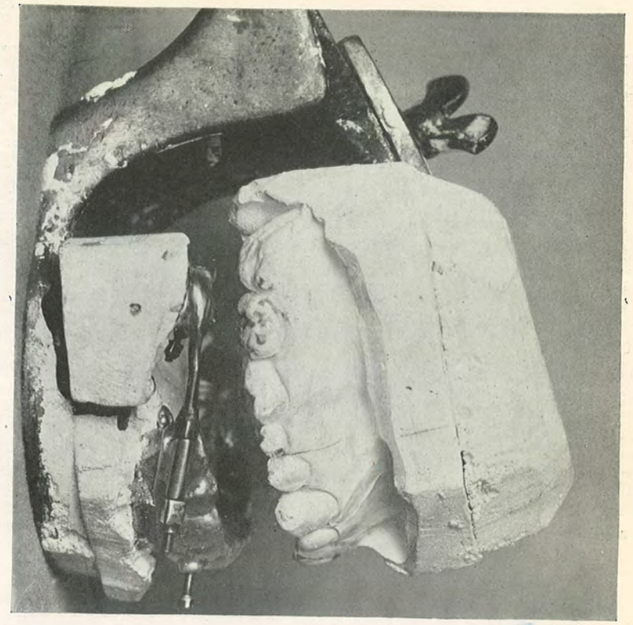

FIG. 1.—Cases VI, VII, VIII and XXII. Type of splint suitable for cases with sound teeth in each fragment. Band around molar tooth in posterior fragment, connected to segment of splint on anterior fragment by adjustable screw-bar.

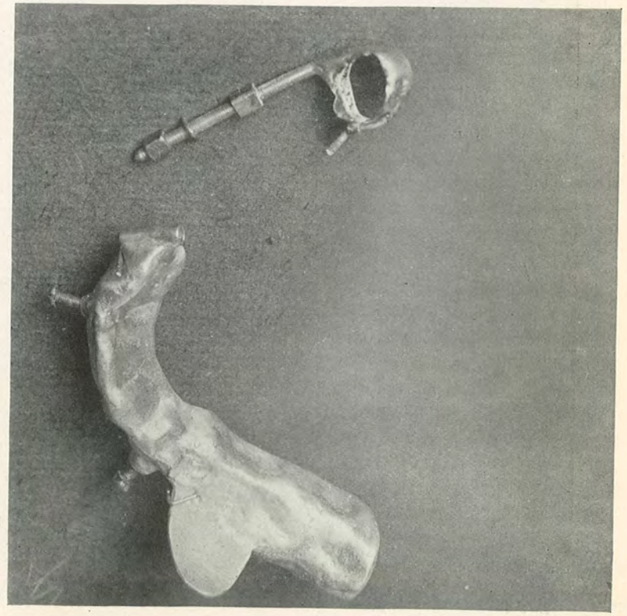

FIG. 2.—Same splint unassembled, showing flange on side opposite fracture to keep mandible from swinging over to affected side during mastication. Flange plays against upper molar teeth.

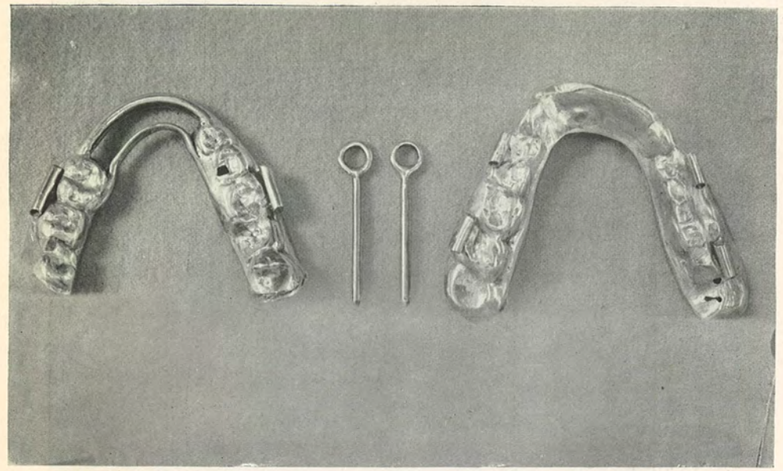

FIG. 3.—Case XIII. Upper and lower cast metal splints with removable lock-pins to permit opening of mouth if desired.

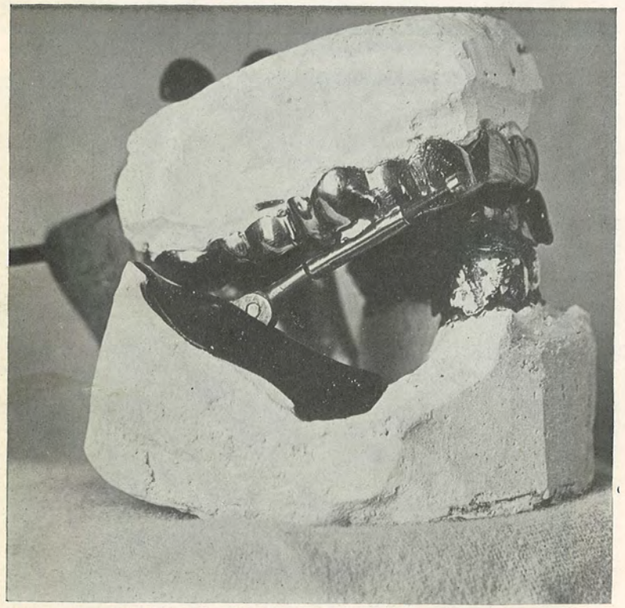

FIG. 4.—Cases IV, XIV, XVII, XVIII and XIX. Vulcanite saddle for ramus attached by extensible threaded rod to splint on upper teeth. Sound side of mandible held over in place by splint attached to upper by lock-pins.

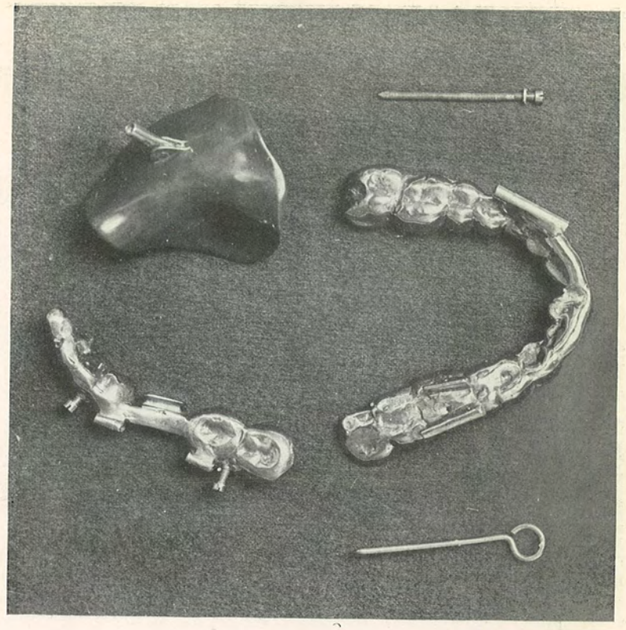

FIG. 5.—Same splint unassembled.

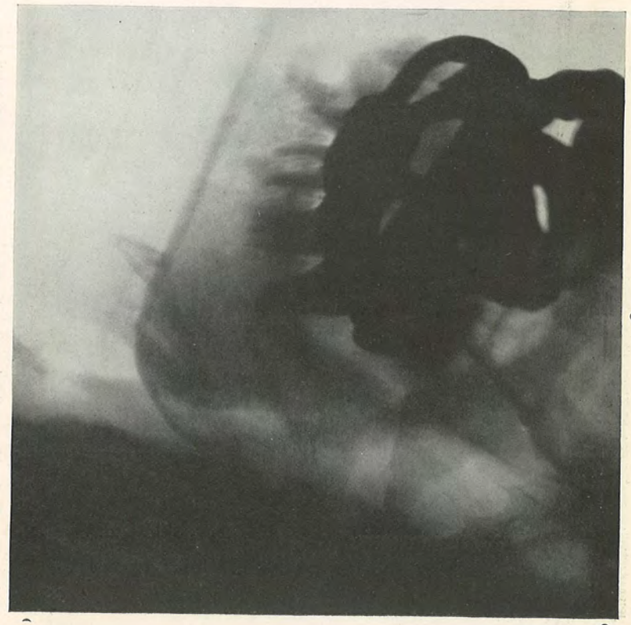

FIG. 6.—Case XIII. Loss of 2.5 cm. at symphysis, before operation.

FIG. 8.—Case XV. Loss of 1 cm. in right body of mandible, before operation.

FIG. 7.—Case XIII. After pedicled graft. Did not unite on one side and required reinforcement by osteoperiosteal graft.

FIG. 9.—Case XV. Shortly after pedicled graft operation.

FIG. 10.—Case VII. Before sepsis had cleared up, showing drain in place.

FIG. 13.—Case XXI. Mal-union, requiring operative reduction

FIG. 14.—Case XXI. Showing ilium graft in place.

FIG. 11—Case VII. Shortly after placing osteoperiosteal graft.

FIG. 12.—Case VII. Showing bone regeneration, two months after operation.

tions here, but a few points will be mentioned. Whichever of the three methods be used, the grafts must not be touched with the gloved hands, and should be transferred immediately from their original site to their new environment. Careful hæmostasis must be carried out before insertion of the graft and again before the wound is closed. If there be slight oozing a small rubber drain is left in place for twenty-four to forty-eight hours.

The indications for the various types of graft will now be briefly discussed.

The *pedicled* graft is satisfactory in cases of loss of substance up to 3 cm. in the body or symphysis of the mandible. It is not applicable where the ramus is involved. It has the advantage of furnishing a piece of bone that has not been cut off from its blood supply and which acts not as a mere scaffolding for the rebuilding of new bone to fill in that lost by the injury, but which is from the first an integral part of the mandible. The pedicled graft is not so vulnerable to infection as the free bone graft, and union will, as a rule, take place more rapidly than where a free graft is used. On the other hand, in the writer's experience the technic of the pedicled graft is more difficult, takes longer, and the operation is attended with more hemorrhage than in the case of the free graft.

The *osteoperiosteal* graft is regarded by the writer as being on the whole the most satisfactory for the great majority of cases, and the most universally applicable. It is suitable for loss of substance of any extent, and in any position. It can be made to assume almost any desired shape. The technic is the simplest. It perhaps requires longer to obtain complete consolidation than by other methods, and no dependence, of course, can be placed upon the rigidity of the graft itself for fixation.

The *crest of the ilium* furnishes a graft that can be adapted to a small or a comparatively great loss of substance. It is especially suitable in cases where immediate rigidity is desired, *viz.*, where too much dependence cannot be placed upon splints for fixation, and also for an immediate cosmetic result where the loss of substance has produced much visible deformity.

Results.—In the twenty-two patients the graft operation was repeated in three, making twenty-five operations in all. Of these fourteen were osteoperiosteal, five were pedicled, and six were from the crest of the ilium. Of fourteen osteoperiosteal grafts, eleven, or 78.5 per cent., are completely consolidated or in process of consolidation, in two only partial regeneration took place, and had to be reoperated upon, while one was lost from suppuration. In the two cases in which regeneration failed to occur, the ramus was involved. Regeneration does not take place as readily nor as rapidly in the ramus as in the body of the mandible.

Of five pedicled graft cases, three are cured, while in two regeneration was incomplete and reinforcement by a second, osteoperiosteal operation was necessary.

Of the six cases of ilium graft, five are undergoing consolidation, while one was lost from suppuration, and another operation will be required.

Thus, of a total of twenty-five operations, nineteen, or 76 per cent., were successful. In four of the failures, complete regeneration did not occur, while two suppurated. Of the twenty-two cases all but two are either cured or in process of firm solidification. These two still remain to be re-operated upon, and it is confidently expected that a good ultimate result will be obtained in them.

In both of the cases in which the graft was lost from suppuration the saddle extension splint was used over the soft tissues of the ramus and caused considerable irritation from pressure. Therefore, it is now considered wiser to use the saddle only to reduce the displacement of the ramus and to remove it before the operation.

In all cases but one the occlusion of the teeth will be good after removal of the splints and replacement of lost teeth. In one case the splint slipped at one end several days after the operation, and the occlusion will not be perfect.

The splints are kept in place for at least three months after the graft operation, this depending upon the extent and seat of the loss of substance. The teeth are unlocked at intervals to permit gentle exercise and stimulate bone growth. Follow-up radiographic examinations are made once a month.

The appended table gives a summary of the twenty-two cases:

SUMMARY OF CASES

Case	Date of injury	Seat of injury	Substance lost	Method of fixation	Date of operation	Type of graft	Result
1NC	7/30/18	L. angle	2 cm.	Intermaxillary wiring of teeth	4/4/19	Osteo-periosteal	Cured
2OK	10/4/18	L. angle	3 cm.	Cast intermaxillary splints	4/25/19	Osteo-periosteal	Cured
3EH	9/26/18	R. body and symphysis	4 cm.	Cast intermaxillary splints	6/23/19	Osteo-periosteal	Consolidation taking place
4PG	10/10/18	L. body	3 cm.	Intermaxillary splint and saddle	7/11/19	Osteo-periosteal	Consolidation taking place
5PD	7/30/18	L. angle and ramus	3.5 cm.	Cast intermaxillary splints	4/22/19	Osteo-periosteal	Only partial regeneration
6MM	9/29/18	R. body	2. 5 cm.	Cast mandibular splint	5/12/19	Osteo-periosteal	Cured
7FM	10/11/18	R. body	3 cm.	Cast mandibular splint	5/28/19	Osteo-periosteal	Cured
8JM	7/4/18	R. body	2 cm.	Cast mandibular splint	7/9/19	Osteo-periosteal	Cured
9WS	9/28/18	L. ramus	2.5 cm.	Intermaxillary wiring of teeth	7/14/19	Osteo-periosteal	Consolidation taking place
10EO	7/17/18	R. body	2 cm.	Intermaxillary wiring of teeth	7/30/19	Osteo-periosteal	Consolidation taking place
11HB	7/28/18	R. ramus	1. 5 cm.	Intermaxillary wiring of teeth	(1)5/7/19 (2) 9/19/19	Osteo-periosteal Osteo-periosteal	Only partial regeneration Consolidation taking place
12OH	9/26/18	L. body	1 cm.	Intermaxillary wiring of teeth	3/26/19	Pedicled	Cured
13RP	5/31/18	Symphysis	2.5 cm.	Cast intermaxillary splints	(1)4/2/19 (2) 7/21/19	Pedicled Osteo-periosteal	Only partial regeneration Cured
14HS	10/15/18	Symphysis and r. body	4 cm.	Intermaxillary splints and saddle	8/13/19	Pedicled	No union at one end
15CH	10/14/18	R. angle	1 cm.	Intermaxillary wiring of teeth	8/27/19	Pedicled	Cured
16FS	9/28/18	Symphysis	2 cm.	Removable spring clasp splint	8/29/19	Pedicled	Cured
17CD	9/26/18	R. body	3 cm.	Intermaxillary splints and saddle	(1) 4/18/19 (2) 8/8/19	Osteo-periosteal Ilium	Lost from suppuration Consolidation taking place
18AR	9/26/18	R. body	2.5 cm.	Intermaxillary splints and saddle	8/25/19	Ilium	Lost from suppuration
19JB	7/15/18	R. body	5 cm.	Intermaxillary splints and saddle	8/18/19	Ilium	Consolidation taking place
20GC	10/8/18	R. body	2.5 cm.	Cast mandibular splint	9/5/19	Ilium	Consolidation taking place
21CF	3/4/18	Symphysis	5 cm.	Cast intermaxillary splints	8/22/19	Ilium	Consolidation taking place
22AT	7/29/18	R. body	2.5 cm.	Cast mandibular splint	9/12/19	Ilium	Consolidation taking place

FRACTURES OF THE PELVIS*

WITH A REPORT OF TWENTY-FIVE CASES

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Fracture of the pelvis, until very recently, had not received the consideration that is due such a serious injury. It is a much more common result of violence than is generally supposed. Therefore, it is with these thoughts in mind that this series of cases is presented.

The first extensive report based on the findings in the literature was by Quain[1] in July, 1916. He reviewed one hundred and twenty-six cases and reported one of his own. His reported mortality previous to 1890 was 86.7 per cent.; since then it was 48 per cent., and since 1905 it is 38 per cent. Since then single cases have been reported by Hawkes,[2] Moorhead,[3] Ross,[4] Klotz,[5] Angiovene,[11] and Dunott.[12] And Gazzotti[6] reports two cases with a description and photographs of an apparatus for their treatment. Mitchell[7] in 1917 read a very exhaustive article on the diagnosis and treatment of fracture of the pelvis. While the author's paper was in the stage of preparation, Mengel[8] presented his very excellent paper embodying sixty-nine cases before the Pennsylvania State Medical Society last September. These papers totalled 202 cases, and to this number we are privileged to add 21 cases. They were treated in the surgical wards of the University, Polyclinic, and St. Agnes Hospitals on the services of Doctors Frazier, Brinkmann, and Muller, to whom I am indebted for the privilege of reporting them.

Humphrey[9] describes the ring of the pelvis as heart-shaped, and calls attention to the wide arch with a flattened centre of the upper or posterior half, and the greater curve with flattening at the ilio-pectineal regions of the lower or anterior half. It results from this configuration that the pelvic ring is weakest at five points, *viz.*, at or a little external to sacro-iliac synchondroses; at the symphysis pubis; and midway between the symphysis and the acetabula.

In studying the clinical effects of fracture of the pelvis it is helpful to consider it with reference to its various functions:

As interposed between the vertebral column and the lower extremity as a weight bearer.

As a means of providing for motion of the trunk on the lower limbs, and of affording some points of attachment for the muscles governing that motion.

As a bony protection for the abdominal and pelvic viscera. When viewed as a bony ring between the spinal column and the femora, the

* Read before the Philadelphia Academy of Surgery, December 1, 1919.

pelvis is made up of two main arches, one in use when standing and one when sitting. The sacrum is the point of union or keystone of both these arches. One extends from the acetabulum through the thick bony ilium, through the upper third of the ilio-pectineal line to the sacrum and is called the sacro-femoral arch. The other extends from the tuberosity of the ischium through the posterior edge of the acetabulum to the same point and is called the ischiosacral arch. These are the essential weight-carrying portions of the pelvis.

Morris[10] calls attention to the mechanics of the remaining portions of the pelvis in this way: When much strength is essential in an arch it is often prolonged in a ring to form a counter arch, *i.e.*, the ends of the arch are tied together so as to prevent them from starting outward. Therefore, a portion of any weight carried by an arch is distributed to the centre of the counter arch. Now in the pelvis the body and horizontal rami of the pubis form the counter arch of the sacro-femoral arch, and the union of the rami of the pubes and ischii the tie of the ischiosacral. The ties of both arches are united in front at the symphysis which like the sacrum is common to both arches. Therefore, it can be easily understood why any severe direct violence applied to the pelvis will result in fracture of the horizontal or descending rami of the pubis, the rami of the ischium, and of the ilia external to the sacro-iliac joint.

In this series of 21 cases there were seven deaths, a mortality of 33.3 per cent.

The youngest patient was six and the oldest sixty-five. All had been subject to severe injury.

Twelve cases were simple fractures, that is, without visceral complication, though three of them were complicated by fractures of other bones. In five cases there was a rupture of the bladder and in three a rupture of the urethra. One case which died on the operating table had a torn deep epigastric artery in addition to an intra- and extraperitoneal rupture of the bladder. Bloody urine was present in one case without evidence of rupture of the bladder or kidney, due possibly to a contusion of the bladder or kidney. An inguinal abscess developed in one case and an abscess over the right hip and gluteal region in another, both several days after the injury. In one case there was a penetrating fracture of the acetabulum (mention). This would seem to differ from Doctor Estes' statement in discussing Mengel's paper that "When the body of the pubis and ramus of the pubis are broken by direct violence, drainage is almost imperative. It is not simply the rupture of the bladder or urethra; that, of course, makes drainage an absolute necessity. But there is in my experience a very large amount of blood effused in the cellular tissues of the perineum and ischiorectal region, and this blood is nearly always contaminated by colon bacillus or by some slight leakage from the urethra. Almost inevitably there is infection." Fracture of the pubis occurred twelve times in this series and in only one of these did such an infection

occur—a gluteal abscess (Case XII). The ilium was involved seven times, the body of right ischium once. The anterior superior spine once; the acetabulum once, and both tuber ischii once. The patients that died all had other severe injuries.

Case III.—Aged sixty-five. Rupture of urethra, multiple fractures of the ribs developed nephritis. Died on twenty-sixth day.

Case IV.—Died in thirty hours. Had a fractured skull, sixth, seventh, eighth ribs, femur, and compound fracture both bones leg.

Case VIII.—Ruptured bladder and urethra; signs of internal hemorrhage; profound shock. Died in two hours.

Case X.—Fractured skull and evidence of a ruptured bladder. Unconscious on admission. Died in three hours.

Case XV.—Ruptured bladder. Developed cystitis and general sepsis after operation. Died in six days.

Case XVII.—Extensive lacerated wounds of the perineum extending up into the abdominal cavity, through the neck of the bladder. Died three hours after admission.

Case XVIII.—Rupture of bladder, intra- and extraperitoneal. Peritonitis present, torn deep epigastric artery. Died three hours after operation.

Symptoms and Diagnosis.—Every case of severe injury in the pelvic region should be looked on with suspicion. The clinical findings should be checked up by X-ray, of course, but there should be no delay in operating if it is indicated.

The most common symptom is pain; felt usually at or near the seat of fracture. It is sometimes described by some patients as "a pain through the pelvis." This pain is increased by pressure inward exerted simultaneously on both hips. I agree with Mengel that crepitus should not be looked for because of the danger of injuring the urethra or bladder if they have not already suffered. Crepitus was noted on our records three times.

Movement of the body causes pain in or near the seat of fracture. I feel that rectal examination should not be made in suspected fracture of the ischium for fear of a sharp edge of bone puncturing the bowel.

The patient should always be catheterized. If bloody urine is withdrawn a given amount of some sterile solution such as boric acid should be injected after the bladder is emptied by catheter and then drawn off again. If the full amount is recovered one can feel reasonably sure that the bladder is not ruptured. In case the catheter cannot pass because of rupture of the urethra, a perineal section should be done and an attempt made to reconstruct the urethra. Drainage should also be provided for. It may be necessary to do a suprapubic for retrograde catheterization.

Should the bladder be ruptured extraperitoneally there will in addition be a swelling and bogginess over the lower abdomen. This, of course, will require incision and proper drainage of the space of Retzius.

If the fragments are exposed at the time of operation and can be replaced in proper position without difficulty, it should be done. Otherwise they had best be let alone.

As to treatment of the fracture. If it is a fracture of the ilium with or without sacro-iliac joint involvement, a plaster cast should be applied around the pelvis, cut out in the proper place to allow for attention to bowels and urine.

If the pubis or ischium is involved a wide adhesive swathe should be applied giving access to necessary wound dressings. In either case the patient should be placed on a Bradford frame with the head end resting on the head of the bed and the foot end on the mattress against the foot of the bed. This will permit attention being given him without disturbing his position.

Of the cases that recovered eleven were traced at the end of a year or more.

Seven were in absolutely normal condition.

One had normal function but had occasional pains in the region of the sacrum.

One had a limp due to shortening in a fractured limb which fracture was sustained at the same time as the pelvic injury.

Another who had a possible rupture of the urethra had some delay in starting urination and some dribbling. Examination disclosed an enlarged prostate. He improved under treatment but drifted from observation.

One case had vague pains through the pelvis though examination was negative.

ABSTRACTS FROM CASE RECORDS

Case I.—Jas. H., aged twenty-three years, admitted January 23, 1918. Was caught under a falling wagon, which struck him on the right hip and pinned him beneath it. He was unable to walk and complained of pain in both gluteal regions. There was some tenderness over the region of the bladder and pressing both hips together caused pain above the symphysis pubis. Temperature was 99; pulse, 82; and respiration, 22. He was catheterized without difficulty, first few c.c. were bloody, but the remainder was clear. Bladder was emptied and eight ounces of sterile boric acid solution injected. Full amount was withdrawn, showing no rupture of the bladder. An adhesive swathe was applied to the pelvis and the patient placed on a Bradford. A little blood continued to leak from the urethra, so a permanent catheter was inserted and the bladder irrigated daily with saturated solution of boric acid. This man was a persistent kicker and did not like or appreciate anything that was done for him. February 13 a plaster cast was applied and kept on until his discharge February 25, one year after injury. He had no symptoms, walked without a limp, and voided freely and without pain.

Case II.—J. P., admitted October 30, 1914. Discharged December 15, 1914. He was knocked down and run over by an automobile.

On admission his temperature was normal. Pulse 100, and respiration 26. He complained of great pain in right hip. Right leg was rotated externally and abducted. Soon after admission he voided clear urine. There was considerable ecchymosis about the right inguinal region. Otherwise physical examination was negative. X-ray showed a linear fracture of the right ilium extending into the acetabulum, and epiphysial separation of the right ischium. A plaster cast was applied to the pelvis and extension to the right leg with sand-bags on either side. He was then placed on a Bradford frame. Five days after this his temperature began to rise and inspection disclosed a large abscess in the right inguinal region. This was incised and drained. December 10 the cast was removed and on the 15th he was discharged. At this time there was some limitation of motion in the right hip. The inguinal wound was healed.

One year later there was no deformity, he walked without a limp, and manipulations showed no limitation of motion in the right hip.

Case III.—J. B., aged sixty-five years, admitted November 25, 1917. Died December 21, 1917. Was in an automobile which was run into by a street car. Pain and loss of power in the left leg, and pain in the left hip. Examination showed an abrasion of scalp. Fracture of third and fourth ribs on left side at the costochondral junction. Left ilium was freely movable, and crepitation could be elicited over the symphysis. Temperature was 97°; pulse, 68; and respiration, 20. A diagnosis of fracture of the pelvis with rupture of the bladder was made. X-ray showed a fracture of the descending ramus of the left pubis with considerable separation and a fracture through the body of the left ilium.

November 25: Operation by Doctor Muller. Under spinal anæsthesia abdomen opened, but no intraperitoneal rupture of the bladder was found. The preperitoneal tissues were very much infiltrated with blood. Investigation in the space of Retzius showed the bone to be bare and a fracture of the descending ramus of the left pubis with about 1 to 2 inches separation of the fragments. A large amount of blood was evacuated and it was thought that the urethra was ruptured near the neck of the bladder. Rubber-tube drainage was inserted and the wound closed, with the intention later to do a perineal repair, perhaps accompanied by a suprapubic incision. The man was in bad shape all through the operation; caffeine and strychnine were given hypodermically and saline intravenously. Before closing the peritoneum 20 drops of adrenalin were introduced following the directions of Porter for the treatment of shock. He did fairly well following this operation, but continued to drain urine from the abdominal wound. On December 13 an unsuccessful attempt was made to introduce a tube in the bladder with a purse string, so a urethral catheter was connected with the drainage tube in the hope that permanent drainage would be obtained.

Urine examination showed amber, 1030; heavy cloud of albumin, no sugar. Many light and dark granular casts.

This man did very badly after the second operation, gradually sinking into a state of coma from which he never recovered.

Case IV.—Mrs. H., aged forty-seven years, admitted February 22, 1917, died February 23, 1917. She was knocked down and dragged by a street car. On admission she was in a very desperate condition. She had fractures of the right ilium, and sixth, seventh, and eighth ribs on the right side, depressed fracture of the skull in the right frontal region, fracture upper third of the right femur, compound comminuted fracture both bones of right leg in lower third, and contusions of the entire body. She never recovered from her shock and died about thirty hours after admission.

Case V.—J. P., admitted January 7, discharged January 22. Crushed between a crane and some heavy object. Chief complaint was pain in the region of the right hip. General condition was good. Redness and swelling over right hip, tenderness on pressure over the horizontal ramus of the right pubis. Movements of both hips painless; with finger in the rectum, pressure against the right descending ramus elicited tenderness. No blood in the urine or fæces. X-ray showed an impacted fracture of the horizontal and descending rami of the right pubis. There was no pain when lying perfectly quiet. A wide adhesive swathe was applied and the patient placed on a Bradford frame. He was discharged with his adhesive swathe in place and a belt prescribed. One year after he had no symptoms and walked without a limp.

Case VI.—B. T., aged thirty-nine years, admitted March 25, discharged April 22. Fell from the platform of a moving train and crashed into a fence. Admitted one hour after the accident.

Pain in region of left hip. Examination showed: Fracture nasal bone, abrasion and contusion of chest, tenderness in region of left anterior superior spine. Catheterized specimen showed no blood. X-ray showed a fracture of the left anterior superior spine and a split fracture of the left ilium vertically downward two and one-half inches from the crest of the ilium.

A plaster case was applied to the pelvis and he was placed on a Bradford frame. Case was removed three and one-half weeks later and he was discharged in four weeks. At this time he had no pain or tenderness over seats of fracture, but he had some difficulty in completely extending the thigh on the trunk (left). One and a half years later he was without any apparent deformity or functional abnormality.

Case VII.—M. P., aged thirty-one years, admitted November 30, discharged December 10. This case was most interesting because it disclosed a deformity due to a failure to diagnose the condition at the time of the accident.

C. C. Inability to walk without a support and shortening and weakness of the left leg.

He was a miner, and one year before, while lying on his side, a mass of slate fell and struck him on the left hip. He was treated in the local hospital for ten weeks for a fracture of the left femur. Had on a fracture box and extension. After his discharge he was

unable to walk without a support. Three months ago he was again put to bed with extension but with no improvement. When he was discharged after his first time in the hospital he complained of a numbness and coldness in the left foot. This has persisted up to the present time.

Examination disclosed a slight flexion and external rotation of the left thigh. Shortening of an inch and a half. When the leg is fully extended there is marked lordosis. There appears to be some ankylosis of the hip-joint. There is considerable atrophy of the entire left leg and thigh. Both knee jerks exaggerated. Area of greatly diminished sensation over the outer side of dorsum of left foot. And all the toes show distinct sensory impairment. Urine shows specific gravity 1026; no albumin, many hyaline, and light and dark granular casts. Neurological condition thought by the neurologist to be due to some injury of the spinal cord at the time of the accident. X-ray shows a penetrating fracture of the acetabular ring with the head of the femur jammed through.

CASE VIII.—E. S., aged twenty-nine years, admitted June 29, and died the same day. The steering wheel of a truck broke and it plunged through a bridge railing to railroad tracks 75 feet below, carrying the patient with it. On admission he was in a state of shock, but was conscious. There was some tenderness in the right hypochondrium and in the right costovertebral angle. Much swelling in the left inguinal region, and greatly abnormal mobility and crepitus in both ilia. In attempting to catheterize resistance was felt after passing into the perineum, and a few drops of blood flowed out. He died before operation was performed. A diagnosis of ruptured viscus with internal hemorrhage was made.

CASE IX.—A. S., aged thirty-eight years, admitted April 8, discharged April 22. C. C. Pain over sacral region and weakness of the right leg. March 24 he was thrown from a train to the roadbed and struck a rail in a sitting posture. He was taken to a hospital where he remained several days. Was admitted here through the surgical dispensary. He had no symptoms except those mentioned above. X-ray showed a fracture of the descending ramus of the right pubis without displacement. An adhesive swathe was applied to his pelvis and he was placed on a Bradford frame. At the end of two weeks he had no pain and his right leg was apparently normal.

One year later he had perfectly normal function in both legs, but complained of more or less pain over the sacrum in damp weather.

CASE X.—J. A., admitted November 1, and died the same day. He was admitted in an unconscious condition with a history of having been swept from the top of a train by a bridge. He had a large hæmatoma in the occipital region, was bleeding from the nose and ears and urethra. All reflexes were absent. There was some mobility over the right symphysis and a sense of bogginess just above the symphysis. He died three hours after admission. A diagnosis of fracture of the right pubis with extraperitoneal rupture of the bladder was made; also a fracture of skull.

CASE XI.—J. A., aged thirty-eight, admitted October 12, discharged April 2. Fell 35 feet when a scaffold on which he was working collapsed. Examination shows a punctured wound of the left heel, crepitus in left heel and considerable tenderness over lumbosacral region. There was no blood in urine. Chief complaint pain in back and in perineum. X-ray showed a fracture of the horizontal ramus of the left pubis and fracture of the left os calcis and left astragalus. He was incontinent of urine and a permanent catheter was inserted. An adhesive swathe was placed about his pelvis. The incontinence of urine persisted and he also lost control of his anal sphincter. His temperature began to rise and a yellow discharge from his penis caused considerable discomfort. October 29 a suprapubic cystotomy was done and considerable pus evacuated from his bladder. After this he felt better and his temperature dropped to normal.

November 17: Was still unable to void, so the suprapubic drain was allowed to remain in. Began irrigations of the bladder with boric acid, washing out considerable gravel and pus. He regained control of his anal sphincter.

January 1: The urine was clear and he was allowed out of bed; he walked fairly well. The suprapubic opening was still draining. February 10: Lost control of his anal sphincter again. Became very much discouraged.

February 23: Examination showed the urethra to contain many false passages, one of which communicated with the scrotum.

At this time he insisted on going home. Refused any further treatment whatever.

Unfortunately, this man had moved and we were unable to trace him to his new address.

CASE XII.—E. P., aged sixteen years, student, admitted February 26, discharged April 26. She was struck by a railroad train and was unconscious for two hours. There were no signs of a fracture of the skull. She could not sit up because of excessive pain within the pelvis. There was a compound fracture of both bones of the right leg in the lower third. A large bruise on the right hip. Measuring from right anterior superior spine to right interior mandibles was 3 to 4 inches shorter than the left side. The bases of Bryant's triangles were equal on both sides. There was no pain on moving the hips, but there was considerable pain on pressing both hips toward the midline. There was a fracture of the ninth, tenth, and eleventh ribs on right side. Tenderness over the left ulna about two inches below the olecranon. Urine was voided clear.

X-ray showed a subperiosteal fracture of the left ulna in upper third. Compound comminuted fracture of both bones right leg lower third. Fracture of horizontal ramus of both pubes with slight displacement.

The opening on the leg at seat of fracture was closed by suture and healed kindly.

March 6: Tibia was plated.

March 12: Temperature rose to 105°, and examination showed

tenderness and fluctuation over right trochanter. Investigation with needle showed pus; streptococcus pyogenes.

Exploratory laparotomy under N. O. anæsthesia and eucaine. Right rectus incision. Abdomen negative. Appendix removed. Incision in right hip between trochanter and crest of ilium, large collection of reddish fluid evacuated which had dissected its way upward and downward. It was not purulent in appearance and was probably a large retroperitoneal hæmatoma which got out by way of the lymphatics.

March 27: A large abscess developed in right gluteal region. It was incised and drained.

April she was discharged with all wounds healing by granulation. There was a cast on her right leg. There was 5/8 inch shortening in the right leg because of little callus formation at seat of fracture. All movements in region of right hip were normal.

Two years from the date of her discharge she was able, with the aid of an extra thick heel, to walk with almost no limp.

CASE XIII.—J. H., aged fifty-four, admitted July 14, discharged August 21. He had fallen from a scaffold and landed on his right hip. He had no cough or dyspnœa, nor did he complain of any pain in his chest. Chief complaint was pain in right hip and right groin. Could not void urine. Physical examination of his chest and abdomen was negative. He was perfectly conscious. There was quite an extensive bruise on right hip and his scrotum was swollen and ecchymotic. Catheterizing him, 200 c.c. of urine were withdrawn, which was very bloody.

A permanent catheter was placed in his bladder with a little difficulty and an adhesive swathe about his pelvis. He was placed on a Bradford frame. Ten days later the catheter was removed from his bladder and he was able to void thereafter without trouble.

He was discharged with no abnormal symptoms.

Two years after his discharge he could walk without any difficulty. But he complained of dribbling of urine for a short while after voiding. His prostate was considerably enlarged. Light massage and hot sitz-bath improved this condition, but he disappeared from observation before gaining any more headway.

CASE XIV.—M. K., aged forty-three, admitted January 11, discharged March 19. Chief complaint pain in left hip and in left side of abdomen. He was squeezed between two motor trucks which collided. He was conscious on admission; temperature, pulse, and respiration were normal. There was a severe contusion and abrasion over the crest of the left ilium. He voided clear urine and 8 ounces of boric acid solution injected into bladder was entirely recovered. X-ray showed a linear fracture of the left ilium extending from one inch behind the anterior superior spine downward to within one inch of the acetabulum.

A plaster cast was applied to his pelvis and he was placed on a Bradford frame.

When discharged he was able to walk without a limp and complained of no pain in the region of the fracture.

He returned to his former occupation of laborer and was able to do as much as before his injury.

One year later he was without pain and had no deformity.

CASE XV.—W. S., aged forty-five years, admitted August 15, died August 21. Chief complaint severe pain through the pelvis. In state of shock. He was knocked down by an automobile which ran over his lower abdomen.

He was tender over the lower abdomen, there was a sense of bogginess just above the symphysis; severe contusion of the back in the lumbar region; blood was dripping from his penis. He was catheterized and only one-half ounce of urine was obtained. Eight ounces of boric acid solution was injected into his bladder and only half of it returned. Therefore, a diagnosis of ruptured bladder was made.

He was given an intravenous infusion of saline and under ether a suprapubic incision was made. There was no intraperitoneal rupture of the bladder found, so the space of Retzius was investigated. There was found a collection of blood and urine and the fragments of a fractured right descending ramus were found. A couple of small loose pieces were removed and a rubber tube inserted for drainage. A suprapubic drain was placed in the bladder and a permanent catheter was placed in the urethra. He did very poorly after the operation; ran a continuously high temperature and was very flighty. Urine showed a heavy cloud of albumin and many granular casts. Two days after operation he began to drain pus from the opening in the space of Retzius. He died on the sixth day after admission from general sepsis.

CASE XVI.—Mrs. E. F., aged forty-one years, admitted September 14, discharged October 22. She was knocked down and rolled beneath a street car. She complained of great pain in both hips. Her temperature was 97°; pulse, 68; and respiration, 18. She had general contusions all over her body and was so sensitive that examination was very difficult. Pressure on both hips caused considerable pain in symphysis region, and she was very tender over both tuber ischii. Eight ounces of boric acid injected into bladder was fully recovered.

X-ray showed a fracture of the descending ramus of the right pubis and a fracture of both tuber ischii.

A plaster cast was applied September 20 and removed October 20. She was discharged October 22, walking normally, but complained of more or less pain on sitting down.

Two years after she was in good health and had no symptoms resulting from her accident.

CASE XVII.—A sailor on *U. S. S. Missouri*, age about twenty-five, was admitted 5.45 P.M. in state of profound shock, and died at 8.15 P.M. He had been dragged by a street car. The perineum was the seat of extensive lacerated wounds, there were abrasions of both

knees and an abrasion involving the entire front of the left thigh and the inner side of the left leg. All wounds were bleeding profusely; both ilia were freely movable and there was marked depression on both horizontal rami.

The wounds were packed with sterile gauze and he was given 600 c.c. of normal salt solution intravenously with 30 minims of adrenalin. He never rallied from his shock. Died about three hours after admission.

CASE XVIII.—G. F., aged thirty-seven years, admitted January 11, and died same day about eight hours later. Temperature on admission was 96°; pulse, 80; and respiration, 32. Injured in collision of two motor trucks. Abdomen was very rigid and his urine was bloody, only a few c.c. being obtained by catheter. Of 8 ounces of boric acid solution injected into the bladder only 2 ounces were recovered.

There was a depression over the horizontal ramus of the right pubis. He was given an intravenous injection of salt solution and taken to the operating room. A suprapubic incision was made; the abdominal wall was greatly infiltrated with blood from torn deep epigastric artery on right side. There was an intra- and an extraperitoneal rupture of the bladder. Peritonitis was present. The peritoneal cavity, the bladder, and the space of Retzius were drained with rubber tubing and the abdomen closed with through-and-through suture of silkworm gut. He never fully recovered from his anæsthetic, but died about three hours after operation.

CASE XIX.—T. McF., aged twenty-one, admitted April 19, discharged May 24. He was caught between a falling timber and the side of a freight car. On admission he complained of severe pain in the right side and the right iliac crest. His general condition was good; no evidence of a rupture of the bladder or urethra was found. A diagnosis of fracture of the right ilium was made and confirmed by X-ray. The fracture beginning 2 inches behind the anterior superior spine running down toward the acetabulum for about 3 inches.

An adhesive swathe was applied and he was placed on a Bradford frame. He made an uneventful recovery and was discharged walking normally and without any pain.

CASE XX.—F. F., aged thirty-six, admitted May 23, discharged July 10. He had been run down by a light motor car which passed over his lower abdomen.

He was in good general condition. There were abrasions of both hips and a swelling over the symphysis. He complained of some pain in right groin, especially when the hips were pressed together. He voided bloody urine. Eight ounces of boric acid solution was injected into the bladder and only 5 ounces was recovered.

A diagnosis of fracture of the right pubis with ruptured bladder was made and he was operated on immediately.

There was found a rupture of the bladder in the space of Retzius. This space was filled with clots and urine came from the wound in the bladder. The bladder wound was sutured and a rubber tube

drain placed in the space of Retzius. He made an uneventful recovery.

X-ray later disclosed a fracture of the descending ramus of the right pubis. We were unable to locate this man at the end of a year and a half.

CASE XXI.—F. T., aged fifty-four, admitted February 14, discharged March 25. He was struck on the side by a piece of falling timber. There was a large abrasion over the right hip; pressure on the right crest elicited exquisite tenderness. His general condition was very good; X-ray showed a fracture of the right ilium extending from the anterior superior spine downward and backward for a distance of 3 inches.

An adhesive swathe was placed around his pelvis. He was discharged in normal condition.

One year later he was without pain except in damp weather. He had no limitation of motion nor interference with locomotion.

CASE XXII.—T. T., a colored girl. Knocked down and dragged by a trolley car.

On admission she was in fairly good condition. There was a contusion of the left leg and hip; fracture of the left humerus. She was very tender over both ischii and over the symphysis.

X-ray showed a fracture of the left humerus, fracture of the left ischium, and fracture of the horizontal and descending rami of the left pubis.

She was placed on a Bradford frame and an adhesive swathe placed about her pelvis. There were no complications and she made an excellent recovery. On discharge she was able to walk without support but with a slight limp, favoring the left leg.

CASE XXIII.—T. L., white, a teamster. Admitted August 25, discharged October 10.

Received in accident ward slightly under the influence of alcohol. Gave a history of having been thrown from a wagon. He maintained that the wagon passed over his pelvis. On examination he was very apprehensive and very nervous. There were no signs of any grave injury. There were no evidences of a fracture of the pelvis or lower extremity. He voided urine freely and it contained no blood. He was admitted to the ward and put to bed.

The next day he complained that he had considerable pain in his left groin on walking.

X-ray disclosed a fracture of the horizontal ramus of the left pubis without displacement.

An adhesive swathe was applied and he was placed on a Bradford frame.

CASE XXIV.—W. L., aged forty-five, admitted January 30, discharged March 25. On admission temperature, 97.3°; pulse, 68; respiration, 20. While helping to move a heavy iron tub the hoisting chains broke and it fell, striking him in the back.

Abdomen was slightly distended and rigid, but not tender. Extremely tender over the left great trochanter and over the sym-

physis. There was a fracture of the middle of the shaft of the left femur with 1¾ inches of shortening.

He was put to bed with extension on the fractured leg and anti-shock measures instituted.

Next day X-ray showed a fracture of the left acetabular ring, a fracture of the horizontal ramus of the left pubis, and a fracture of the middle of the shaft of the left femur.

No urinary symptoms arose.

February 15: There was no shortening.

He was discharged walking on crutches.

CASE XXV.—H. B., aged twelve years, admitted May 12, discharged May 22. Knocked down by an automobile which ran over his right hip. On admission he was somewhat shocked. Temperature, 97°; pulse, 76; respiration, 20.

Could not stand and complained of great pain in the right iliac crest. Right thigh could be moved freely but with considerable pain. There were no urinary symptoms.

X-ray showed a linear fracture of the ilium extending from the crest downward toward the acetabulum. The lower half of the line of fracture split in two.

NOTE.—Between the time this paper was read and its being sent to the publisher, Cases XXII, XXIII, XXIV, and XXV were discovered in the records. This will bring the mortality down to 28 per cent., and add the following to the bones that were the seat of fracture: Ilium, 1; acetabulum, 1; left pubis, 3; left ischium, 1.

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