TRANSACTIONS
OF THE
PHILADELPHIA
ACADEMY
OF
SURGERY

VOL. XIX.

1917

ACADEMIA CHIRURGIAE PHILADELPHIENSIS · ARTI ET DOCTRINAE CHIRURGIAE · INSTIT. A.D. MDCCCLXXIX.

TRANSACTIONS

OF THE

PHILADELPHIA

ACADEMY OF SURGERY

VOLUME XIX

PHILADELPHIA
PRINTED FOR THE ACADEMY
1917

NOTICE

The present volume of *Transactions* contains the papers read before the Academy from January, 1916, to December, 1916, inclusive.

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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PHILADELPHIA ACADEMY OF SURGERY

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Office abolished after 1889 by amendment to By-Laws.

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ELECTED

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ELECTED

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With Recorder.

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1884–1891

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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

1905

WILLIAM J. TAYLOR
DEFORREST WILLARD
RICHARD H. HARTE

1900–1901

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J. EWING MEARS
J. CHALMERS DACOSTA

1910

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

1902–1904

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

1915

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

ACTIVE FELLOWS OF THE PHILADELPHIA ACADEMY OF SURGERY

1910.* Alexander, Emory G., M.D., 1627 Oxford Street. Clinical Professor of Surgery in the Woman's Medical College; Demonstrator of Fracture Dressings at the Jefferson Medical College; Surgeon to the St. Christopher's Hospital; Associate Surgeon to the Episcopal Hospital; Assistant Surgeon to the Kensington Hospital for Women; Surgeon to the Out-Patient Department of the Mary J. Drexel Home for Children.

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

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

1906. Ashhurst, Astley P. C., M.D., 811 Spruce Street. Instructor in Surgery in the University of Pennsylvania; Surgeon to the Episcopal Hospital; Surgeon to the Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases.

1915. Billings, Arthur E., M.D., 252 South 16th Street. Assistant Surgeon to the Bryn Mawr Hospital; Assistant Out-Patient Surgeon to the Pennsylvania Hospital; Chief Clinical Assistant in the Surgical Department B. of the Jefferson Hospital; Instructor in Surgery in the Jefferson Medical College.

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

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

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

1907. Carmany, Harry S., M.D., 366 Green Lane, Roxborough. Surgeon to St. Timothy's Hospital; Out-Patient Surgeon to the Episcopal Hospital.

1909. Carnett, John B., M.D., 123 South 20th Street. Associate in Surgery in the University of Pennsylvania; Chief Surgeon to the American Stomach Hospital; Surgeon to the Philadelphia General Hospital; Assistant Surgeon to the University Hospital; Consulting Surgeon to the Phœnixville Hospital and to the Phipps Institute.

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

1896. DaCosta, John Chalmers, M.D., 2045 Walnut Street. Samuel D. Gross Professor of Surgery in the Jefferson Medical College; Consulting Surgeon to the Philadelphia Hospital.

1896. Davis, Gwilym G., M.D., University of Pennsylvania, Goett. M.R.C.S. (Eng.), 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.

1896. Deaver, Henry C., M.D., 1415 N. Broad Street. Professor of Surgery in the Woman's Medical College; Surgeon to the Episcopal Hospital, to the Kensington Hospital for Women, and to the Children's Hospital of the Mary J. Drexel Home.

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

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

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

1916. Dorrance, George M., M.D., 2025 Walnut Street. Surgeon to the St. Agnes Hospital; Demonstrator of Applied Anatomy in the University of Pennsylvania; Consulting Surgeon to the Sacred Heart Hospital, Allentown, Pa.

1884. Dulles, Charles W., M.D., 4101 Walnut Street. Consulting Surgeon to the Rush Hospital.

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

1898. Frazier, Charles Harrison, M.D., 1724 Spruce Street. Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to the University and Philadelphia Hospitals.

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., 318 South 15th Street. Orthopædic Surgeon to the Abington Hospital; Assist-

‡ Non-Resident Fellow.

ant Surgeon to the Orthopædic Hospital; Assistant Surgeon to the Widener Memorial Industrial School for Crippled Children; Surgeon to the Orthopædic Department of the Episcopal Hospital.

1914. GINSBURG, NATHANIEL, M.D., 1704 Pine Street. Associate in Surgery in the Philadelphia Polyclinic; Assistant Instructor in Surgery in the University of Pennsylvania; Surgeon to the Jewish Hospital; Surgeon to the Mt. Sinai Hospital.

1902. GIRVIN, JOHN H., M.D., 2120 Walnut Street. Associate in Obstetrics in the University of Pennsylvania; Gynæcologist to the Presbyterian Hospital.

1892. HARTE, RICHARD H., M.D., 1503 Spruce Street. Associate Professor of Surgery in the University of Pennsylvania; Surgeon to the Pennsylvania Hospital; Consulting Surgeon to St. Mary's, St. Timothy's, the Bryn Mawr, and the Abington Hospitals.

1882. HEARN, W. JOSEPH, M.D., 2119 Spruce Street. Emeritus Professor of Clinical Surgery in the Jefferson Medical College; Consulting Surgeon to the Phœnixville Hospital and to the Peninsula General Hospital of Salisbury, Md.

1913. HEARN, WILLIAM P., M.D., 334 South 42d Street. Surgeon to the Philadelphia General 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.

1916. HIRST, BARTON C., M.D., 1821 Spruce Street. Professor of Obstetrics in the University Hospital; Gynæcologist to the Howard and Orthopædic Hospitals; Consulting Surgeon to the Lying-in Hospital, Newport, R. I., Hospital, and Pottstown, Pa., Hospital.

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

1898. HUTCHINSON, JAMES P., M.D., 133 South 22d Street. Surgeon to the Pennsylvania, Methodist Episcopal, and Bryn Mawr Hospitals.

1915. ‡ IVY, ROBERT H., M.D., First National Bank Building, Milwaukee, Wis.

1915. JONES, JOHN F. X., M.D., 1815 Spruce Street. Surgeon to the St. Joseph's Hospital; Surgeon to St. Vincent's Home; Clinical Assistant to the Jefferson 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, Children's, and Bryn Mawr Hospitals; Consulting Surgeon to the Philadelphia Home for Incurables.

† KEEN, WILLIAM W., M.D., LL.D. (Hon.), F.R.C.S. (Eng. and Edin.), 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; Ehren mitglied der deutschen Gessellschaft fur Chirurgie.

1914. KEENE, F. E., M.D., 116 South 19th Street. Instructor in Gynæcology in the University of Pennsylvania; Gynæcologist to the Chestnut Hill Hospital; Consulting Gynæcologist to the Abington Hospital; Assistant Gynæcologist to the University Hospital.

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

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

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

1914. LAWS, GEORGE M., M.D., 2033 Locust Street. Instructor in Surgery in the University of Pennsylvania; Instructor in Anæsthesia in the Presbyterian Hospital; Assistant Surgeon to the Out-Patient Department of the University Hospital; Dispensary Chief and Assistant in the Hospital for Diseases of Women and the Presbyterian Hospital; Assistant Surgeon American Stomach Hospital.

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

1910. LEE, WALTER E., M.D., 905 Pine Street. Surgeon to the Glen Mills School; Assistant Surgeon to the Germantown Hospital; Surgeon to the Out-Patient Department of the Pennsylvania Hospital; Surgeon to the Dispensaries of the Episcopal, Orthopædic, and Children's Hospitals; Assistant Surgeon to the Bryn Mawr Hospital.

1899. LOUX, HIRAM R., M.D., 1614 N. Broad Street. Professor of Genito-Urinary Surgery in the Jefferson Medical College; Surgeon to the Philadelphia General Hospital.

1900. MARTIN, EDWARD, M.D., 1506 Locust Street. John Rhea Barton Professor of Surgery in the University of Pennsylvania; Professor of Clinical Surgery in the Woman's Medical College; Surgeon to the University of Pennsylvania, Howard, and Mt. Sinai Hospitals; Consulting Surgeon to the Bryn Mawr, Wernersville, and Norristown Hospitals.

1915. MERRILL, WILLIAM JACKSON, A.B., M.D., 1927 Chestnut Street. Instructor in Orthopædic Surgery in the University of Pennsylvania; Assistant Orthopædic Surgeon to the University, Howard, and Jewish Hospitals; Consulting Orthopædic Surgeon to the Germantown Hospital.

1907. MILLER, MORRIS BOOTH, M.D., 2117 Pine Street. Professor of Surgery in the Philadelphia Polyclinic and College for Graduates in Medicine; Consulting Surgeon to the Douglas Hospital.

1904. MITCHELL, CHARLES F., M.D., 332 South 15th Street. Surgeon to the Germantown and Bryn Mawr Hospitals; Surgeon to the Out-Patient Department of the Pennsylvania Hospital; Consulting Surgeon to the Eastern State Penitentiary.

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

1902. MUTSCHLER, LOUIS H., M.D., 2030 Tioga Street. Surgeon to the Episcopal Hospital; Assistant Surgeon to the Orthopædic Hospital.

1905. NASSAU, CHARLES F., M.D., LL.D., 1831 Chestnut 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. Consulting Surgeon to the Pottstown Hospital.

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

1906. ‡NORRIS, HENRY, M.D., Rutherfordton, North Carolina.

1915. OWEN, HUBLEY R., M.D., 319 South 16th Street. Chief Surgeon, Bureau of Police and Fire; Surgeon to the Philadelphia Hospital; Assistant Surgeon to the Orthopædic Hospital; Assistant Surgeon to the Medical Reserve Corps of the United States Navy.

1912. PFEIFFER, DAMON B., M.D., 2028 Pine Street. Instructor in Surgery in the University of Pennsylvania; Director of the Clinical Laboratory in the Presbyterian Hospital; Surgeon to the Abington Memorial Hospital; Assistant Surgeon to the University Hospital; Assistant Surgeon to the Out-Patient Department of the German Hospital.

1916. RANDALL, ALEXANDER, M.D., 1831 Chestnut Street. Assistant Surgeon to Out-Patient Department University Hospital; Assistant Surgeon to the Genito-Urinary Service Philadelphia General Hospital; Consulting Surgeon to the Germantown Hospital; Assistant Instructor in Surgery in the University of Pennsylvania.

1890. ROBERTS, JOHN B., M.D., 313 South 17th Street. Professor of Surgery in the Philadelphia Polyclinic.

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

1913. RODMAN, JOHN STEWART, M.D., 2106 Walnut Street. Assistant Surgeon to the Presbyterian Hospital.

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

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

1894. SHOEMAKER, GEORGE ERETY, A.M., M.D., 1831 Chestnut Street. Gynæcologist to the Presbyterian Hospital; Consulting Surgeon to the Woman's Hospital.

1903. SITER, E. HOLLINGSWORTH, M.D., 1818 S. Rittenhouse Square. Instructor in Genito-Urinary Diseases in the University of Pennsylvania; Genito-Urinary Surgeon to the Philadelphia General Hospital; Chief Surgeon to the Out-Patient Department for Genito-Urinary Diseases in the University Hospital.

1913. SKILLERN, PENN GASKELL, JR., M.D., 241 South 13th Street. Instructor in Anatomy in the University of Pennsylvania; Instructor in Surgery in the Philadelphia Polyclinic; Surgeon, Polyclinic Hospital; Surgeon to Douglas Hospital.

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

1898. SPELLISSY, JOSEPH M., A.M., M.D., 317 South 15th Street. Orthopædic Surgeon to St. Joseph's Hospital; Physician in Charge of Photo A Department in the University Hospital; Orthopædic Surgeon to St. Edmund's Home for Crippled Children.

1911. STELLWAGON, THOMAS C., JR., M.D., 1831 Chestnut Street. Assistant Professor of Genito-Urinary Surgery in the Jefferson Medical College; Assistant Surgeon to the Philadelphia Hospital; Assistant Genito-Urinary Surgeon to the Jefferson 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.

1908. SWEET, J. EDWIN, A.M., M.D., 301 St. Mark's Square. Assistant Professor of Experimental Surgery in the 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 and to the Woman's Hospital.

1911. THOMAS, BENJAMIN A., M.D., 116 South 19th Street. Professor of Genito-Urinary Surgery in the Philadelphia Polyclinic and College for Graduates in Medicine; Instructor in Surgery in the University of Pennsylvania; Surgeon-in-Chief to the Out-Patient Department of the University Hospital.

1911. THOMAS, THOMAS TURNER, M.D., 2005 Chestnut Street. Associate Professor of Applied Anatomy in the University of Pennsylvania; Associate in

Surgery in the University of Pennsylvania; Surgeon to the Philadelphia 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; Genito-Urinary Surgeon to the Samaritan and Garretson Hospitals.

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

1902. WHITING, A. D., M.D., 1523 Spruce Street. Medical Director of the Germantown Hospital; Surgeon to the Germantown Hospital; Surgeon to the Southern Home for Destitute Children; Surgeon to the Home for the Training in Speech of Deaf Children; Assistant Surgeon to the German Hospital; Surgeon to the Out-Patient Department of the German Hospital.

1890. WILSON, H. AUGUSTUS, M.D., 1611 Spruce Street. Professor of Orthopædic Surgery in the Jefferson Medical College; Emeritus Professor of Orthopædic Surgery in the Philadelphia Polyclinic; Consulting Orthopædic Surgeon to the Lying-in-Charity Hospital and to the Kensington Hospital for Women.

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

1902. YOUNG, JAMES K., M.D., 222 South 16th Street. Professor of Orthopædic Surgery in the Philadelphia Polyclinic; Associate Professor of Orthopædic Surgery in the University of Pennsylvania; 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 FORREST 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.

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.		
1881	*Sir James Paget	London, England.
1881	*Theodor Billroth	Vienna, Austria.
1881	*Bernhard von Langenbeck	Berlin, Germany.
1881	*Willard Parker	New York, N. Y.
1881	*Lewis A. Sayre	New York, N. Y.
1881	*Moses Gunn	Chicago, Ill.
1881	*John T. Hodgen	St. Louis, Mo.
1881	*W. W. Dawson	Cincinnati, Ohio.
1881	*T. G. Richardson	New Orleans, La.
1881	J. Collins Warren	Boston, Mass.
1881	*W. T. Briggs	Nashville, Tenn.
1881	*Christopher Johnston	Baltimore, Md.
1881	*D. W. Yandell	Louisville, Ky.
1898	*Maurice H. Richardson	Boston, Mass.
1898	George M. Sternberg	Washington, D. C.
1898	*Charles B. McBurney	New York, N. Y.
1898	*Nicholas Senn	Chicago, Ill.
1898	*Theodore F. Prewitt	St. Louis, Mo.
1898	L. McLane Tiffany	Baltimore, Md.
1898	*Nathaniel P. Dandridge	Cincinnati, Ohio.
1898	*Roswell Park	Buffalo, N. Y.
1898	Robert F. Weir	New York, N. Y.
1898	Frederick S. Dennis	New York, N. Y.

* Deceased.

1900 W. H. A. JACOBSON.....London, England.
1900 THEODOR KOCHER.....Berne, Switzerland.
1900 VINCENZ CZERNY.....Heidelberg, Germany.
1906 WILLIAM J. MAYO.....Rochester, Minn.
1906 DUDLEY P. ALLEN.....Cleveland, Ohio.
1906 ROBERT ABBE.....New York, N. Y.
1906 C. B. G. DE NANCREDE.....Ann Arbor, Mich.
1907 *JOHN C. MUNRO .....Boston, Mass.
1908 J. EWING MEARS.....Philadelphia, Pa.
1909 STEPHEN PILCHER .....Brooklyn, N. Y.

CONTENTS

TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

STATED MEETING, HELD JANUARY 3, 1916

The President, DR. JOHN H. GIBBON, in the Chair

CARCINOMA OF UNDESCENDED TESTICLE

DR. CHARLES F. NASSAU reported a case of carcinoma of an undescended testicle occurring in a man aged forty-one years, who was operated upon in January, 1912, and is still living, indicating that carcinoma of a testicle is probably not as fatal a condition as sarcoma.

Three months before admission he had an attack of pain in lower abdomen, with inability to empty bladder. Left testicle is not palpable in canal or scrotum. Admitted to hospital June 15, 1912, with another attack of pain in pelvis, with inability to empty bladder. There was a large freely movable firm mass present in the abdomen above the pubes. No testicle could be felt in scrotum or canal on left side. Rectal examination: Large freely movable mass palpable in pelvis.

An incision, 5 inches long, made through left rectus, exposed a large mass which proved to be the testicle. It was delivered, pedicle tied off and tumor cut away. Peritoneum was sewed over the stump. No glands palpable. Appendix was found to be inflamed and it was removed.

The tumor was an ovoidal mass, measuring 10 x 7.5 x 5 cm., weight 547.5 gms. Pathologist report: Scirrhous carcinoma. About the middle of the specimen is a whitish constricting band. The specimen is smooth, moist, glistening and firm to the touch. Incision meets with no resistance, revealing moist, lobulated, glistening yellowish-white tissue. Thin serum can be expressed from the entire surface.

PSEUDO-DIVERTICULUM OF GALL-BLADDER

DR. GEORGE G. ROSS gave the history of a woman, aged forty-four years, who, three weeks subsequent to an operation for acute appendicitis, developed an acute cholecystitis. On November 23, 1915, she was operated on through a right rectus incision. The gall-bladder was free

from adhesions. It seemed to empty itself on pressure, and outside of some thickening of the wall did not seem to be badly damaged. As the history and symptomatology, including a cholesterin test, were so positive a cholecystectomy was done. When the gall-bladder was opened it was found to be a typical strawberry bladder at the fundal end. At the fundus near the attachment to the gall-bladder a marsupial-like pouch was discovered. The opening was patulous and the pocket appeared to be about one inch deep. The mucous membrane surrounding the orifice of this pouch was the point of the most intense inflammation.

Pathological examination by Dr. Allen J. Smith. In his opinion this pouch was probably an acquired and not a congenital one. The pouch (not a diverticulum) was over a centimetre in diameter and communicated with the general cavity of the gall-bladder by a short, narrow mouth. It was lined by continuation of the mucosa of the bladder and was the seat of marked hyperæmia. The wall of this pouch of the gall-bladder was incised in the longitudinal line of the pouch; and a portion of the tissue on one side of this incision was prepared for microscopic examination.

On examination one side only (thought to be that which corresponds with the interior of the bladder proper) shows a mucosal surface, thin, with villous prolongations, its epithelium largely desquamated and that which remains low, cuboidal, and degenerative. No such appearance is seen on the opposite (corresponding with the lumen of the pouch) side, this surface being free from epithelium and finely fringed with loosened fibrous tissue (artificial tearing or material?). A layer of smooth muscle underlies the mucosal surface (but not the outer surface). Beyond this muscle the tissue to the free surface (of pouch?) is made up of a loose fibrous tissue. The latter is not as dense as one is accustomed to see in a scar but might have been produced by inflammatory change.

The general appearances can be best tentatively explained by supposing that an inflamed and ulcerous surface has had overhanging mucosal borders, that these later adhered to the interior of the pouch thus formed, healed, with a persisting track into the gall-bladder, but the epithelium of the gall-bladder failed to grow into and line the cavity.

FOREIGN BODY IN ELBOW-JOINT (MOUSE)

Dr. Ross presented a man, aged thirty years, who two years ago while pitching ball says he felt something crack in his elbow. He had to stop pitching for the rest of the season. The following season he pitched some although his elbow continued to hurt him. About four

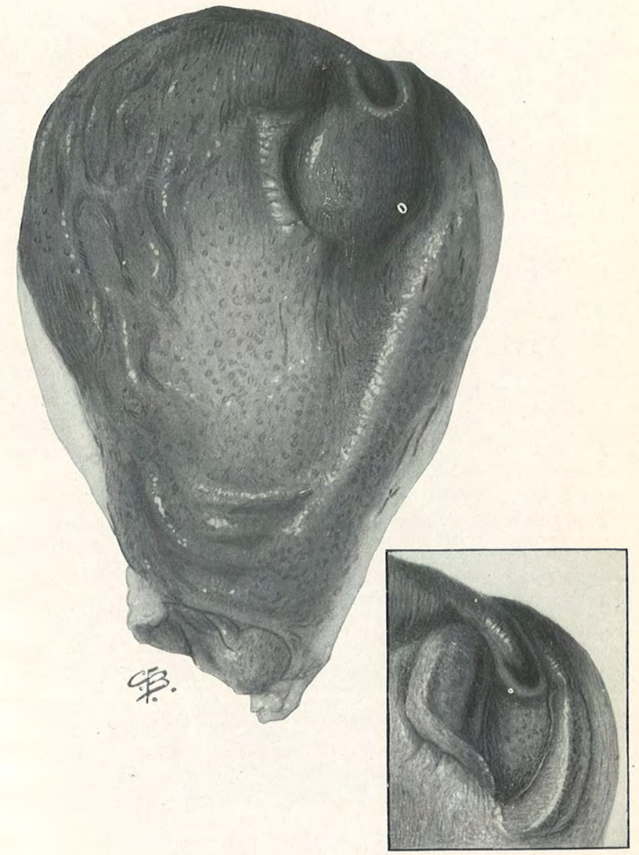


Fig. 1.—Pouch of gall-bladder.

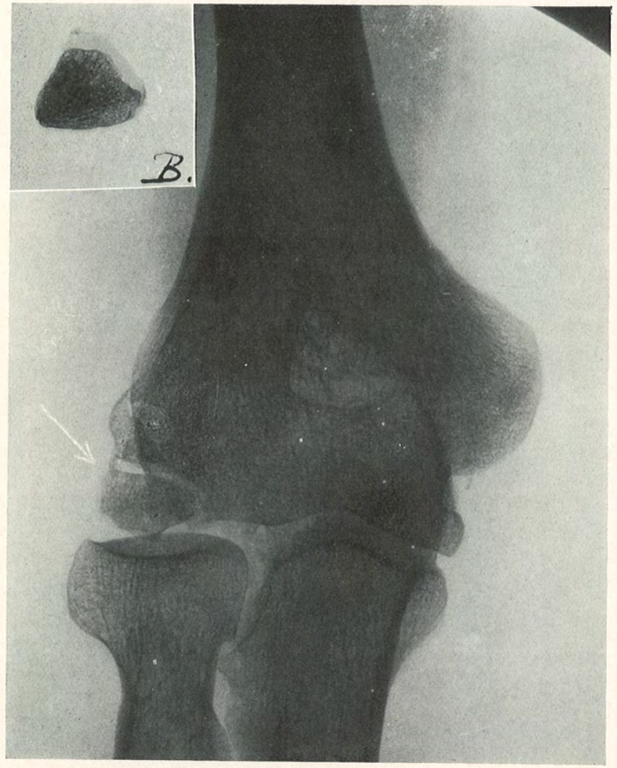


FIG. 2.—Bit of the external condyle broken off, and forming a loose body in the elbow-joint. *B*. the fragment removed.

months ago he bumped the elbow and felt something loose, after this, in the outer side of the joint. An X-ray of the elbow a week ago showed a fracture of the external condyle of the humerus. On the outer side of the elbow just above the joint can be felt a small movable body about the size of a hazel-nut. This is hard and slips when the arm is moved.

Through an incision made over the mass it was easily found and removed. It proved to be a piece of bone the size of a hickory nut, covered with cartilage. It was unattached and was to the outer side of the external condyle.

A perfectly normal functional result was secured.

DR. JOHN H. JOPSON said that Dr. Ross's case of "joint mouse" belongs to that group of cases of fracture of the capitellum which has been especially studied by Kocher and Lorenz, to which he alluded in his paper on that subject published two years ago, and called by them "fractura capituli humeri partialis," in contradistinction to the larger group of fractures of the capitellum in which there is a splitting off in whole or in part of that articular prominence. In the first group the injury partakes of the nature of partial or complete avulsion of the cartilage covering the capitellum, to which portions of the spongy tissue of the bone may also adhere. Kocher has reported four cases and Lorenz two cases of this injury.

It is of infrequent occurrence and in the majority of cases is due to indirect violence, possibly, as Kocher points out, by traction through the anterior capsular attachments pressing backward on the cartilage and prying it off, as when the injury occurs while lifting with the forearm extended. The X-ray shows, as in Dr. Ross's case, irregularity in outline of the normal shadow of the capitellum. Treatment, of course, is by incision and removal of the fragment, which in all of the cases reported has given uniformly good results.

STATED MEETING, HELD FEBRUARY 7, 1916

The President, Dr. Charles H. Frazier, in the Chair

TOTAL CYSTECTOMY ONE AND A HALF YEARS AFTER OPERATION

Dr. B. A. Thomas presented a man, aged forty-two years, who was first cystoscoped by him January 23, 1912, on account of frequency of urination and dysuria. At that time small nodules or tubercles were discovered on the posterior aspect of the vesical sphincter. A few days later these were removed and a pathologist reported them to show "inflammatory changes but no evidence of tuberculosis." The patient was temporarily relieved but in a few weeks his symptoms returned with greater severity, and he was treated for over a year by several physicians, being cystoscoped frequently, both with and without general anæsthesia. His treatment consisted mainly of prostatic and vesical neck "punch operations," "fulgurations" or high frequency electro-coagulation, suprapubic cystotomy, etc. On September 30, 1913, he again came under the care of Dr. Thomas. At this time the patient's condition was deplorable. He was obliged to urinate very frequently with excruciating pain; had been utterly incapacitated from work for a year and a half, and threatened suicide.

Cystoscopy done at this time at the Polyclinic Hospital revealed multiple, variously sized, small tumor formations completely covering the trigonum and vesical neck, obscuring the ureteral orifices from view (Fig. 1). A few of these growths were removed by the cystoscopic rongeur for histo-pathological examination, and were reported by Dr. John A. Kolmer to be "inflamed polypi." On November 11, the bladder was opened suprapubically and the entire trigonum and vesical orifice thoroughly cauterized with the actual cautery. The patient was relieved for a month or six weeks, when his symptoms returned, and cysto-urethroscopy demonstrated the presence of reforming polypi about vesical orifice and in prostatic urethra. In view of the generally poor results following ureteral transplantation into the rectum, it was decided to perform bilateral nephrostomy, supplemented by total cystectomy. The left kidney was nephrostomized January 13, 1914; the right, February 24. The patient was markedly relieved after these operations for several months, save that he had to have his left ureter re-ligated with silk, the original catgut ligature becoming absorbed and permitting

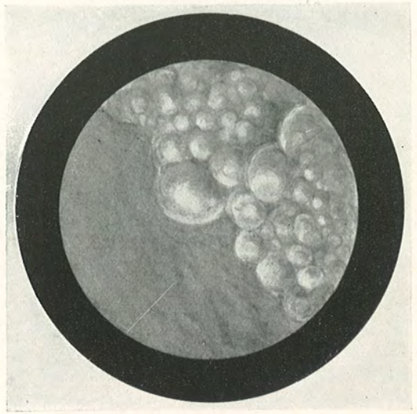
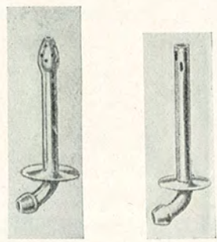


Fig. 1.—Cystoscopic appearance of multiple inflamed polypi covering trigonum and vesical orifice.



A *B*

Fig. 2.—One or the other of these sterling silver tubes is placed in the renal fistula and the tract permitted to granulate around it. Should phosphatic incrustations occur to interfere with the drainage, the tube must be removed for cleansing; in which event the bulbous expansion is not practicable, and tube *B* should be substituted and held in position by adhesive plaster. In order to make the drainage water-tight, the tube may be expanded conically for a short distance above the circular flange.

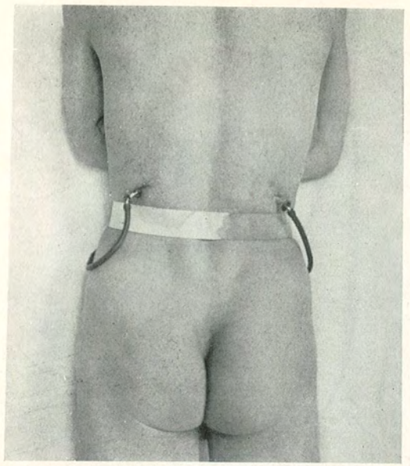


FIG. 3.—Posterior view of renal drainage apparatus. The silver tubes here shown are the same as *A* in Fig. 2. By expanding the tube near the flange and securing same close to the skin, the apparatus may be made almost, if not quite, water-tight.

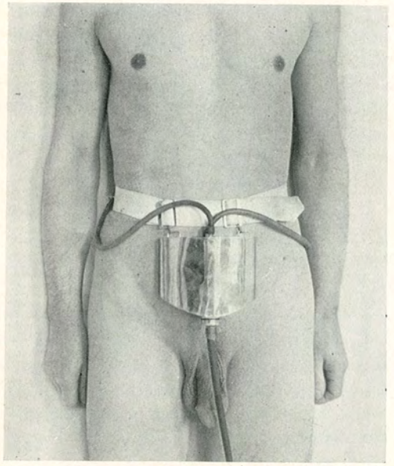


FIG. 4.—Anterior view of drainage apparatus, showing receptacle suspended over suprapubic region. The tubing attached to the bottom of the reservoir may or may not be utilized.

FIG. 5.—Carcinoma of penis of nine months' duration. Observe metastasis to right inguinal lymph-node.

FIG. 6.—Appearance of external genitalia four and a half years after amputation of penis for carcinoma. Patient can urinate in erect posture quite satisfactorily.

of partial patency of the ureter. On November 6, 1914, total cystectomy was done, the patient showing a remarkable convalescence. Four months later he began to complain of discomfort in the perineum and pain, referred down the urethra, associated with a slight mucopurulent discharge from the meatus. Suspecting involvement of the prostatic urethra and realizing from the beginning that the prostate was very slightly enlarged, a radical perineal extracapsular prostatectomy and posterior urethrectomy were performed. In order to minimize the danger of recurrence of these growths, 50.5 mg. of the element radium were implanted deeply in the perineum for 48 hours.

The renolumbar fistulæ have been fitted with sterling silver tubes (as shown in Fig. 2). These are connected with light rubber tubing to a flat metal receptacle suspended over the suprapubic region (Figs. 3 and 4). Thus equipped this man has been in good general health and practically free from pain for months; has little difficulty in keeping himself dry; requires dressing but once a week, excepting what he can do himself; goes about in- and out-of-doors at his leisure, and is able to do light work in comparative comfort.

The reporter thought this case to be worthy of record, not only as vindicating the feasibility of Watson's suggestion made in 1906, but because it marks the first instance in which the procedure has been successfully accomplished, and illustrates the practicability of the utilization of a satisfactory renal drainage apparatus.

AMPUTATION OF PENIS FOR CARCINOMA: CONDITION FOUR AND A HALF YEARS AFTER OPERATION

Dr. B. A. Thomas presented a man, aged fifty-eight years, who came to the Polyclinic Hospital in October, 1911, with a typical carcinoma of the glans penis, involving the urethra, with metastasis to the inguinal lymph-nodes on the right side (Fig. 5). He stated that he had noticed the lesion on penis for nine months. The inguinal lymph-nodes in both groins were thoroughly removed and the penis amputated as close to the pubic arch as possible. Dr. John A. Kolmer, who examined the specimens pathologically, reported "carcinoma of the penis with metastasis to at least one lymph-node."

The patient convalesced satisfactorily and when seen last, February 7, 1916, had gained 40 pounds in weight, enjoyed excellent health, worked every day, and showed no signs of recurrence or metastasis (Fig. 6).

The case is of interest, first, owing to the fact that the patient has been free of any signs of recurrence or metastasis for 4½ years, although

at the time of operation metastasis was present in the inguinal lymph-nodes; second, because complete extirpation of the penis with perineal urethrostomy was not done, necessitating the patient to sit down in order to urinate; and third, because the patient can urinate quite satisfactorily in the standing posture.

Dr. E. H. Siter said that of 12 cases of cancer of the penis that had been under his observation, 2 were inoperable; 10 were operated upon. In 2 of these operated cases an amputation was done and in the other 8 a total extirpation, including the scrotum. The best interests of the patient in these operations, he thought to be served when the urethra is brought out in the perineum. There is better control and no excoriation. After total extirpation of the entire genitalia there was a smaller percentage of recurrence.

Some five years ago he operated upon 2 cases in Blockley, doing a total extirpation. These patients he had seen within six months and they have had no recurrence. Where only an amputation was done he had invariably had recurrence.

Dr. Alexander Randall said that carcinoma of the penis presents many phases of difference from carcinoma elsewhere. Metastasis and the time of recurrence in carcinoma of the penis are apparently very late. The apparent immunity of the circumcised is peculiar to all. In 100 cases reported by Barney in the Annals of Surgery for 1907, some interesting points were brought forward. He found 85 per cent. of the cases had congenital phimosis, about 60 per cent. had carcinoma in the inguinal glands, and that 75 per cent. had enlarged inguinal lymph-glands. The growth was an epithelioma in practically every case. There were 26 recurrent cases in this series. Under one year there were 12 cases, or 39 per cent.; from 1 to 2 years, 6 cases, or 19 per cent.; from 2 to 3 years, 5 cases, or 16 per cent.; 3 to 4 years, 2 cases, or 6 per cent. In from 4 to 5 years there were no recurrences. After five years there was recurrence in 12 per cent. He likewise shows that a patient may live over 11 years from the time of onset of the cancerous growth. The operation of choice is the operation of Nicoll, published in 1909, which is more surgically a cancer operation like that used in carcinoma of the breast, because he takes out the inguinal glands and lymph-channels down to the dorsum of the penis and the penis itself, all in one piece, starting outside the zone of cancer and working towards the primary growth, making a complete resection of all involved tissue. This is the ideal operation, rather than that of amputation of the penis, and just a single excision of the glands on either side, through separate incisions.

FRACTURE OF FIRST LUMBAR VERTEBRA WITHOUT NERVE SYMPTOMS

Dr. Francis Olcott Allen said that among the patients at the Insane Department of the Pennsylvania Hospital there was found a woman of forty, small, slightly built, but physically well. About midnight, June 18, 1915, she managed to get out of a second-story window and dropped to the ground, some twenty or twenty-five feet below. From an examination of the soft earth under the window, it was apparent that she had landed on her feet and then on her buttocks. She got up and made her way across the grounds for a distance of several hundred feet. She was then overtaken, brought back and put to bed.

He saw her about an hour and a half after this escapade. She was sitting up in bed, talking incessantly, entirely preoccupied with her own ideas, and paying no attention to the severe injury she had sustained. Examination revealed a marked swelling of the soft parts in the lumbar region, with a distinct kyphosis. This area was tender and gave some pain on certain motions of the trunk. No paralysis or other signs of a cord lesion could be made out. A skiagram was taken the next day and showed a fracture of the first lumbar vertebra. Owing to the disturbed mental state the patient was allowed to do as she pleased, as far as her injury was concerned, sitting up in bed most of the time, until she was able to be about. Her mind gradually recovered and she returned to her home, where she now is assisting her husband in a bakery. At a further examination made January 17, 1916, just seven months after injury, there was found a distinct kyphosis in the region of the first lumbar vertebra, with ankylosis of the adjacent spine. There was some tenderness over the spine just below the kyphosis, but no other physical findings were noted. The patient said that her injury did not prevent her from doing her work or anything she wanted to do. She complained of some pain in the lumbosacral region, of a sense of weakness when she did not wear corsets, and of her back feeling tired at night after doing her work in the bakery. Dr. Bowen reports on a skiagram made the same day:

The body of the first lumbar vertebra is considerably deformed but there is no evidence of the previous line of fracture. This vertebra will eventually be ankylosed with the twelfth dorsal and the second lumbar. A considerable part of that process is already accomplished.

The interesting feature of this case is, of course, that the cord and spinal nerves escaped even temporary injury. The spinal cord proper ends at the level of the lower part of the first lumbar vertebra, but

through the canal of the first lumbar there also pass the nerves supplying sensation as high as the groin, and motion to the legs below the knees, as well as control of the bladder and rectum. In injuries of this portion of the spine, some or all of these functions are usually affected, and it is extraordinary that, in as marked a bony lesion as this patient presents, there should not be sufficient impingement upon the canal to cause pressure upon the nerve structures.

Dr. Henry R. Wharton had had under his care two cases of fracture of the lumbar vertebræ which presented no marked symptoms of spinal injury. One was the case of a young woman of eighteen years of age who fell under a trolley car. There was marked kyphosis and a little evidence of loss of power in the lower extremities; some anæsthesia of the anterior surface of the thighs. The other case was that of a woman of twenty-five who jumped out of a burning apartment house in West Philadelphia, alighting on a bank of snow. He saw her a short time after the accident. There was fracture of the second lumbar vertebra, as shown by X-ray examination, and marked kyphosis. The only symptom of spinal injury was anæsthesia of the anterior surface of the thighs. Dr. Burr saw the latter case with him and found no evidence of spinal injury except the skin anæsthesia previously noted. Both patients made good recoveries and have good use of their limbs. He had seen both within a year. They walk perfectly well, although they still have marked kyphosis in the lumbar region at the site of injury and have slight rigidity of the spine in bending. Otherwise their conditions are excellent.

CASE OF HERMAPHRODITISM

Dr. Francis Olcott Allen gave the history of a second patient, a woman of forty-three, unmarried, an inmate of the Insane Department for many years, suffering from dementia præcox. Double inguinal hernia had been present since infancy. She had never menstruated, and vaginal examinations, the first when she was fourteen years old, showed that neither cervix nor uterus was palpable. When Dr. Allen saw her, on June 25, 1915, she had been ill for two days with an attack of vomiting and apparent abdominal discomfort. Her mental condition was such that it was not possible to be sure of her subjective sensations. She had had similar attacks before, but none so severe as the present one. On examination there seemed to be tenderness in the lower right abdomen, but whether its seat was in the inguinal or the appendiceal region could not be determined. There was no muscular rigidity, nor was any hernia discoverable in her recumbent position. Her temperature was 101°

and there was a leucocytosis of 17,000; 86 per cent. polymorphonuclear. He operated upon her the same day, removing a normal-looking appendix, which was later reported to show, microscopically, a chronic inflammation. On exploring the pelvis, no uterus, tubes, or ovaries could be found. At each internal ring there was a small body about the size of an ovary. His incision was through the right rectus, so that he could do no more than determine the presence of such a body on the left side. The one on the right side slipped readily in and out of the ring and was evidently the content of the hernia. He decided to remove this organ in order to prevent the recurrence of the hernia, and in doing so found that it was retroperitoneal; that extending from it into the inguinal canal there was a band of tissue; that a duct-like cord ran retroperitoneally toward the midline; and that another duct-like structure, also retroperitoneal, passed upward, under the cæcum, toward the kidney. There were no signs of peritoneal inflammation, past or present, and these three attachments were not adhesions but definite structures. The peritoneum was divided, the three structures mentioned ligated and cut, and the organ removed. The peritoneum was sutured over the uncovered surface and the abdominal wound closed.

The patient recovered and returned to the Insane Department, where she still is. She has not had any attacks of vomiting, such as she formerly had, and is physically well. Her mental state is unchanged.

The organ removed is described by Dr. Orton, of the Laboratory of the Insane Department, as follows:

Specimen consists of a mass of tissue of irregular form partially covered with serous membrane and made up of two closely associated masses. One of these is a roughly oval mass about 2.5 by 1.7 by 1.6 cm. in size and closely associated with a larger, more irregular, mass. Partly encircling the smaller mass and attached to it at either end is a cord-like or tubular structure varying in diameter from 2 to 6 mm.

Gross Appearance.—On section the smaller oval mass has a whitish, coarsely granular appearance, characteristic of a section of testicle, while the mass below shows numerous large vessels and a moderate amount of rather intense congestion.

Microscopic Examination.—Small pieces of the smaller mass fixed in Zenker's fluid and in formalin. Remainder fixed *in toto* in Kaizerling.

Zenker fixation, paraffin sections, eosin and methylene blue stain: Section is covered on one side by heavy fibrous tissue capsule. Main portion is made up of tubular structures between which lie many close-packed masses of cells. The tubules are made up of light connective-tissue strands, containing, for the most part, loosely grouped, rather indefinitely formed cells with relatively few and rather small nuclei. In many instances the tubules are more or less filled with this material; in others, it forms a distinct parietal zone surrounding a lumen and with a general radial arrangement of protoplasm and nuclei.

In general, the microscopic picture of this section conforms entirely with that of a cryptorchid testis from a male or with the advanced stages of testicular atrophy seen as a result of hypophysectomy, in both of which there is complete or almost complete absence of cells of the spermatogenic series, but with the preservation of the tubular connective-tissue reticulum, in whose lumina lie the more or less altered remains of cells, which probably represent the sustentacular cells of Sertoli, and with a striking complement of the interstitial cells of Leydig.

This histologic diagnosis is borne out by the anatomic relations I have described—the gubernaculum passing ahead of the testicle into the inguinal canal and the vas deferens inward toward the seminal vesicles behind the rectum. The other duct-like structure running toward the kidney can be explained by assuming a persistent embryonic Müller's duct.

An examination of the patient's external genitalia and secondary sexual characters showed no evidence of even a tendency to masculinity. The bony frame was small; the distribution of hair typically feminine; the breasts as well developed as those of normal single women of the same age and build; the vulva, nymphæ, and urethra normal in appearance; the vagina of fair size, ending in a blind pouch; the clitoris not enlarged.

On the accepted theory that the internal secretion of the genital gland is the determining factor in the secondary sexual manifestations, this individual would be expected to be masculine in type. The only way to account for the findings as they are is to assume that ovarian tissue is also present and functionally predominant. It may be that the organ at the left ring is an ovary, though it seemed at operation precisely like the one removed. Or there may be ovarian tissue elsewhere, which was not found at operation. There are other cases recorded in which both testicular and ovarian tissues were present.

This patient's family history is very curious in connection with her own genital anomaly, and suggests a possible hereditary factor in her case. Her maternal grandmother was one of a large family, among whom two married sisters had no children. Her mother was one of seven sisters and two brothers. Of these, three sisters never menstruated. One of the three was examined some years ago and was found to have "testicles." What such a report means is, of course, uncertain, but it indicates some anomalous condition. The patient herself is the only abnormal member of her immediate family, both of her sisters having normal menstruation, and one of them a normal child.

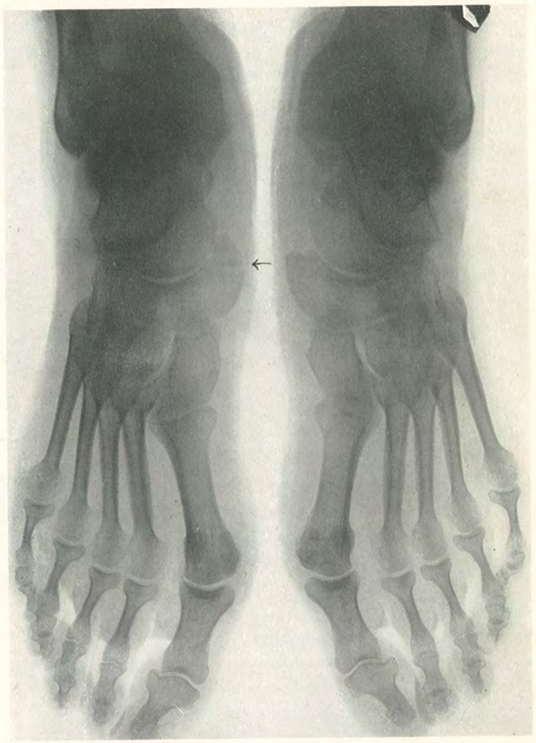


FIG. 7.—Fracture of tuberosity of scaphoid of foot by muscular action.

FRACTURE OF THE TUBEROSITY OF THE SCAPHOID OF THE FOOT BY MUSCULAR ACTION

Dr. George Erety Shoemaker described an unusual variety of injury which simulates a sprain of the foot, but in reality is a more serious lesion. The patient was a normal young woman of thirty years, lately convalescent after a pregnancy, but otherwise well. The injury was occasioned by so slight an application of force as stepping from an automobile to the pavement, where a slight irregularity turned the foot, clad in a light, low shoe. She fainted with the pain and fell, but only after the injury; consequently, the injury was due to muscular action. An ordinary adhesive plaster dressing of strips, alternating in direction, applied by the Gibney method, proved intolerable, causing pain from pressure under the inner side of the arch of the foot, where was the point of greatest tenderness. Another dressing was applied with like result. Crepitus was not obtainable, perhaps on account of swelling. The X-ray showed that the tuberosity of the scaphoid was broken off or separated, the fragment being a half inch in thickness and not a scale. By comparison with the normal scaphoid of the other foot, the slight displacement and the line of separation are seen very distinctly.

A question arises as to whether this was a fracture or a separation of the tuberosity, because Piersol (Anatomy, page 425) says that the end of the knob of the tuberosity is sometimes distinct from the scaphoid and is then known as the tibiale externum.

Spalteholz does not mention any such anomaly, nor does Cunningham or Quain; moreover, anomalies of this type tend to be bilateral if present, but here the other scaphoid is all in one piece.

The main portion of the tendon of the tibialis posticus muscle is inserted in this tuberosity and it is easy to understand the powerful force brought to bear by a misstep upon this support of the arch of the foot. I believe the condition to have been one of fracture of the scaphoid. If unrecognized by the X-ray, and therefore not treated by fixation for a sufficiently long time, the disability from such an injury would likely be lasting, because the tibialis posticus would move the fragment and prevent union.

A plaster-of-Paris dressing gave immediate relief from pain. The treatment was that of fracture. Convalescence was normal, but it was a year and a half before occasional discomfort failed to be felt under strain.

EXPERIMENTAL COLONIC STASIS

By Charles H. Frazier, M.D.
and
Max Minor Peet, M.D.
of Philadelphia

(From the Department of Surgery and the John Herr Musser Department of Research Medicine of the University of Pennsylvania)

It is a well recognized fact that more putrefaction takes place in the colon than in any other part of the gastro-enteric system, largely due to the normal stasis in this organ, but since so much attention has recently been directed to the possible absorption of large quantities of putrefactive toxins from abnormal stasis, it was considered advisable to produce experimentally such a condition and to determine by accurate chemical analyses the toxic substances eliminated by the urine.

Since the dog possesses practically a straight colon, it was evident that the maximum amount of stasis without partial obstruction could be secured by a simple reversal of the large intestine, which for some time at least should give a reversed peristalsis, *i.e.*, away from the anus instead of towards it.

The possible action of the liver in removing, before they could be excreted by the kidneys, appreciable quantities of the absorbed products of intestinal putrefaction was determined by the production of an Eck fistula with ligation of the portal vein above the venous anastomosis.

Technic of Colonic Reversal.—Medium-sized female dogs were used. Under ether anæsthesia, a low midline incision was made. A section of colon above the sigmoid varying in length from four to six inches was selected, divided at either end between clamps, reversed, and end-to-end anastomosis performed, silk or chromic catgut being used for the interrupted approximating sutures and silk for the continuous Cushing right-angled suture. The abdominal wound was closed with silk. Recovery was rapid and the post-operative history was satisfactory.

In a few dogs some dilatation of the reversed colon was found at autopsy. This was invariably due to partial obstruction from stenosis at the lower anastomosis. In no case did this added stasis make an appreciable difference in the results.

Technic of Eck Fistula.—Under ether anæsthesia, a midline incision, extending from a little below the ensiform cartilage to the umbilicus, was made. In the first two operations, we followed the technic of

Carrel and Guthrie, the vena cava and portal vein being isolated and their lumen closed by taps or serrefines. Later, a special spring-jawed forceps with curved blades, resembling a diminutive intestinal clamp, was used. We found this greatly facilitated the operation since it entirely did away with the isolation of the vessels. The clamp was placed lengthwise on the vessel and afforded ample room for the anastomosis. The suture technic of Carrel and Guthrie was adhered to with the exception of the needles used. We found by shortening and curving the Kirby No. 16 needles that the stitches could be more easily placed. Paraffin oil was used to prevent clotting. At the completion of the venous anastomosis, a heavy silk ligature was tied around the portal vein close to its entrance into the liver, thus forcing all of the portal circulation directly into the vena cava. The recovery was usually rapid and uneventful.

Results of Reversal of the Colon.—In some dogs, immediately following operation the stools were very soft, but as a rule they were well formed and did not differ in gross appearance from those passed before operation. Practically all the dogs gained weight after a few weeks, although a loss in weight generally occurred at first. One dog weighed nearly twice as much thirteen months after colonic reversal as at time of operation.

Urinary Findings After Reversal of the Colon.—The report of the chemical investigation made by Dr. A. E. Taylor is as follows: Chemical analyses of the urine showed an excess of the urinary bases. These excesses were only marked for a short time following the operation. Later there was little evidence of any excess.

The following substances were demonstrated by qualitative tests: Methylamine, trimethylamine, tetramethylendiamine, pentamethylendiamine, paroxyphenylethylamine. From the presence of the last, we may reasonably infer the presence of phenylethylamine. Methylguanidine, diamethylguanidine, and imidazolethylamine were searched for in vain.

The finding of these substances can be reasonably interpreted as the result of simple but excessive putrefaction of protein and animo-acids in the colon. Apparently the direction of these processes of putrefaction was not abnormal in the qualitative sense, but only in the quantitative.

The urine of these dogs as well as the substances obtained after chemical isolation of the mixed bases was injected intravenously, but no noticeable toxicity could be established nor did the curve of blood-pressure differ from that to be noted following the injection of normal canine urine.

Results Following Reversal of the Colon in Dogs with an Eck Fistula.—The dogs with Eck fistula differed in no way from those with simple reversal of the colon. The stools were well formed, the animals ate well, and no toxic symptoms were demonstrable. The chemical analysis of the urine was the same as before, both qualitatively and quantitatively, showing that the liver had not removed or changed the substance absorbed from the colon.

Conclusion.—The results of these experiments would seem to indicate that mere stagnation of fæces in the colon of the dog, when on a normal mixed diet, does not lead to the formation of toxic substances of note, at least in the presence of the normal flora of the canine colon.

The fact that these dogs remained in perfect health and gained in weight would indicate that simple colonic stasis in the dog is harmless and certainly would suggest that the dire effects attributed to colonic stasis in man were, in part at least, due to some other cause than the absorption of the products usually formed in simple fecal stagnation.

HIGH INTESTINAL STASIS*

By J. E. Sweet, M.D., Max M. Peet, M.D.
and
B. M. Hendrix, Ph.D.
of Philadelphia, Pa.

(From the Department of Surgical Research and the Department of Physiological Chemistry, University of Pennsylvania)

The problem of the cause of death in either the mechanical or functional, *i.e.*, paralytic, obstructions of the upper bowel is not a new problem of surgery. Many explanations have been offered, practically each worker offering a new theory to account for the clinical fact that such disturbances of the normal physiology of the upper bowel are marked by the clinical picture of a grave constitutional disturbance of a manifest toxic nature. Among these theories, for example, were, that the picture is due to central nervous disturbance, to peripheral nervous disturbance, *i.e.*, splanchnic paralysis,—to bacterial invasion, to a loss of a necessary function of the parts involved, to the formation of peculiar poisons, to dehydration by vomiting and diarrhœa, etc.

Instead of following the usual plan of presenting an historical summary of the subject, discussing the various theories proposed, we have thought to present a series of charts, illustrating the surgical conditions involved, in the course of the explanation of which the viewpoints of various workers will be presented.

The problem was made more concrete by the work of Draper. Draper was experimenting with a twine triangular stitch which was to take the place of the elastic ligature devised by McGraw for performing a gastro-enterostomy and was confronted with the difficulty that all his animals operated as in Fig. 1 died before 72 hours, the time which he found to be necessary for the twine stitch to cut a stoma between stomach and bowel. On the other hand, animals operated as in Fig. 2 lived, and animals operated as in Fig. 3 lived as well. In other words, animals in which a blind end of the duodenum longer than 35 cm. from the pylorus was made, lived, while if the blind end was less than 35 cm. in length measured from the pylorus, the animals died. In the first 35 cm. of the duodenum some changes therefore take place under the conditions of obstruction which cause the death of the animal. Draper's further attempts at solving the problem were directed along the line of

* Read before the Philadelphia Academy of Surgery, February 7, 1916.

his idea that the toxin is a normal product of the duodenum, which, under normal conditions, is neutralized or detoxified by the jejunum.

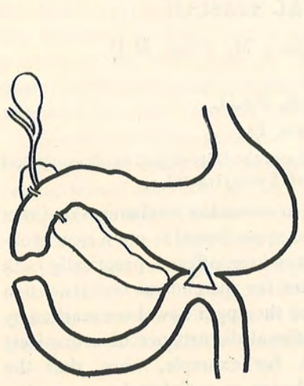


FIG. 1.

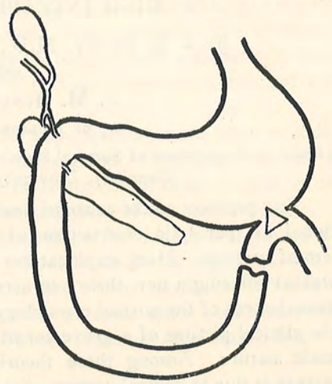


FIG. 2.

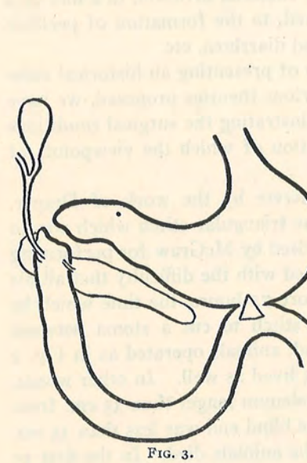


FIG. 3.

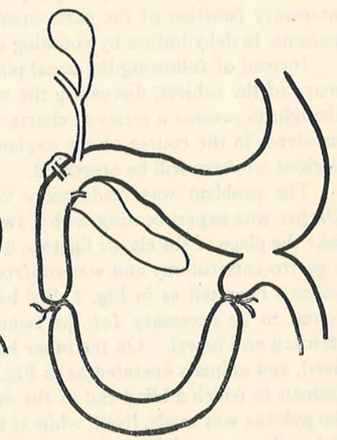


FIG. 4.

As we shall see, his idea may not be so far from the truth although his attempts to prove his point have not been convincing.

Whipple, Stone and Bernheim, of Baltimore, approached the subject by a slight modification of Draper's method, as shown in Fig. 4. To an

ordinary gastro-enterostomy is added a double ligation of the gut at the points shown. On the death of the animal this isolated loop is found to contain a powerful poison, which, free from bacteria, on injection into a normal animal will cause its death with the typical symptoms of high obstruction. This finding would seem to rule out all the other theories which do not include the action of a definite poison.

About this time we became interested in the problem, because of the possible relation to the cause of death in acute pancreatitis. It is, we believe, a generally admitted clinical fact that the symptoms of acute pancreatitis and of acute high obstruction are so alike, if not identical, that a differential diagnosis can only be made at operation. Draper had already expressed himself to the effect that the pancreatic juice, grossly at least, appears to be the lethal agent, and pointed out the technical difficulties in the way of the definite solution of this point. Certain other points needed to be cleared up, because of their bearing on general surgery, and we decided to enter the field.

The first point which interested us concerns the question, of general surgical interest, does a gastro-enterostomy opening really function in the presence of a normal pylorus? In spite of the work of Cannon and Murphy, who by their X-ray studies concluded that such an opening does not function in the presence of a normal pylorus; in spite of the work of Draper, who reported the experiment shown in Fig. 5, in which a string attached to a bolus of food shows at autopsy that it has followed the normal course of the food, there was two or three years ago but a small number of surgeons who believed that the food followed its normal course. Whipple, Stone and Bernheim seemed to take for granted that the gastro-enterostomy opening drains the stomach and upper gut, above their first ligature. It was, however, in our opinion a question whether they were not really studying a condition of functional obstruction of the upper duodenum as well as an actually obstructed portion. If such were the case, their finding of a toxin within this loop would not necessarily mean that it had been formed there; it might just as well have been formed in the functionally obstructed portion and excreted into their closed loop. The fact that they found no toxin in a closed loop the mucosa of which had been destroyed by sodium fluoride would not add further proof, for the destruction of the mucosa would destroy both possibility of formation in the loop and the possibility of excretion into the loop. We therefore tried the experiment shown in Fig. 6. If this operation be done on a series of animals, doing either the end-to-side pictured, or the ordinary lateral gastro-enterostomy, it will be found that some of the animals will die with all the symptoms of

high obstruction; and in those that live, either an enormous dilatation of the duodenum, as shown in Fig. 7, will be found at autopsy, or perhaps less dilatation but striking hypertrophy of the muscular layers of this segment of the duodenum.

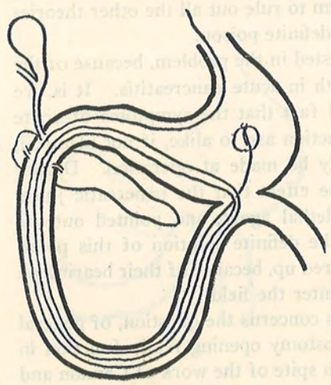


FIG. 5.

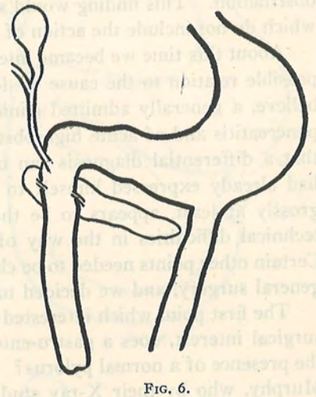


FIG. 6.

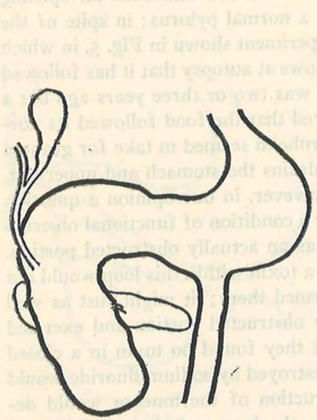


FIG. 7.

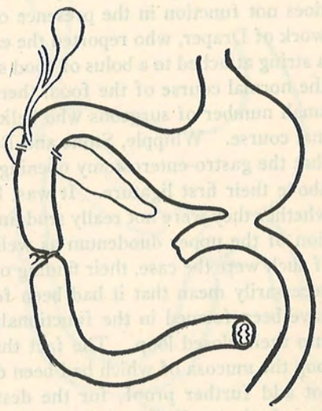


FIG. 8.

It is only this functional obstruction of this first segment of the gut, in Whipple, Stone and Bernheim's experiments, it seemed to us, which could explain the finding which they report after the operation shown in Fig. 8. They report that death follows, even though the isolated loop be drained to the exterior, and even though it be washed out freely.

We then followed the technic shown in Fig. 9, by which, instead of doing the gastro-enterostomy with its functional obstruction, we isolate the same area of the duodenum as did they, but restore the continuity of the tract by an end-to-end suture, and we found that we could drain the loop at either end, and the animal remained perfectly well. We have had several instances in which the animal has lived for weeks with this loop closed at both ends; we have had many instances in which the animal lived for a week or ten days; we have drained into the bowel below by doing an end-to-side to a point of the bowel lower down, and nothing happens. We find that such loops, entirely closed, tend to

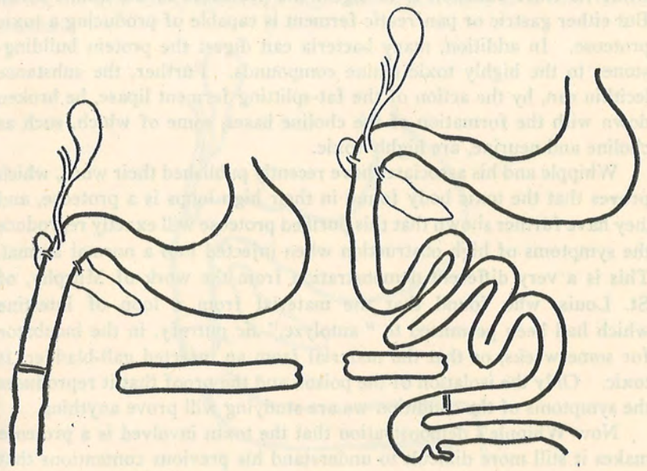


FIG. 9.

FIG. 10.

become enormously distended with fluid, and our present opinion is that it is only because of such distention and consequent rupture that our animals with closed loops die.

Now if a loop of the lower ileum be closed off, the continuity of the tract being restored by an end-to-end around the loop, it will be found that the animal will survive for long periods. This was shown by Halsted years ago. We have found that if we make such a low loop, and fill it with pancreatic juice, or with a fresh dog's pancreas, the animal may die in the time limit, and with the symptoms, characteristic of high obstruction. But this experiment is not conclusive of the rôle of the pancreas or its ferments in the production of the poison in question, for we may have added only the necessary pabulum for the

intestinal bacteria. Let us look for a moment at the chart Fig. 12, which shows the toxic products of proteid digestion. Highly toxic properties have been found in the proteose stage of protein digestion. The normal ferments of the stomach and the normal ferments of the pancreas can, of course, break a protein down to this stage; normally it is supposed that the gastric digestion carries the proteins of the food to the peptone stage, from which the digestion is carried to the amino-acid stage by the ferments of the pancreas and the intestine. The intestinal juice is not supposed to contain any proteolytic ferment except the ferment erepsin, which can digest the protein casein, but no others, while its chief function is to digest the proteoses to the amino-acids. But either gastric or pancreatic ferment is capable of producing a toxic proteose. In addition, many bacteria can digest the protein building-stones to the highly toxic amine compounds. Further, the substance lecithin can, by the action of the fat-splitting ferment lipase, be broken down with the formation of the choline bases, some of which, such as choline and neurine, are highly toxic.

Whipple and his associates have recently published their work, which proves that the toxic body found in their high loops is a proteose, and they have further shown that this purified proteose will exactly reproduce the symptoms of high obstruction when injected into a normal animal. This is a very different demonstration from the work of Murphy, of St. Louis, who found that the material from a loop of intestine which had been permitted to "autolyze," *sic* putrefy, in the incubator for some weeks, or that the material from an infected gall-bladder, is toxic. Only the isolation of the poison and the proof that it reproduces the symptoms of the condition we are studying will prove anything.

Now Whipple's demonstration that the toxin involved is a proteose makes it still more difficult to understand his previous contentions that this toxin is formed in the intestinal loop, or by the mucosa of the intestinal loop. For the formation of a proteose a proteolytic ferment is essential, and the mucosa is not supposed to contain any proteolytic ferment except the ferment erepsin, which is supposed to break down, not form, the proteoses. We have found this proteose in our own loops in animals operated as in Fig. 9, and, nevertheless, we are not prepared to admit that this toxin can be formed without the assistance of the pancreatic juice.

We are inclined to rule out the gastric digestion because of the experiment shown in Fig. 11. In an animal in which, a long time previous, the ducts of the pancreas have been tied, so that for a long period no pancreatic ferments have been entering the intestine, an absolute high obstruction, without the formation of any loops, was produced. Three

such animals have lived for seven and eight days, instead of the two to three days a normal animal will live with such an obstruction. Further, we have obtained a toxic material from loops of intestine in such animals which had no external secretion of their pancreas, but it was not a proteose. From the symptoms produced it would seem that this poison belonged in the class of the choline bases. The intestinal juice, while it contains no proteolytic ferment capable of producing a proteose, does contain a lipase. An animal in which the operation shown in Fig. 11 has been done should have the products of gastric digestion, which products might contain a proteose, but the fact that they do not die with the symptoms of high obstruction leads us to rule out the stomach.

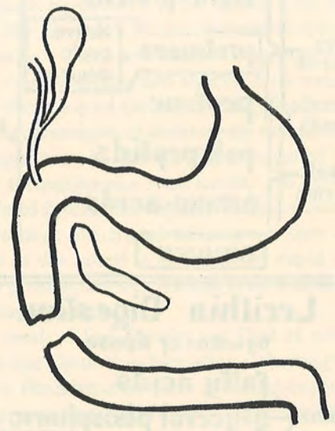


FIG. 11.

Two findings in the course of this work have, therefore, interested us surgically. First, the added demonstration of the fact that a gastro-enterostomy opening does not function in the presence of a normal pylorus. The second, the explanation of the similarity between acute pancreatitis and acute high obstruction,—they are alike because they are both essentially the same thing, an intoxication with the toxic products of protein cleavage, in pancreatitis certainly due to the proteolytic ferment of the prancreas, in high obstruction not necessarily, perhaps, but in our opinion in all probability, the same toxin, produced by the same ferment. In pancreatitis the escape of the products of the digestion of the pancreas into the tissues permits the intoxication; in obstruction the conditions of obstruction permit the absorption of toxic products,

which under normal conditions would either not be formed, or if formed would be immediately broken down to non-toxic products.

Draper's idea that we are dealing with a normal product of the duodenum which in normal conditions is detoxified by the jejunum may be not so far wrong after all.

There is another phase of this problem which we think may have surgical interest and importance. The work which has been done on stasis in the large intestine has all suffered from the fact that no one has ever been able to actually demonstrate any definite poison. Drs. Frazier

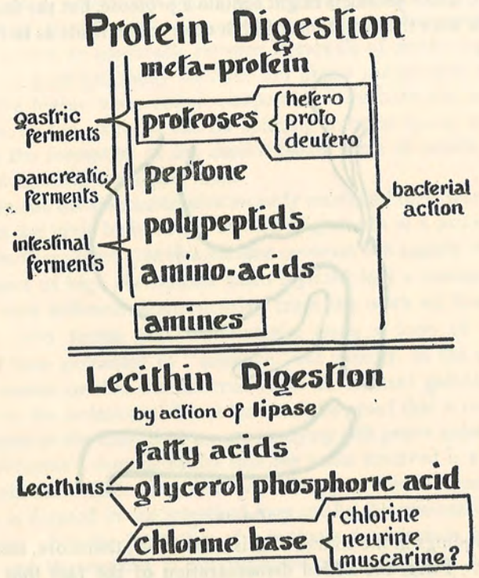


Fig. 12.

and Peet have just recounted their failure to find any such toxin; Strauss has recently reported experiments in which he demonstrated that segments of the colon can be indefinitely isolated. The old experiments of Halsted show that chronic ileal stasis can be indefinitely borne. Are we, perhaps, looking at the wrong end of the intestinal tract, even in these cases? The ptosis of the colon will certainly drag the head of the pancreas across the transverse duodenum, and, indeed, a dilated duodenum has often been reported in these cases. The removal of the colon would relieve this drag. In other words, given the demonstration of a

toxin of great potentiality—less than one-tenth of a gramme of this proteose will kill a 15-pound dog in a few hours—would it not be well for the clinician to consider the possibilities of a chronic absorption of such a poison?

We are aware that surgery already possesses a plethora of theories; but as long as a theory is given its proper evaluation as a theory, as a working hypothesis, and is not accepted until supported by such an array of facts that the theory has itself become a fact, these theories offer the only means of progress in a field where so little is known.

Dr. John H. Jopson said that surgeons had long noted that the poison responsible for the fatal results in cases of acute intestinal obstruction was much aggravated in its action both by the anæsthetic and by operations for the relief of the obstruction when the bowel was not drained externally. Cases of intestinal obstruction may come to the operating table in fair condition, and shortly after anæsthesia is begun, and also after the liberation of the obstruction, the patient will go down very rapidly. The advantages of enterotomy and enterostomy are well recognized, although there is still some difference of opinion as to the advisability of the formation of a fecal fistula. In cases of spontaneous establishment of fecal fistula, the rapidity of improvement is oftentimes most striking. Perhaps Dr. Sweet can say whether the sudden relief of the obstruction in the bowel is followed by rapid absorption in the hitherto distended portion, or does the absorption take place lower down after the obstruction is relieved?

Regarding the work of Drs. Frazier and Peet of reversal of the colon in the dog, he did not think this furnishes a thorough criterion of the conditions found in the human subject. Clinical experience has demonstrated that cases presenting marked ptosis of the large and small bowel, associated with constipation, are relieved and made more comfortable, as a rule, so long as the constipation is overcome by medicinal or operative measures. Almost any one of the several operations which have been recommended for intestinal stasis will give relief, temporary perhaps, but still marked for the time. One should not, therefore, discard the whole theory of intestinal stasis in its relation to colonic absorption on the testimonial of experimental work alone, when it is strongly controverted by clinical experience.

Dr. A. E. Taylor said that there are four obvious possibilities in the intoxication to be observed in high intestinal obstruction and in colonic stasis:

Intoxication by retention of toxic substances secreted by or formed in the glands of the digestive apparatus and the intestinal mucosa.

Intoxication by absorption of half-way stages of protein or lipoid digestion, or by abnormal intermediary stages.

Intoxication by products of bacterial action on the products of the digestion of protein or lipoid.

Intoxication by specific bacterial poisons, in really representing specific infectious processes.

It is likely that many so-called gastro-intestinal intoxications are in reality specific bacterial infections involving the alimentary tract, but the bacteriology of the fæces is in such a state of confusion that it has not been possible to isolate and identify the pathogenic organism in accordance with established procedures.

Intoxications under factors one and two may reasonably be restricted to high intestinal obstruction; intoxication under factor three may reasonably be restricted to colonic stasis.

Bacteria operating, in the colon largely, upon the end-products of protein digestion seem to display, in accordance with the characteristics of the particular flora, three directions of reaction: direct reduction, leading to the splitting off of ammonia and the conversion of the amino-acid back to the corresponding fatty acid; hydrolysis, with splitting off of ammonia, and leading to the corresponding hydroxy-acid; and the so-called carboxylase reaction, carbon dioxide being split off and the corresponding amine formed. It seems reasonable to infer that certain flora react in the one direction, other flora in another. The formation of amines tends to the production of substances likely to have toxic properties, especially the amines of the basic histone bodies, which exist in nature in the ergot, and one of which, imidazolethylamine, is very toxic. It is clear, both from the results of these experiments and from clinical experiences, that mere retention of normal stools in the colon, under certain conditions of bacterial activity, need not necessarily lead to the formation of toxic substances. The exact toxic cause of the symptoms in high intestinal obstruction has not been established.

Dr. Sweet, in reply to Dr. Jopson, said that it has been found that substances such as strychnia are absorbed with difficulty from the obstructed loop. It has been found that the specific poison of high obstruction is not absorbed from the normal intestine. Nevertheless, there is clinical evidence that the material above an obstruction can cause symptoms of intoxication if allowed to pass down the gut, and it should be noted that neither of the two experiments I have just mentioned actually corresponds to the clinical condition. The intestine below an obstruction is not necessarily a normal intestine, and it is conceivable that rapid absorption might take place, as, in fact it seems, occurs in clinical practice.

JEJUNAL ULCER, FOLLOWING GASTRO-ENTEROSTOMY FOR DUODENAL ULCER, WITH COMPLETE CLOSURE OF THE GASTRIC END OF THE STOMA*

By Nathaniel Ginsburg, M.D.
of Philadelphia, Pa.

The subject of this communication is the history of a case of jejunal ulcer occurring in an adult male, two and a half years after the performance of a posterior gastrojejunostomy for a duodenal ulcer, correctly diagnosed, and properly treated. The occurrence of a jejunal ulcer in this case following gastro-enterostomy is not regarded as particularly unique in any sense, but the absolute closure of the stoma discovered by radiologic examination, and later confirmed by operative exploration, coexistent with a large jejunal ulcer at the duodenojejunal angle, is deemed a surgical post-operative state worthy of report and record.

While gastrojejunal and jejunal ulcer as a sequence of gastrojejunostomy have been observed in considerably over a hundred cases, the complete closure of the orifice in the presence of ulcer, as far as the search of the literature reveals, was present in only two other instances. The report of this case, therefore, makes three occurrences of gastrojejunal or jejunal ulcer accompanying absolute closure of the stoma created by the first operation.[1]

The patient is fifty-one years of age, and has been a cabinet-maker by trade. His occupation has exposed his epigastric triangle to constant traumatism from the pressure of tools in this region. In May, 1912, he was submitted to an operation for duodenal ulcer by another surgeon, a posterior gastrojejunostomy having been performed. His symptoms before this operation were indigestion, post-ingestion vomiting of food, epigastric pain, and loss of weight. The pain occurred one to three hours after taking food. His vomitus did not contain blood at any time, nor was blood ever noted in his stools.

The patient consulted me at the suggestion of Dr. L. H. Jacob, on October 16, 1915, complaining of pain and soreness in the upper abdomen, loss of appetite, vomiting, and gradual and persistent decrease in weight. He was markedly constipated, requiring salts for relief. His pain was relieved by food ingestion, but returned

* Read before the Philadelphia Academy of Surgery, February 7, 1916.

[1] Hartman reports 7 cases of obliteration of the gastro-enterostomy stoma due to cicatrization of secondary gastrojejunal ulcer (Ann. of Surg., June, 1914).

some hours later. There was no nocturnal pain or hunger during the week previous to the date I first observed him. He had had eructations of food and gas, lately with daily vomiting after his evening meal. He regarded his condition as rapidly progressive, having lost thirty pounds.

The physical examination of the patient was negative, except for the right rectus scar of the previous operation and marked epigastric rigidity, with tenderness on deep pressure. Radiographic examination of the stomach revealed no indication of the gastrojejunal orifice, and no evidence of pyloric or duodenal blockade. The gastric outline did not suggest gross morphologic disturbance in this organ, and a test-meal did not support retention, since recovery of any portion of the ingesta was not obtained six hours later.

On October 21, 1915, exploration of the upper abdomen through a right rectus incision revealed extensive perigastric and pericolonic adhesions to the liver, gall-bladder, and parietal peritoneum. The gall-bladder was easily compressed, and free of stones or gross mural change. Inspection of the duodenum revealed a small stellate scar on the ventrolateral surface of bowel, two inches from the pylorus, the remains of a healed ulcer. There was very slight induration at this point, and no duodenal closure existed, nor was there evidence pointing to previous surgical interference with the bowel lumen proximal to the ulcer. The stomach was mobilized, and inspection of the gastrojejunal site revealed the presence of an annular, circumscribed area about the size of a half-dollar, corresponding to the location of the previously existing communication between the small bowel and the stomach. Invagination was impossible, and apparently no opening existed between the stomach and the intestine. The root of the mesentery contained several large lymph-nodes adjacent to the indurated area.

Separation of the two structures at the gastrojejunal site brought to view a large indurated, excavated ulcer in the jejunum, at the duodenojejunal angle, the base of the ulcer being formed by the gastric wall, and occupying a superior position in the small intestine. The lesion corresponded to the site of the anastomosis. No shreds of suture material were found hanging from the margin, or were discovered embedded in the ulcer tissue. Excision of the ulcer was performed, and the large opening in the jejunum was closed by reversing the axis of the opening by transverse suture of the bowel wound with chromic catgut. Closure of the small intestine was exceedingly difficult, owing to the immobility of the terminal limb of the duodenum lying on the ventral surface of the vertebral column. Interrupted catgut sutures were employed, suspending the intestine from the inferior border of the pancreas

to reinforce those first introduced. The lumen of the bowel after closure was not encroached upon sufficiently to jeopardize its patency at this point. Digital exploration through the opening in the posterior wall of the stomach failed to find any communication between this organ and the bowel. The gastric opening was closed by inversion with catgut, reinforced by seromuscular sutures of silk.

The patient made a rapid and satisfactory recovery from the operation, requiring repeated lavage only during the first twenty-four hours. He has lived upon a carefully restricted diet until within the past few weeks. At present he is well and suffering no gastric disturbance.

Jejunal ulcer and gastrojejunal ulcer as a sequence of gastro-enterostomy have been noted with increasing frequency during the past five years, and the number of recorded cases supported by operative discovery is reaching a considerable size. Schostak, von Eiselsberg, Roojen, Moynihan, Mayo, Patterson, Lieblein and others have called attention to this subject in written communications, and have operated for the removal of this offending feature in the physiologic success of the previously performed gastro-intestinal anastomosis. American medical literature contains but few references to this condition, and those which have appeared are but brief case reports; largely emanating from a single surgical clinic in this country (see Mayo Clinic Reports). Patterson, of London, has contributed the most exhaustive review of the subject of gastrojejunal and jejunal ulcer to be found in the English language. His paper was preceded by a notable study of the subject by Schostak, who with Lieblein has offered the best reports from the continental surgical clinics. Lieblein's paper is a carefully written and exhaustive compilation of all the cases thus far reported in the literature, and pays much attention to the factors relating to the etiologic causes and prevention of this unfortunate operative sequence.

Wolfler first called attention to this condition in 1881; but it was not until 1899 that Braun reported the first case of ulcer of this type before the German Surgical Congress, after having verified at autopsy a perforated jejunal ulcer which followed posterior gastro-enterostomy performed eleven months previously. In 1902, Quènu reported the first case in England. In 1907, Hamann published in the *Cleveland Medical Journal* the first case of perforated jejunal ulcer recorded in America. In 1907, Schostak exhaustively considered 35 cases of ulcer of this type. In 1909, Herbert Patterson, of London, collected 52 cases, and, in 1910, Roojen reviewed 78 cases. Lieblein has collected 129 cases up to the date of his publication (June, 1915), 79 being jejunal ulcers and 50 gastro-

jejunal in type. All these cases were verified by operation or autopsy.

The ulcers, either gastrojejunal or jejunal in type, have been single as a rule, although one case of multiple ulcers of the jejunum occurred in the practice of Lennander following gastro-enterostomy performed for carcinoma of the stomach. At autopsy, the patient having died on the tenth day from peritonitis, the presence of these ulcers was confirmed.

This lesion is distinctly a sequence of gastrojejunostomy performed for the relief of a gastric or duodenal ulcer, and has been reported more frequently in cases following an anterior gastro-enterostomy than after the operation by the posterior route. Fifty-two carefully studied cases were associated with anterior gastro-enterostomy and 25 cases followed the posterior operation.

The frequency with which this type of ulcer has been known to follow gastro-enterostomy for the relief of gastric or duodenal ulcer is difficult of correct estimation. Patterson regarded the occurrence as being 2 per cent., but this percentage is largely conjectural and open to serious question, owing to the fact that his statistics are entirely based upon reports collected from European sources. He excluded in his estimation a great number of operations performed in this country, following which ulcer of this type has not been reported. Since many thousands of patients have been operated upon for gastric and duodenal ulcer in America with relatively few cases of gastrojejunal or jejunal ulcer complicating the post-operative state, it is obvious that no correct estimation of the frequency of this type of ulcer is possible at the present time. This is explained by the fact that highly developed and skilful gastro-intestinal surgery in this country has eliminated the possibility of the frequent occurrence of this complication.

Etiology.—The etiological factors underlying the development of gastrojejunal and jejunal ulcer are numerous and no single element should be regarded as being the causative agent.

So far as the writer has been able to discover, there is no detailed report with relation to post-operative gastric analyses in cases in which gastrojejunostomy had been done for gastric or duodenal ulcer. No doubt much interest would attach to careful systematic studies of a series of cases operated upon, in which ulcer was found at operation. Relief of symptoms occurring in about 85 per cent. of cases following gastrojejunostomy is in itself evidence of the curative value of the operation. However, the 15 per cent. of cases somewhat bettered or not helped by the operation would make an exceedingly interesting subject for future contemplation. Patterson is one of the few who

appears to have systematically studied gastric contents before and after operation, and he has shown that hyperacidity following gastro-jejunostomy may occur.

Early closure of the gastrojejunal stoma due to cicatrization, with or without the presence of gastrojejunal ulcer, may occur if the pylorus is patent, and no doubt in these cases future studies will reveal marked hyperacidity of the gastric contents.

W. J. Mayo agrees with Patterson that gastrojejunal ulcers are the result of technical failures in the performance of the operation (gastro-jejunostomy), and differ from true jejunal ulcers, which he regards as the result of alterations in the normal physiologic intestinal conditions. In the latter case, the jejunum, which has been constantly bathed in the alkaline pancreatic and biliary secretions, is suddenly subjected to a hyperacid gastric secretion, and therefore loses the surface protection which is present before gastro-enterostomy is performed. In other words, the mucous membrane through a long period of evolution is abruptly transferred into an acid atmosphere after having been subjected to the environment of a constant alkaline secretion. Jejunal ulcer can occur, however, independent of any operative procedure, and give rise to perforation, as proven by the following case.

Francis O. Simpson, of the West Riding Asylum, Wakefield, England, reported a case of acute perforated jejunal ulcer in a man fifty-six years of age, who died, and in whom at autopsy a perforation of a jejunal ulcer about six centimetres from the duodenojejunal angle was found. This case has an interesting bearing upon the etiology of jejunal ulcer, since it is reasonable to assume that, if hyperacidity plays some part in the production of gastric or duodenal ulcer, it may, by creating an upper jejunal acidity, predispose to the development of jejunal ulcer.

The toxic action of the hyperacid gastric juice upon the cells of the mucous membrane causes protoplasmic destruction, the act of digestion being completed by the intestinal juices. This single agent associated with the traumatism to the mucous membrane of the jejunum, incident to the application of an intestinal clamp for the performance of gastro-enterostomy, must in itself be regarded as an important causative element. When the ulcer exists at the site of the anastomosis and is, therefore, gastrojejunal in type, there is no doubt but that the gastric hypersecretion and the wound made in effecting the anastomosis are the two factors largely responsible for this lesion. There is much discussion as to whether the mucous membrane at the suture line heals by primary or secondary intention, and of the relationship the suture material

employed in making the anastomosis bears to the development of ulcer in the margin of the stoma. There is no doubt in the writer's mind, from a careful study of the subject, that the suture line does not heal by primary intention, and that the catgut employed on the mucous surface produces necrosis, and is either absorbed or thrown off, causing the stoma to reach to the seromuscular suture line. It is, therefore, obvious that healing takes place at the gastro-enterostomy orifices by primarily producing an annular granulating surface which quickly heals over and extends down to the seromuscular suture line. The toxic and digestive action of the gastric and duodenal juices upon an unhealed surface, over a long or short period of time, render possible the development of an ulcer. When the seromuscular suture line is made with a continuous strand of silk or linen, it has not been infrequently the experience at operation to find shreds of this material hanging in the orifice from the margin of the stoma. This foreign unabsorbable material acts as a "septic drain," retarding healing and maintaining constant irritation. Since, however, many cases are on record in which no suture material was found in the ulcer at operation, we must conclude that the use of an unabsorbable suture with danger of the shred becoming part of the gastro-enterostomy orifice, while an important contributing factor, is not the sole causative agent in the production of this pathological state. A continuous seromuscular suture may narrow the newly created opening by having a tendency to purse-string the gastro-enterostomy orifice, and this important agency in the production of ulcer at the anastomosis site must not be overlooked.

No doubt, after gastro-enterostomy for gastric or duodenal ulcer, hyperacidity in most cases is quickly relieved. There are cases, however, in which the hyperacidity persists for some time following the operation, and, when associated with indiscretion in diet, we have important predisposing factors in the development of gastrojejunal or jejunal ulcer. What relationship patency of the pylorus bears to the production of this type of ulcer we are unable to say, since closure of the pylorus forces the gastric contents to pass through the newly acquired opening in the stomach wall, while on the other hand there are those who maintain that pyloric or duodenal exclusion is unnecessary to the physiologic success of the operation, and therefore do not practise this procedure.

The studies of Rosenow have thrown so much light upon the agency of infection (streptococcus) as an important factor in the development of gastric and intestinal ulcer, that the evidence adduced by him cannot be disregarded in a discussion of the causation of this condition. In the

case of the types of ulcer under consideration, the ideal conditions exist for implantation of organisms upon a traumatized surface, in which circulatory interference has taken place from the application of clamps or as the result of suturing.

It should be noted that Patterson, in his very complete discussion of this subject, first insisted upon the classification of ulcers into two groups—(1) gastrojejunal and (2) jejunal ulcers—depending upon the location of the ulcer with reference to the anastomosis previously made and the etiologic factors relating to their origin.

In the first group, the ulcer is part of the stoma, developing on the suture line, and possesses the real causative elements, viz.: the open wound of the gastric and jejunal mucosa, plus the importance of the unabsorbed silk or linen suture and the hyperacid gastric secretion. In the second group of cases (jejunal ulcer), the important factor in the ulcer production is undoubtedly the contact of an acid secretion on a mucous surface, constantly bathed by an alkaline medium.

Diagnosis.—When symptoms suggestive of the primary lesion occur a year or more after a period of complete relief, and strongly suggest recurrent pathological activity of the gastric or duodenal ulcer previously operated upon, the clinical evidence should strongly suggest the possibility of a gastrojejunal or jejunal ulcer rather than a recrudescence of an ulcer which has probably healed following the operation. It is evident that the diagnosis of this unusual lesion, even when based upon clinical evidence of undoubted importance pointing to the primary lesion, can only be certified by operation and an examination of the gastro-enterostomatized site.

Since an abdominal tumor has been present close to the midline in the epigastrium in many of the cases, this evidence, supported by the clinical features of the case, is of much value in arriving at a correct conclusion. The tumefaction, however, has been frequently mistaken for some other epigastric lesion, and ulcer was not considered. In the future, careful and repeated gastric analyses indicating hyperacidity will be an important factor pointing to the presence of ulcer.

Radiologic studies of the stoma of gastro-enterostomatized patients have only recently been made for the purpose of diagnosing the presence of gastrojejunal ulcer. Carman and Balfour have recently summarized their studies of eleven patients examined by means of the Röntgen ray. They observed that ten patients showed abnormalities not customarily seen. The signs usually found were retention from a six-hour meal, large size of the stomach, exaggerated peristalsis and spasticity, and deformity of contour about the stoma. There was local irregularity of

the jejunal contour, and some dilatation of the duodenum was also present. They regard marked deformity about the stoma as the most suggestive feature of gastrojejunal ulcer if associated with clinical evidence suggestive of the presence of this lesion.

Clinically there are two types of cases:

(1) In this class of cases the first symptoms immediately suggest an acute perforation of either the stomach or the duodenum, and the symptom-complex is characteristic of this grave abdominal catastrophe. Sudden, sharp, agonizing upper abdominal pain, accompanied by evidence of severe shock, with early board-like rigidity of the abdominal wall and a scaphoid abdomen, leaves no doubt in the observer's mind of the evidence of perforation. The pulse, during the first hours following perforation, is slow and full, and nausea and vomiting accompany the symptoms enumerated. The pain is intense and continuous, and little relief is afforded by the administration of morphine. The rigidity is often maintained even in the presence of deep ether narcosis. The absolute localization of the lesion in this class of cases can only be determined by immediate exploration, which should be the rule.

(2) In the group of cases where chronicity of symptoms is attended by the formation of protective adhesions about the ulcer site, acute perforation into the abdominal cavity does not occur. Tumor formation about the ulcer site may occur with adhesion to the anterior abdominal wall, stomach, colon, or small intestine, resulting in perforation and the establishment of a fistula into one of these structures. In one of Patterson's cases perforation took place into the anterior abdominal wall, and resulted in a jejunal fistula discharging on the surface of the abdomen. It is not unusual, from a survey of the cases reported, to find instances of perforation of the ulcer into the colon or small intestine. In the latter class of cases, radiographic examination, employing bismuth, will assist in clearing up the diagnosis.

In spite, however, of these various symptoms, the cases which have come to operation in this country have largely been patients in whom the clinical evidence of renewed activity of the primary lesion was suspected, and the pathology present was ascertained only by surgical operation.

Treatment.—The treatment of acute perforating ulcer of any abdominal hollow viscus is immediate operation, and the application of measures best adapted to the case in question. Closure of the ulcer is of greatest importance, and any other procedure will depend upon the conditions present. Dissociation of the gastro-enterostomy previously made may be all that is necessary combined with careful closure of the

openings in the stomach and intestine. This was practised in the writer's case (not acute perforation), and, since the primary duodenal ulcer had completely healed, there was no reason for performing a new gastro-enterostomy. The earlier cases reported, in which ulcer followed anterior gastrojejunostomy, presented a number of complications, such as fistula into adjacent organs or into the abdominal wall, and the surgical requirements were more extensive than they have been in ulcers latterly seen, especially in this country.

The necessity for suprapubic drainage following acute perforation will largely depend upon the amount of foreign material found in the abdomen at operation, and the time elapsing between perforation and exploration. When there is much soiling of the abdomen and beginning peritonitis is present, drainage should always be instituted. It should be the rule, however, in operating upon these cases to do as little as possible, since the separation of protective adhesions may open new avenues of infection, and disseminate foci which have been well localized and restricted by nature. Mayo, in a number of cases, has excised the ulcer and closed the gastric and jejunal openings, performing a new gastrojejunostomy when it has been deemed necessary.

Many cases, not acute in nature, which have come to operation have been those in which gastroenterostomy was done one to three years previously (some cases exceeding this period of time), and the primary lesion, either gastric or duodenal, has been found to have healed, and therefore the measures have been largely directed toward the relief of the symptoms produced by the complication at the gastro-enterostomy site. Closure of the jejunum, if the anastomosis has been made close to the ligament of Treitz, may be an extremely difficult procedure, since the distal limb of the duodenum, lying retroperitoneal and being immobile, cannot be delivered into the wound. Suture of the bowel should be either oblique or transverse with relation to its longitudinal axis, and every effort should be made to prevent narrowing of its lumen. Catgut should be employed and, if necessary, reinforced by interrupted seromuscular sutures of silk or linen. The latter should not penetrate the mucous surface of the bowel.

The prophylaxis of this condition entails the careful scrutiny of every patient's diet following the performance of gastro-enterostomy for gastric or duodenal ulcer. The immediate transformation from a long period of illness, occasioned by the ulcer present, into perfect health does not occur; and the digestive apparatus should not be subjected to unnecessary tests too soon. The administration of alkalies to overcome any hyperacidity remaining after the operation is advisable,

and careful selection of articles of diet is likewise of much importance. Patterson is so strongly imbued with the importance of dietetic observation in his patients who have been gastro-enterostomatized for ulcer of the stomach or duodenum, that he does not advise meat as part of the diet for six months following operation. Small quantities of food at frequent intervals have a better physiologic effect upon the recently short-circuited stomach than three regular meals daily, consisting of an unlimited selection and quantity.

Since no cases of gastrojejunal or jejunal ulcer have been known to follow the pyloroplastic operation as devised and performed by Finney, this operation should have first place when it is indicated in the treatment of pyloric ulcer. The posterior no-loop gastrojejunostomy as performed in this country has shown fewer ulcers than any other operation save the Finney type. Theoretically, the performance of gastro-enterostomy without the use of clamps, thereby not traumatizing the mucosa of either the stomach or the jejunum, possesses more safety than the operation in which either the single or paired clamps are employed for holding the two structures in apposition. Interrupted seromuscular sutures of silk, linen, or catgut are preferable to the continuous suture which may persist, hanging in the stoma created. There are some surgeons who regard the suture element in the production of gastro-jejunal ulcer of so much importance that they employ only catgut for all suturing in this operation. A large opening and either permanent or temporary blockade of the duodenum are of much importance in safeguarding against the development of ulcer at the stoma. At the present time, the question of duodenal closure by ligature, or unilateral exclusion, as practised by von Eiselsberg, is still a debatable question, if one may judge by the literature available upon this subject.

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Dr. John H. Jopson had had one case of ulcer at the stoma following gastro-enterostomy for perforation of a duodenal ulcer. The symptoms of ulcer had been present for ten years before perforation had taken place. At operation the perforation was found temporarily sealed by adhesions. It was sutured and a posterior gastro-enterostomy performed, using catgut for the inner and Pagenstecher for the outer sutures. The ulcer symptoms recurred about five and a half months after operation. There was hunger pain, paroxysmal in type, coming on especially in the afternoon and during the night, without vomiting. An area of tenderness was present just to the right of the middle line and between the ensiform cartilage and the umbilicus. Pain would begin over a small area and spread downward. The patient could not take any solid foods without pain. Liquid diet gave moderate relief. At operation, in July, 1914, the pylorus was found buried in adhesions and was not disturbed. There was a perforating ulcer at the gastro-enterostomy opening involving both stomach and jejunum, covered in by recent adhesions, not leaking but bleeding freely when exposed. It was 2 cm. in diameter. It was sutured and anastomosis performed

between the proximal and the distal portions of the jejunum below the gastro-enterostomy opening.

This operation was not followed by permanent relief. There was marked hyperacidity of the gastric secretion subsequently and frequently blood present in considerable quantities in the stools. The patient was fairly well on liquid diet. When last seen he was better, but still suffering from ulcer symptoms.

Dr. George G. Ross mentioned a case in his service at the Germantown Hospital, a man upon whom he did a gastro-enterostomy for gastric ulcer. Two years after the operation the man came back to the hospital in the middle of the night with a perforated gastrojejunal ulcer. He was operated upon by Dr. Swartley. The case will be fully reported at a future meeting of the Academy.

Dr. Damon B. Pfeiffer recently saw a case which seems to throw some light upon the rôle of unabsorbable sutures in gastrojejunal ulcer. The case occurred in the service of Dr. Deaver and was that of a woman who at operation was found to have duodenal ulcer of chronic type. The ulcer was excised, the duodenum inverted and sewed to the denuded head of the pancreas, and a posterior gastrojejunostomy made. Following the operation the patient did pretty well for a couple of weeks. She then began to have epigastric pains as before the operation, and finally, after a downward course, during which she passed considerable blood from the bowel, she died. At autopsy, upon opening up the loop of jejunum just beneath the gastrojejunostomy, it was found that the outer seroserous suture, which was a continuous one of linen thread, was hanging in the bowel. Half had ulcerated out and half was retained. The inner layer of suture was chromic catgut and there was no trace of it. The in-turned end of the stomach which had been sutured in much the same way as the gastro-enterostomy, *i.e.*, with a linen suture outside and chromic gut within, showed much the same condition, and the linen thread was hanging part way in the lumen of the stomach. The condition was very suggestive; if the patient had lived, ultimately both sutures probably would have pulled out; but it is easy to suppose that such a suture in place for some time might set up chronic ulcer and be the foundation of gastrojejunal ulcer.

Dr. J. Edwin Sweet said that in the laboratory of surgical research they used silk for all coats of the intestines. They have seen many gastrojejunostomies with the silk sutures sloughing away with no evidence of ulcer forming about them. One can well imagine that silk thread in a gastric mucosa, which was, as evidenced by previous history, subject to ulcer formation, might be an added irritation, but one can hardly conceive of how silk thread alone in a normal mucosa could be held responsible.

Dr. Nathaniel Ginsburg said that with reference to the unabsorbable suture in relation to gastrojejunal ulcer, this is not the sole factor responsible for the development of this lesion. Chronic irritation at the line of union maintained by hyperacidity and the presence of the suture acting as a foreign body, in some cases, is the causative element in the production of the ulcer at the stoma site.

Lieblein supports the contention that hyperacid gastric contents plus the traumatism occasioned by the suture at the anastomosis site is a very important etiological factor. He quotes the work of Wilkie, of Edinburgh, who, in his animal experimentation, used silk sutures and later fed the animals upon a hyperacid diet. He was able to produce jejunal and gastrojejunal ulcers in his animals, using a control set of cats to whom he did not feed hyperacid diet following operation, and in whom ulcer was not produced. It must be borne in mind, however, that the physiology of the gastro-intestinal path of the human and the lower animal type differs markedly, and that the nervous system which is such an important factor in the human plays little part in experimental work upon dogs and cats.

In a discussion some years ago, Cannon stated that he fed animals with shot whom he had gastro-enterostomatized without closure of the pylorus. His radiograph showed a shot with a string attached, having passed through the patent pylorus. He contended that the best functional result therefore occurs if the pylorus is occluded when gastro-enterostomy is done, thereby forcing all the gastric contents through the stoma.

Patterson replied that he was unable to speak from experimental work upon dogs, but he never fed his patients upon shot, inferring that the difference between human and animal surgery must always be borne in mind in making deductions when the final summary is drawn.

A NEW NEEDLE-HOLDER

Dr. J. E. Sweet presented a needle-holder and said that his reason for attempting the design of a new instrument is to be found in the slightly unusual conditions surrounding the operative work in the Research Laboratory and in the fact that no instrument of which he had knowledge satisfactorily fulfilled these conditions. They have found from experience that their patients, since they will not be quiet after an operation, but will be as active as before, must have their wounds so repaired that the strain will be withstood. They have found

that this can only be accomplished by the use of interrupted sutures in the layer of the wound which normally carries the chief strain—the aponeurosis layer in a midline wound, for instance—and these interrupted sutures must be laid not over one-eighth to one-quarter inch apart. Further, they must prepare their own suture material. The result of this is that they try to avoid the loss of time caused by the threading of many needles, and therefore adopt the technic of starting with a long thread, tying each suture as laid, thus saving time and suture material. With the common needle-holder this means that the suture is placed, the needle-holder laid down, the suture tied, scissors picked up, the suture cut, the scissors laid down, and the needle-holder taken up again. He therefore wanted a holder which could be held in the hand, and yet leave the thumb and fingers free for tying. This prin-

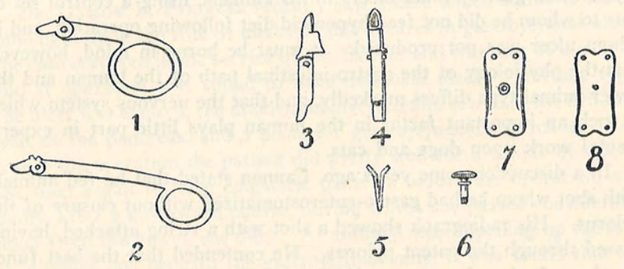

FIG. 9.—The component parts of needle-holder.

ciple is found in the handles of the Kocher scissors. Since one of these handles is very short, and therefore permits of but short leverage, he introduced the principle of the double-lever joint, such as is used in powerful cutting implements, as bolt cutters, heavy wire cutters, etc. This gives great power at the jaw, and enabled him to dispense with any form of catch for the handles; a comparatively light pressure on the handles holds the needle firmly, and any form of catch, with the well-known troubles inherent to them, is unnecessary. The scissors attachment is not new in principle, nor is the form of the jaw. It is not unlikely that in this form of instrument, with the bearings supported at each end, the alignment of the scissors blades will be kept more perfect than in other types. By removing the one screw the entire mechanism comes apart for cleaning.

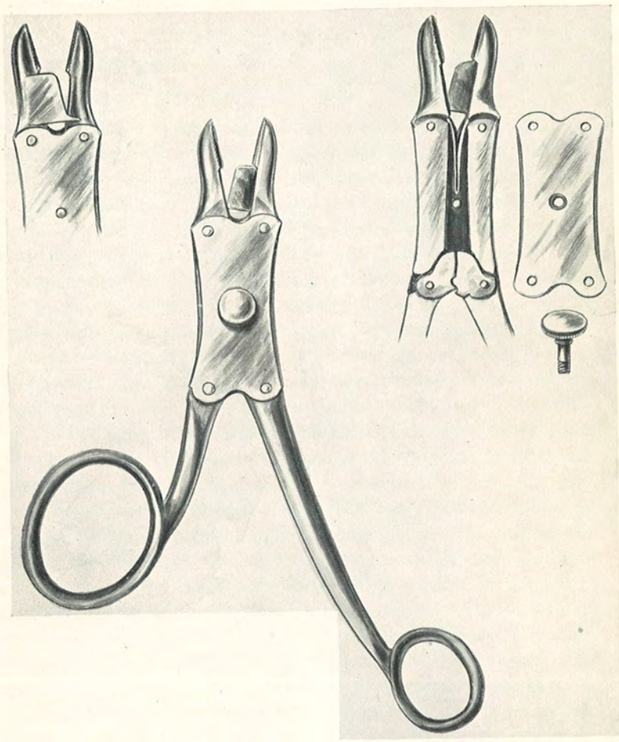

FIG. 8.—Sweet's needle-holder.

STATED MEETING, HELD MARCH 6, 1916

The President, Dr. Charles H. Frazier, in the Chair

IMPROVED METHOD OF CLOSING WIDE CLEFT PALATE MALFORMATIONS

Dr. John B. Roberts presented an infant to show the result of an operation for closing a cleft palate. He said that cleft palate operations by Brophy's "tie-beam" sutures of the upper jaw had in his work in early infancy cases caused much undesirable suppuration within the mouth, or severe damage to the alveolus. Recently, therefore, he had adopted, as in the case shown, a method by which the wire sutures were introduced from the outside of the cheeks, and were carried through the two upper maxillary bones. The separated portions of the roof of the mouth, being still largely cartilaginous, are drawn closer together by twisting the two wires over corks covered with gauze on the outside of the cheek on each side. Later, these wires are twisted to increase the approximation of the sides of the cleft in the palate and maxillary bones. He had in the two cases buried the twisted ends of the wire beneath the skin, and allowed the cutaneous wounds to have a chance to close, though their union is slow on account of some suppuration. At the time the tie-beams are introduced the cleft in the alveolar process in front is closed by a wire suture, and at a later period the cleft in the lip united by silkworm-gut sutures. The first step in the operation had been done when the infant was about three weeks old, that step being the introduction of the tie-beams and wiring the alveolus. The second step is the closing of the lip at about four weeks and a half of age. The case presented shows the wires introduced and the lip still open. A second patient has had the wires in the jaw for four months with very little irritation, except some slight suppuration of the cheek wounds. The anterior part of the cleft in the roof of the mouth is closed, the alveolus has been brought together, and the upper lip, now united for several weeks, looks very well.

In future he intended to introduce the wires so as to have a twist on one side only, doing this by returning the end of the first wire across the cleft a second time and having the loop on the second cheek buried at once. He was not sure but that, after taking out the wire tie-beams at the end of five or six months, he would introduce for a considerable

period, either another set of wires, or perhaps be satisfied with a heavy kangaroo tendon loop and knot for the two supporting sutures.

He had for a number of years been convinced of the value of Brophy's suggestion to close these wide clefts in early infancy so far as is possible while the upper jawbones are largely cartilaginous. The impact of the mandible against the upper jaw has a tendency to keep the cleft from coming together and, perhaps, widens it. Therefore, early support and approximation of the two sides of the fissure by the prolonged use of tie-beam sutures, and by closure of the upper lip and the alveolus, seem mechanically wise. It seems cruel to make suppurating wounds on the outside of the cheeks of these little patients, but this is of less importance when one thinks of the gravity of the congenital malformation. The dimpled scars in the cheeks, left after healing of the wounds, may easily be made inconspicuous by plastic operation.

BONY UNION OF TRANSVERSE FRACTURE OF BOTH PATELLÆ WITHOUT OPERATIVE SUTURE

Dr. John B. Roberts presented a man aged perhaps 50 years, who last December, while in the Polyclinic Hospital for fractures of the fibula, called his attention to his knees. He stated that Dr. Roberts had treated the left patella with a board splint twenty-two years ago, April 3, 1894, at the Polyclinic, and the right patella for a similar fracture about six years previously with hooks at the Pennsylvania Hospital. On investigation it was found that the man had been in the Pennsylvania Hospital about 1886, when Dr. Roberts, as Out-patient Surgeon, was using the Levis separated Malgaigne's hooks for this fracture, having been taught their value by seeing Dr. R. J. Levis's success in getting close union by means of them. It is possible that his connection with the case at the time was as Dr. Levis's assistant, for he did not remember the patient clearly. The patient still shows evidence of scarring of the skin by the hook points; and the patella is solid, of good shape and the mobility and usefulness of the limb perfect. The left patella is a little larger than its fellow; a shallow transverse groove in it is palpable, and the outline of the periphery is a little distorted. The flexion of this knee is slightly restricted in extent. The man declares that they are both perfectly useful; and, as he is a laborer, this testimony as to absence of disability is worthy of acceptance. The skiagraph plate shows apparently a close, probably an osseous, union of both bones.

At the Pennsylvania Hospital at the time mentioned, about 1880, Malgaigne's hooks were frequently employed during a number of years by T. G. Morton and R. J. Levis, and also by the reporter, following

Fig. 1.—Condition before operation (about two weeks old).

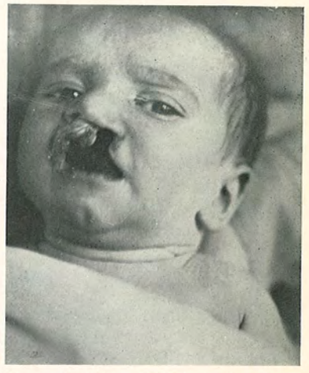

Fig. 2.—Condition when about three weeks old.

Fig. 3.—Condition after first operation (about three weeks old).

them, with great satisfaction. Since that time he had used adhesive straps to hold the fragments together, and applied a posterior splint of wood or of gypsum and gauze, as was the case in this man's second fracture. At other times he had used a circumferential subcutaneous suture in the coronal plane, or had exposed the bone by incision and sutured the periosteum and muscles. The last has been done as an exception. In all cases the rectus femoris muscle is kept relaxed by flexing the hip-joint during treatment.

He thought this case sufficiently interesting to present to the Academy because of the vigorous opposition of many to the employment of non-open treatment of this fracture. Two united and useful broken patellæ, one of twenty-two years' and the other of about twenty-eight years' standing, giving a laboring man no disability sufficient to attract his attention, are surely eloquent witnesses to the value of subcutaneous or non-operative treatment.

ABSCESS OF BRAIN

Dr. J. Stewart Rodman presented a woman, 30 years of age, who was brought to the Presbyterian Hospital in a dazed condition, having fallen shortly before, striking her head on a wash-tub. The following day, when her history was taken, she was fully conscious, and answered fairly well. The upper part of the left side of the face involving the forehead was swollen and ecchymotic. Fluctuation was obtained over left malar bone. No crepitus—no increased tenderness.

Eyes.—Right, normal. Left eyelid swollen and ecchymotic. Marked subconjunctival swelling. Pupil reacts sluggishly to light. No discharge from ears or nose. Thorax, abdomen and extremities negative; no paralysis; pulse regular, good volume—80.

Spinal puncture, day of admission; 10 c.c. fluid obtained under moderate pressure and slightly blood tinged.

X-ray showed fracture of left malar bone, and fracture (possible) of sphenoid.

During the following three weeks there was gradual absorption of the swelling over malar; irregular type of fever. Mentality good for two weeks, then drowsiness and beginning difficulty in speech, and weakness on right side. Appearance of swelling, giving fluctuation in left temporal region.

Examined by Dr. Cadwalader three weeks after admission.

Result of neurological examination, incomplete paralysis right side face, arm and leg. Reflexes exaggerated left side. No Babinski.

Sensation uncertain because of mental condition. Understands what is said to her and recognizes objects. Cranial nerves react normally.

Diagnosis.—Depressed fracture of left temporal bone or hemorrhage without fracture. Possible encephalitis or cerebral abscess from infection travelling from sinuses.

An exploratory craniotomy was done by Dr. Rodman. Vertical incision through the centre of the left temporal swelling. A large collection of pus under scalp was evacuated. A fracture of the left temporal bone was exposed. The fracture opening in skull enlarged by a rongeur and the bulging and tense dura was opened by a criss-cross incision. The brain cortex bulged into wound. Convolutions flattened out. Exploratory puncture: Reached greenish pus about 2½ to 3 cm. below surface of cortex. Incision then made into cortex and about 2 oz. of greenish pus evacuated. Rubber tissue drain to abscess cavity. Scalp incision closed with interrupted silkworm gut.

Postoperative Course.—Temperature remained normal. Could talk following day with some hesitancy; afterwards speech normal. Sixth day following operation, slight convulsion lasting few moments; twitching of face and both hands; pupils dilated; inability to speak; pulse weak; lasted only a few minutes. On the tenth day following operation, slight twitching of facial muscles; lasted ten minutes; fully conscious. After this, recovery entirely uneventful. Original drain undisturbed for three weeks. At that time drainage ceased and drain removed.

Culture of pus from abscess of brain staphylococcus albus.

SARCOMA OF LEFT HUMERUS AND FEMUR

Dr. Rodman presented a woman forty-nine years of age. Had suffered from pain in her left shoulder for three years. Two years ago first noticed a swelling of this shoulder. She thinks swelling is now little if any larger than when first noticed. During this past summer, July, 1915, a swelling developed gradually above her left knee. She tripped and fell in July, 1915. Following this her knee became swollen, but in about a week she was able to get about with the help of a cane and crutch. Fell again one week prior to admission, striking her shoulder and thigh. After this fall, both shoulder and thigh painful. When admitted, she was rather emaciated; her left shoulder was symmetrically enlarged and pulsated. A loud bruit could be heard over the swelling. Systolic murmur heard in left supraclavicular triangle and also in left suprascapular region. Little, if any, limitation of motion in left shoulder-joint, but some muscular weakness. Just above and

including the left knee the diameter of the part was increased by one-half by a symmetrical swelling. Not tender; no apparent pulsation, but a loud systolic murmur heard over entire swollen area. Unable to bear weight on the left leg because of pain. No crepitus nor preternatural mobility.

Diagnosis.—Osteo-angio sarcoma of left humerus (primary) and left femur (secondary).

RICHTER'S HERNIA. ACUTE INTESTINAL OBSTRUCTION

Dr. Rodman presented a third patient, a woman, sixty-eight years of age, who, until two days prior to admission, had been enjoying her usual good health. She then developed sudden severe lower abdominal pain, cramp-like in character. Vomited frequently during the day of onset and also during the following day. Pain also continued. Was given purgatives but was unable to have a bowel movement. Abdomen became distended.

Two hours after her admission to hospital Dr. Rodman made a midline incision between symphysis and umbilicus. On opening the peritoneum, free fluid escaped, and distended coils of small intestine crowded into the wound. On pushing these aside, collapsed small intestine was found which was traced to the left internal ring. There bowel had become caught by a prolapse of one wall into the opening (Richter's hernia). Gentle traction was sufficient to disengage the bowel. The dark area where that bowel had been caught (one wall) was infolded by interrupted Lembert stitches of Pagenstecher. Wound closed without drainage. Recovery uneventful.

THE HANDLING OF CHILDREN WITH TUBERCULOSIS OF THE SPINE WHILE THEY ARE UNDER THE INFLUENCE OF AN ANÆSTHETIC *

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It is possible that we have not heretofore given enough consideration to the fact that a child suffering with tuberculosis of the spine, and while conscious and in full control of its voluntary muscles, is a very different object from the one which lies unconscious and relaxed under an anæsthetic.

The spinal column is deeply imbedded in and supported by the intrinsic and extrinsic muscles, and these, being under voluntary control, can instantly change the spine from a pliable and yielding column into a firm and unyielding one. This power of voluntary control and self-protection is, of course, entirely lost under an anæsthetic. Likewise, the reflex muscle spasm is also lost. It is, however, the voluntary control, and the loss of it, which is the important feature.

Therefore, the spine of a child who is conscious and in full voluntary control of his movements might be compared to a watch-chain imbedded in paraffin. Under these circumstances the watch-chain could be lifted by both ends without its sagging, or one end can be rotated between thumb and finger, and the whole chain rotates in corresponding fashion. But if the paraffin is melted, the chain once more becomes limp and sagging, link moves in link, torsion at one end is gradually communicated from one link to the next until the limit of motion is reached, and so on throughout the length of the chain until perhaps one end has been rotated several times.

And so when handling a normal child we find the same condition. We lift the child in our arms and he naturally and instinctively makes a bridge of his backbone across our supporting arms. And the same is true of torsion of the spine—he instinctively resists it.

If this is true of a normal child, it is even more marked in one whose spine is diseased. Here all the elements of self-protection and guarding against injury are amplified, the child's nervous system is hypersensitive, and carefully but positively does he voluntarily protect his weakened and tender spine when he is lifted or turned over.

* Read before the Philadelphia Academy of Surgery, March 6, 1916.

Under the relaxing effect of ether anæsthesia this power of self-protection is lost and the spine sags and bends when the child is lifted, and torsion at one end of the spinal column is carried segment by segment the length of the spine, one vertebra rotating on the next one, to the limit of motion, and so on down. So we have the analogy to the watch-chain.

Now let us imagine that we have removed the spine from a child suffering with Pott's disease, and as we hold it in our hands we examine it. What do we find? Here is one with a rather sharp, angular kyphosis at the tenth dorsal vertebra. The body of the tenth dorsal has entirely disappeared, the anterior edge of the body of the ninth is resting upon the anterior edge of the body of the eleventh and in the triangular space thus formed by the bones is the soft cheesy material—the tubercular débris of the disease—and it is also under tension, for the periosseous and periarticular structures are bulging at the sides and may at any moment give way. For the retaining walls are rotted through and through, they are weak and friable, and serve only as a feeble barrier to protect the surrounding tissues. But the plastic exudate and organized lymph are doing what they can to reinforce the protecting wall. The age of this child may be perhaps three or four years.

Let us take up another specimen—the spine of a child about ten or eleven. Here a different condition prevails. There is rather an obtuse kyphosis in the lower dorsal region, involving the ninth, tenth and eleventh vertebræ. The body of the tenth has entirely disappeared, the intervertebral cartilages have been absorbed, the disease has been making inroads into the inferior portion of the body of the ninth and the superior portion of the body of the eleventh, but these two bodies are not resting the one upon the other, as in the previous case, but are separated by a considerable space. This space is filled completely with the soft mass of tubercular material, and as it is under some tension, it has forced its way into the spinal canal, entirely surrounding the spinal cord, and yet is held in restraint by a limiting wall of plastic exudate, which prevents its free escape into the spinal canal. The contrast between this spine and the previous one is very striking. Why is it that in the one case bone rests upon bone, while in the other there is the wide gap between the bodies? The history tells us that this latter child was treated for many months lying supine upon a Bradford frame, and there is every evidence that the disease continued to make progress in spite of the treatment. Now if pressure be made upon the ends of this spine it easily buckles at the apex of the kyphosis; that is, it closes as a hinge would. The increased pressure upon the abscess must cause it to

rupture at its weakest point, just as the artist, pressing in the sides of his tube of paint, expels the paint upon his palette. The abscess, therefore, may be expressed into the surrounding tissues, or into the spinal canal, or even into the spinal fluid itself, thus setting free in the cellular tissues and their lymphatics, or in the spinal fluid, large quantities of toxins.

In regard to the first spine, where bone rests upon bone, very little harm would result from pressing the ends of the spine together. But by making traction upon them the opposite effect is produced. The ligamentous structures, necrotic from the disease, easily tear and give way and the spine straightens, the kyphosis opening at its apex like a hinge, and tubercular material with its toxins may be set free in the surrounding cellular tissues and taken up by the lymphatics.

There is another factor to be considered. The intimate relationship of the great, the lesser and the smallest splanchnic nerves to the thoracic vertebræ is important. When we consider the situation of the sympathetic ganglia from which these nerves arise—the intercommunication between these ganglia and the spinal nerves and the spinal cord—the fact that these sympathetic nerves lie in such close contact with the bodies of certain of the vertebræ and terminate in the solar plexus and renal plexus, and further, that the ganglia themselves are directly connected with the bodies of the vertebræ by nerve filaments which pass into the bone, then we can see what effect traumatism in this region must have upon the general condition of the patient. Stretching and tearing of these delicate nerve structures so close to the spinal axis may produce sudden and severe shock. Likewise compression or pinching of the nerve tissue may produce shock.

What is the clinical application of these facts?

Case I.—A child of three, with a moderate angular kyphosis in the lower dorsal spine, is considered a suitable case for a bone-grafting operation. His condition remains good throughout, with very little disturbance of his pulse or breathing. When it is time to apply the plaster bandages the patient is lifted from the table by the shoulders and pelvis. His trunk sags forward into hyperextension and a perceptible change takes place in the contour of the kyphosis. It has diminished. The plaster was put on rapidly and carefully, and perhaps not more than five minutes passed until it was completed; and yet, during this interval, the child changed from a condition of safety to one of shock. The change itself came very quickly and without warning, and he gave his doctors considerable concern until reaction was finally established.

In this young patient with tender and delicate structures, weak and friable from disease, we believe there was an actual though slight giving way of the spine at the apex of the kyphosis; or in other words, it opened a little as a hinge would open. The child's temperature, which had been running close to the normal previous to the operation, reached 104° on the second day and then gradually declined, and his condition became entirely satisfactory.

Case II.—A child of ten or eleven had had tuberculosis of the spine for several years and had not done well. Her resistance was poor. She was put to bed on a Bradford frame, with extension on her head and lower limbs. Both lower limbs were paralyzed. After a year and three months of this treatment she was still paralyzed..

Dr. Spiller then saw her in consultation with me. From every point of view the case was not promising. But we concluded that if the spine could be made rigid by bone grafting, it would give her the best chance for improvement, and we hoped that eventually the pressure on the cord might be relieved and she might regain the use of her lower limbs. We at least had hopes of seeing her up in a wheel-chair. It seemed to me that she could be carried safely through the operation. The mother was very anxious to have anything done which promised even a little improvement.

A plaster jacket was made on the day preceding the operation and cut down both sides, so that it could be quickly and easily applied the moment the operation was completed.

At the time of the operation the child was handled with the utmost care. She was lying prone upon the table, completely relaxed under the anæsthetic, and we were about to proceed with the second step of the operation—that of inserting the bone-grafts into the spinous processes—when an unforeseen thing happened. Our anæsthetizer, thinking the child was lying a little too near the head of the table, pushed her by the shoulders. Instantly the spine buckled. That is at the apex of the kyphosis it folded together like a hinge. Very carefully we straightened her out again into her former position and proceeded with the operation. In cutting longitudinally from the base of one spinous process to the base of the next one, just about at the apex of the kyphosis, some tubercular material was seen. The child was severely shocked by the time the operation was completed. She was put into the plaster jacket and back to bed. She gradually reacted and we began to feel hopeful for her recovery. The next day her temperature was 105° and our hopefulness changed to doubt. The day following her temperature reached $105^{3}/_{5}$°, and we were completely discouraged. There was no sign of pneumonia, no evidence of meningitis. The patient died on the third day.

I must assume the responsibility for the child's death. I do not know definitely the cause of her death. It is not my purpose either to criticise or to censure. It is possible, however, that we have grown too accustomed to think of a kyphosis as a compact mass of bone.

If there is an undercurrent of truth in the points which I have endeavored to bring out, how can we guard against these accidents?

The solution seems simple enough.

On the day preceding the operation the child should be placed prone upon a muslin hammock stretched fairly taut, but sagging a little with the child's weight. The body is swathed with a layer of cotton and, if desired, the pelvis protected with a girdle of felt and likewise a strip of felt on each side of the ridge of the spine, to prevent pressure on the tips of the spinous processes. The plaster jacket is then applied and cut down each side in the midaxillary line.

At the time of the operation the child is placed supine upon the table, the front of the plaster jacket is then removed, and the anæsthetic started. (A child should never be given an anæsthetic while his thorax is completely enclosed in a plaster jacket.) A few minutes later the front of the jacket is replaced and held firmly in place by two assistants, while the child is turned over into the prone position. The back of the plaster jacket is removed, the operation performed upon the spine, a light gauze dressing put on, and the back of the jacket with its cotton replaced, fastened firmly with girdles of adhesive plaster, and the child returned to its bed.

In this way all twisting and unnecessary movements of the spine are avoided.

We have often watched two assistants—perhaps the etherizer and a nurse—turning a child over on the operating table. Almost never do they act in perfect accord. The shoulders are turned a little before the pelvis or the pelvis a little quicker than the shoulders, and consequently there is the inevitable twist or torsion of the spine. The simple measures which I have outlined will effectually guard against this.

And so I have come to believe that, first, the operation of bone-grafting upon the spine of a child is of itself accompanied by comparatively little shock.

Second, these children bear the anæsthetic surprisingly well, proof course, it is properly given; and

Third, the handling of these children with diseased spines while they are relaxed under the anæsthetic is the most vital point in the whole procedure.

THE ELEMENT OF ERROR IN ABDOMINAL DIAGNOSIS*

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A few months ago I heard a distinguished surgeon say that, had he life to live over, being fully conscious that brilliant operators are infinitely more common than great diagnosticians, he would desire to become a clinician. No more fascinating field exists in medicine than surgical diagnosis; and yet, what branch has so few masters? No less interesting are the commoner errors of surgical diagnosis, and particularly engrossing is the study of the seemingly inevitable mistakes made in the diagnostics of abdominal disease.

Absorbed with this subject, I, some time ago, at Rochester, kept record of the errors made in a series of general cases admitted to the diagnostic department of the Mayo Clinic. Eleven hundred and seventy patients were studied, about one-half of these coming to operation. With the latter group it was found at the operating table that there was a gross error in the primary diagnosis of the clinicians in 10.08 per cent. In all of these the surgical indications were correct and the patient required an operation for relief, but in the percentage stated the clinical diagnosis was wrong.

The original diagnosis, with the operative findings, in all cases in which gross errors were made were studied, but at this time only those with abdominal diseases are considered and are presented in the following table:

Gross Errors in Diagnosis Checked at Operating Room

Clinical Diagnosis.	Operative Diagnosis.
1. Perforating gastric ulcer	Chronic cholecystitis and appendicitis
2. Aortic aneurism	Ovarian cyst
3. Chronic cholecystitis	Duodenal ulcer
4. Duodenal ulcer	Chronic appendicitis
5. Duodenal ulcer	Chronic cholecystitis
6. Duodenal ulcer	Chronic appendicitis
7. Chronic appendicitis	Duodenal ulcer
8. Carcinoma of the stomach	Septic gall-bladder with stones

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	Clinical Diagnosis	Operative Diagnosis
9.	Duodenal ulcer	Chronic cholecystitis
10.	Duodenal ulcer	Chronic appendicitis
11.	Chronic appendicitis	Gall-stones
12.	Pyloric ulcer	Carcinoma
13.	Ovarian cyst	Hydronephrosis
14.	Extension of pus pocket from perineal abscess	Pancreatic cyst
15.	Chronic cholecystitis	Carcinoma of the stomach
16.	Chronic appendicitis	Hydrosalpinx
17.	Ovarian cyst	Fibroids
18.	Hemorrhagic endometritis	Fibroids
19.	Neurosis (explore) appendix?	Chronic cholecystitis with stones
20.	Reflex (explore)	Gall-stones
21.	Chronic appendicitis	Chronic cholecystitis
22.	Functional stomach (explore)	Strawberry gall-bladder (chronic cholecystitis)
23.	Duodenal ulcer	Carcinoma of stomach
24.	Carcinoma of stomach	Old duodenal ulcer
25.	Ovarian cyst	Hydrosalpinx
26.	Pyloric obstruction (ulcer)	Chronic cholecystitis
27.	Carcinoma of cæcum	Chronic appendicitis with abscess
28.	Gastric ulcer	Thickened pyloric ring (congenital)
29.	Fibroids	Ovarian cyst
30.	Pyloric obstruction-ulcer	Syphilis of stomach
31.	Intestinal obstruction; postoperative adhesions	Ring carcinoma of transverse colon

It is interesting to note that of these errors over 75 per cent. have to do with the duodenum, gall-bladder or appendix. The majority of patients with disease of one or more of these organs have an accurate diagnosis made of the condition, but, in a certain percentage, as has been shown, gall-bladder disease is mistaken for duodenal ulcer, duodenal ulcer for chronic appendicitis, chronic appendicitis for gall-stones, and so on. The close relationship existing between the gall-bladder, appendix and duodenum has long been known and Rosenow,[1] in his recent work on the elective localization of the streptococci, has added the latest data to prove the fact. Our knowledge of this and the clearer realization of the difficulties of differential diagnosis of conditions affecting these organs have rendered the spectacular McBurney's incision, with its limited exploratory field, considerably out of fashion. The list of errors presented would have been much smaller had not a straight, rectus incision been made in most of the cases. The incompleteness of an operation performed through a gridiron incision on a chronic appendix, not presenting an absolutely clear picture,

particularly in an adult, cannot be questioned. Such an operation leaves the surgeon in but a slightly better position than the gastro-enterologist who cures gastric and duodenal ulcer, and is only kept from knowing he hasn't by the thickness of the abdominal wall. The surgeon routinely following this practice has no check on his diagnosis and will have a satisfying small percentage of errors to record.

The extraordinary similarity in symptomatology often existing between chronic appendicitis and duodenal ulcer is a subject sufficiently threadbare to be omitted were it not for the fact that the point is being constantly overlooked and is a potent factor in rendering abdominal diagnosis anything but an exact science. Not uncommonly does a patient present a history of hunger pain relieved by eating or the taking of alkalies and occurring with definite periodicity with nothing to account for the syndrome but a chronic catarrhal appendicitis. And to strengthen the diagnosis of duodenal ulcer the gastro-enterologist may report a marked hyperacidity, and the röntgenologist hyperperistalsis, or other suggestive signs; and when the operation is performed the duodenum is found normal and the removal of a chronically inflamed appendix cures the patient. I have records of several such patients in whom a 90 per cent. diagnosis of duodenal ulcer was made on a clear, uninvolved, so-called text-book history, who were completely relieved by the removal of their appendices. One patient gained eighteen pounds in the first sixty days following his operation.

Of the 264 cases of gastric ulcer operatively demonstrated at the Mayo Clinic during the year 1913–14, and studied by Eusterman,[2] there was an error in the primary diagnosis in 33 per cent. though an alternative diagnosis of gastric ulcer was made in 8 per cent. In 27 per cent. of the cases of gastric ulcer the primary diagnosis was duodenal ulcer.

Of 814 cases of duodenal ulcer observed in the same period there was an error in the primary diagnosis also in 33 per cent. In 10 per cent. of the cases of duodenal ulcer the diagnosis was gastric ulcer.

"Ninety per cent. of supposed diseases of the stomach are not entities but rather groups of symptoms masquerading as diseases and named accordingly" (Mayo). To no small extent is the converse true—that a certain percentage of actual surgical conditions affecting the stomach, duodenum, appendix or gall-bladder parade a horde of incoherent, intangible, irrelevant symptoms masquerading as nothing in particular, unless it be neurosis—the diagnosis too frequently made. Thus we are sorely in need of more accurate methods of procedure in surgical diagnosis, particularly as applied to the upper abdomen. The clinical history stands first in importance, but it is frequently unreliable.

The Cammidge and other tests have become but unpleasant memories, though they had some value. Even with the assistance rendered by the test meal, gastric diagnosis is anything but positive and methods of greater precision are looked for. For several years there has loomed large on the horizon the X-ray, and now to such an extent has it come to the front that it can be said with truth that nothing in the past decade has so advanced abdominal diagnosis as has röntgenology. Fluoroscopic examination, supplemented by plate studies and, in suspected ulcer, fluoroscopic examination combined with serial plate investigations, have increased the degree of diagnostic accuracy by means of the X-ray to nearly 80 per cent. for duodenal ulcer, 90 per cent. for gastric ulcer and over 95 per cent. for gastric cancer.

The commonest errors in abdominal diagnosis are made in connection with lesions of the gall-bladder, duodenum and appendix, but in this regard, and only second in importance, are the mistakes made in rendering a pre-operative diagnosis in diseases of the urinary system. Renal and ureteral stones, often presenting symptoms simulating anything but those of the classical picture of calculi, are factors accounting for many of our diagnostic errors. Not only is the history in these cases often confusing in the extreme but the invaluable signs, fortunately present in the majority of cases, are often absent. Thus Cabot [3] shows that in a series of 150 cases of renal and ureteral calculi the urine was entirely and persistently normal in 14 per cent. and macroscopic and microscopic blood was absent in 32 per cent. Even the X-ray is useless in a certain percentage of cases of urinary calculi, failing in 10 to 15 per cent. in Cabot's [3] series and in 11 per cent. in that of Braasch.[4]

The patient with a small ureteral stone, presenting an uncertain history, with repeatedly negative urine and nothing to show on the X-ray plate, particularly if there is a large element of neurosis in the make-up, will be frequently dismissed, branded neurasthenic, or, if he has fallen into the hands of an accommodating surgeon, will be stamped neurasthenic and simultaneously his appendix will be transferred to the formalin bottle. It is in these vague cases that the cystoscope and the pyelogram are of greatest value, and failure to resort to them often results in diagnostic humiliation. Not only in the vague but occasionally in obvious cases are gross errors made. Thus, the large clinic does not exist in which, at some time or other, one of its surgeons has not cut down upon a perfectly apparent cystic gall-bladder or splenic tumor only to regret he had not a posterior incision through which to remove the hydronephrotic kidney he has brought to light.

To every clinic come a large number of patients presenting so few

definite symptoms and such a vast amount of vague, indefinite, irrelevant data as to render the making of an exact diagnosis utterly impossible. To certain of these the title of neurasthenic is applied, a term often contracted by the exasperated and irreverent examiner to "neuro."

To the conscientious diagnostician these patients are especially trying, for, though the examiner may feel from the first few minutes of the conversation that the diagnosis is obvious, he lives in constant fear that in the incoherent recital somewhere lurks a point of great significance and that the definitely neurasthenic patient's symptoms may, in a large measure, be the result of some organic, curable condition which he may completely overlook. The attempt to bring clarity out of the tale of symptoms as presented by the full-fledged neurasthenic is the most difficult thing in medicine, and there is no task in the law or ministry approaching it.

To send a patient away branded neurasthenic is often to acknowledge defeat, but to dismiss the patient with that diagnosis only to meet her on the street a month later, obviously in excellent health, is to excite wonder and amazement equalled only by the shock of hearing of her operation for duodenal ulcer, gall-stones, renal calculus or what not at the hands of a more astute brother.

The deadly boredom associated with the daily, routine examination of a large number of patients, presenting a horde of symptoms, and yet having no definite organic lesion, accounts for a certain percentage of errors in diagnosis. The effect of the neurasthenic on the examiner is, not only to make him less alert in the study of patients of this type, but to render him often casual and superficial in investigating the condition of persons who, though they have organic disease, possess also a large element of neurosis. This type of patient is likely to direct the thoughts of the diagnostician far afield by immediately entering upon an exhaustive recital of irrelevant matter.

In a group of over one thousand consecutive patients admitted to the general diagnostic department at Rochester, 17 per cent. were sent away with the lone diagnosis of neurosis—17 per cent. of defeats—and these only acknowledged after every means had been exhausted to render a more scientific decision! In this group, however, is recorded one patient as having returned for re-examination and, though the final diagnosis was 100 per cent. for neurosis and a bare 10 per cent. for chronic appendicitis, she was so clamorous for an operation that an exploration was performed on the strength of the lone 10 per cent. and was promptly relieved by the removal of her gall-bladder and the thirty

or forty stones contained therein. Such a case is an exception, however; and, although this patient had organic disease, the symptoms were unquestionably vague, and the picture was completely masked by the neurotic manifestations which, in all probability, will remain to a great extent, even now that the organic condition has been corrected. The cure of definite surgical disease in a chronic neurasthenic does not, unfortunately, always mean the cure of the neurosis.

Two other groups of cases are customarily, as with the unfortunate and ever-present neurasthenics, examined with less exact care than they deserve, and the frequent superficial study of these individual results in very materially adding to the percentage of error in general diagnosis. The patient whose condition is complicated by alcoholism or venereal disease is apt to be considered with less seriousness by some and with more or less contemptuous disdain by others, the accuracy of the final diagnosis being regulated by æsthetic rather than scientific factors. The Wassermann has gone far in revealing to us the magnitude of the rôle played by syphilis in human disease, and the liability of the diagnostician to overlook latent lues is still another factor adding to the element of diagnostic error. The most important conclusion to be drawn from recent investigations in specific disease is that it is even more prevalent than is ordinarily supposed. The demonstration that of 4000 general hospital patients routinely subjected to the Wassermann test 600 gave a complete fixation justifies such a belief.[5] Since in tabes, the one syphilitic condition with which we are chiefly concerned in a study of errors in abdominal diagnosis, but 18 per cent. give positive Wassermann's in the blood, the necessity, in obscure abdominal cases, even with negative pupil and patella reflexes, of an examination of spinal fluid is apparent.[5] Cases of unsuspected syphilis greatly outnumber those frankly syphilitic among patients applying for treatment at a general clinic.

In the past few years several writers, among them Cabot[6] and Hall[7] in this country, and König,[8] Lomnitz[9] and others in Europe, have directed attention to operations for supposedly local abdominal disease in patients suffering with tabes dorsalis in whom no lesion was found at laparotomy. With the Wassermann reactions on the blood and spinal fluid becoming matters of routine we have learned that any imaginable combination of abdominal symptoms may be due to cerebrospinal syphilis. It is nearly fifty years since Charcot[10] wrote, "of all the visceral symptoms which may display themselves from the period of lightning pains, one which is the most remarkable and least known, if I mistake not, is that which I have proposed to designate by the name

of gastric crisis. . . . Very often its real significance remaining misunderstood, it is the occasion of grave errors in diagnosis."

Of one thousand tabetics recently studied by Nuzum,[11] 8.7 per cent. had been subject to laparotomy one or more times under a mistaken diagnosis. Gastric ulcer was the diagnosis most frequently made, and next gall-bladder disease, with the appendix a close third. In other tabetics on whom useless operations were performed the diagnosis ranged from renal calculi to ectopic gestation. Such mistakes are not made through clinical ignorance, but as the result of superficial examinations, with hurried history taking, in which significant data are overlooked. A history of vomiting, paræsthesia, rheumatism, bladder disturbances, etc., in doubtful cases, even with normal pupils, demands a cytological examination of the spinal fluid, together with a Wassermann.

In reducing the element of error in diagnosis to a minimum in a large series of cases, as is yearly examined in every great clinic, a system of efficiency in the department of clinical diagnosis must be developed to as high a degree of perfection as possible.

At the Mayo clinic the new patient is ordinarily placed in charge of one man, and as many days or weeks as he may deem necessary are devoted to the study of the case. Unlimited time and effort are given to the task. Experts in laboratory procedures, in cystoscopic examination, in röntgenology, are immediately at hand, to whom the patient is sent for special study. All data are then collected and correlated by the original examiner and the diagnosis made.

In the daily routine of clinical work, many and varied physical abnormalities in the patient, as well as significant and important evidence in the history, will be completely overlooked, even by the most painstaking examiner. This alone helps to increase the element of error not an inconsiderable degree, and, in developing our system of diagnostic efficiency, must be considered. To eliminate this more than one clinician should, after all data have been collected, re-weigh the evidence, and at Rochester this is the invariable rule. Thus, in 3 per cent. of the patients studied, was the consultant able to elicit highly important facts from the history which had been completely overlooked by the first examiner. In over 3 per cent. valuable details in the physical examination were noted by the consultant and were added to the evidence and, finally, 4.1 per cent. of the final diagnoses, as made by the original examiner, were checked up and corrected by the consultant.

The patient with vague intra-abdominal symptoms, presenting himself for the first time, will require in the neighborhood of an hour for his first examination. Thus in the clinic where the studies forming the

basis of this paper were made the examiner, working eight hours a day, will average between seven and nine cases. Let this number be increased to twelve or fourteen, and the diagnostic mistakes that would immediately appear as the result of the necessitated haste would at once be so apparent and humiliating as to cause an immediate reduction in the number of new cases daily investigated. Even with infinite care in the study, during an eight-hour day, of but seven or eight cases, significant data in the history and valuable details in the physical examination will be overlooked. An investigation of the latter question revealed that in making general physical examinations the commonest details missed ran as follows:

Small ovarian cysts and other pelvic masses.
Small adenomata of the thyroid.
Small hyperplastic thyroids in early hyperthyroidism.
Enlarged cervical, axillary and other lymphatic glands.
Pre-systolic and other valvular murmurs.
Absent knee-jerks.
Thickened seminal vesicles.
Splenic enlargements.
Epigastric masses in carcinoma of the stomach.
High rectal metastases in carcinoma of the stomach.
Eye signs (in high tabes and other cord and cerebral lesions).
Sclerotic pallor suggesting the anæmias.
Rectal and recto-sigmoid masses in carcinoma of the rectum.

Finally, and probably the most dangerous, omissions result from the failure to recognize the direct indication for some special form of study in the case. Thus a serum test, a fluoroscopic examination, a pyelogram or an examination with the proctoscope, may be all that is needed to at once brilliantly illuminate a hitherto obscure problem.

In moments of pessimism when, after the clinician has delved exhaustively in a case for days only to see the diagnosis of which he was sure proven at the operating table to be grossly wrong, is he apt to muse, that, withal, the best diagnostician is but the cleverest guesser.

Even with the immeasurable assistance rendered us by the culture tube, the Röntgen ray, the blood count and the serum reactions, the prime requisites to the making of a successful diagnostician are the same to-day as they were when the Crookes tube, the microscope and the guinea-pig were unknown to medicine. And so is the ancient statement truer than ever, that incorrect diagnoses are oftener made as the result of lack of care in the making of the examination than as a result of lack of knowledge of how that examination should be made.

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Dr. John H. Gibbon said that anyone who looks upon abdominal diagnosis from a fair point of view, must agree that the surgeon who makes no mistakes is either more or less than a man. Mistakes are made not often because we do not know the difference between two conditions, but because we do not devote enough time to the study of the case. It is fortunate in many ways that surgeons forget their mistakes, yet it would be a good thing if we had them constantly before us. The speaker presented before this Academy some time since a paper on perforated duodenal and gastric ulcers. Yet within a year he operated upon a case in which he was satisfied with the removal of an appendix that was acutely inflamed and covered with lymph. The man died and an autopsy showed a perforated duodenal ulcer! Surgical judgment and common sense are also absolutely necessary in order to avoid mistakes in surgery. The less a man knows about a thing, often the more confident he is. The man who is overconfident does not recognize his mistakes. Self-satisfaction, carelessness and haste are bad things in surgery. Out of dissatisfaction with one's self will come improvement. That a patient may pass through many hands without a correct diagnosis of his condition being made was illustrated ten days ago in the case of a man who for fifteen years had had attacks of severe pain in the upper abdomen. He had become a "neuro," of course, in that time. One

man had passed him on to another, each recommending his favorite treatment; meanwhile the man's neurasthenic symptoms had become very pronounced. He finally fell into the hands of a bright woman physician, who suggested having an X-ray picture taken, and 17 gall-stones could be seen in the plate, and were promptly removed. In operating for appendicitis the surgeon has to keep in mind that, even if he is right in his diagnosis of chronic or subacute appendicitis, there may be something else present. The first three or four cases of ureteral stone the speaker operated upon had been diagnosed appendicitis and in two of them the appendix had been removed.

Dr. John H. Jopson said that it is undoubtedly true that many errors in diagnosis in abdominal lesions, as elsewhere, are attributable to haste and carelessness; and, it may be added, sometimes to mental and physical fatigue. Pirogoff emphasized this many years ago in connection with his report of a femoral aneurism which he had opened in mistake for an abscess. It will also seem that the distance between the brilliant diagnostician and the conscientious plodder is being greatly lessened by the general adoption of exact laboratory methods, and especially by the use of the X-ray. It is equally true that the question of judgment in the interpretation of laboratory as well as clinical data, skill in physical diagnosis by personal methods of examination, and the personal equation generally, will never be eliminated by any methods of research.

Regarding gastric and duodenal ulcer, he gathered from Dr. Foss's statistics that in ten cases of his series a diagnosis of ulcer had been mistakenly made where other lesions were proved present at operation. Only three times had ulcer been found when some other pre-operative diagnosis had been arrived at. This bears out his own conviction as to the chances of an obscure lesion being ulcer or something else. When the differential diagnosis between ulcer, gall-stones and appendicitis is puzzling in the absence of certain confirmatory symptoms, the chances are several to one against ulcer being present.

In connection with the diagnosis of gall-stones, he had been much interested in the papers of Cole, who points out that 20 per cent. can be detected with comparative ease by the use of the X-ray, due to the presence in the stones of the calcium salts. In the remaining 80 per cent. the greater density of the bile itself to the X-ray renders it necessary to demonstrate the negative shadow of the stones and the so-called "bunch of grapes" appearance which they present. After much experimentation with gall-bladders removed from the body, immersed in water and bile, Cole arrived at a technic which he thinks fairly reliable, and in fifteen cases in which he made the diagnosis of gall-stones in cases referred to him for the purpose of diagnosis, in twelve his opinion was proven correct when the patient came to operation. It would, however, be interesting to know in how many cases, in which he failed to make the diagnosis, gall-stones were afterward shown to be present.

As regards the percentage of errors, the speaker had been interested in hastily looking over fifty consecutive histories of his own private cases of abdominal operations to determine how many gross blunders in diagnosis he had made. There were six cases in which such an error in diagnosis was demonstrated, or 12 per cent. These errors included a case of acute hæmatosalpinx in early unruptured extra-uterine pregnancy, diagnosed acute appendicitis; appendicitis and general peritonitis diagnosed probable nephritis with complete suppression of urine and abdominal symptoms; a case diagnosed perinephritis, in which nothing definite was found, but the patient improved after appendectomy; a case diagnosed subphrenic abscess, which recovered, no abscess being found; sarcoma of the transverse colon, with perforation and circumscribing adhesions, diagnosed gall-bladder disease; sarcoma of the stomach, diagnosed as ulcer and hour-glass stomach. In the last case there were three separate nodes of sarcomatous tissue in the stomach wall, with irregular contraction of the same between them, producing an X-ray appearance simulating hour-glass stomach.

FRACTURES OF THE FEMUR *

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General Considerations.—A fracture of any bone of a living human being is not simply "a solution of the continuity of the bone," but an injury which, in the large majority of instances, is a complex traumatic condition, consisting of the break in the bone and injury to the soft tissues of the part involved, of greater or less severity. In some cases the injury to the soft tissues is of more importance than the fracture of the bone itself; in the majority of cases the injury to the soft tissues is of great importance; and in no instance, except perhaps in the rare cases of so-called "green-stick fracture," may they be neglected or forgotten in treating the case.

The cause of fractures is usually stated as (*a*) direct and (*b*) indirect violence. In civil life fracture by direct violence is comparatively rare. Of 739 cases analyzed 120 were from direct violence and 619 resulted from indirect violence.

I have analyzed the conditions and histories of a large number of indirect violence fractures, and I feel sure, in nearly every instance, the fracture of the bone, if it were a long bone, was produced by incoördinate leverage.

When a human being uses his extremities voluntarily for motion and locomotion he accomplishes these acts by coördinate leverage, the motion to the levers (the bones) being applied by the coördinate use of the proper muscles. If taken unawares, the position of the extremity or the position of the trunk may be such that even slight momentum results in violent incoördinate leverage, and a fracture may result.

As regards the number of fractures in the several age periods, the British and American statistics differ somewhat. They are as follows:

American, No. cases [1] studied, 344.		British, No. cases [2] studied, 716.	
Under 10 years	90	Under 10 years	394
10 to 20 years	65	10 to 20 years	155
20 to 50 years	122	20 to 50 years	77
50 to 70 years	55	50 to 70 years	90
70 to 90 years	12	70 to 90 years	0
Total	344	Total	716

* Read before the Philadelphia Academy of Surgery, March 6, 1916.

Of 751 American cases [3] reported the kind of fracture was:

Simple	708
Compound	23
Compound comminuted or complicated	20

The combined reports of the American and British cases make the following classification of locations of fractures of the shaft of the femur:

Upper third	177 cases
Middle third	629 cases
Lower third	186 cases
Total	992 cases

The American statistics do not show, but the British classification indicates the prevalence of fractures of the femur in the several regions as regards the age periods, as follows:

1. Fracture of the neck of the femur.

0 to 10 year period	4 cases
10 to 20 year period	11 cases
20 to 50 year period	20 cases
50 to 70 year period	67 cases
Total	102 cases

2. Fractures of the upper third of the shaft.

0 to 10 year period	66 cases
10 to 20 year period	19 cases
20 to 50 year period	16 cases
50 to 70 year period	33 cases
Total	134 cases

3. Fracture of the middle third of the shaft.

0 to 10 year period	293 cases
10 to 20 year period	106 cases
20 to 50 year period	43 cases
50 to 70 year period	40 cases
Total	482 cases

4. Fracture of the lower third of the shaft.

0 to 10 year period	35 cases
10 to 20 year period	30 cases
20 to 50 year period	18 cases
50 to 70 year period	27 cases
Total	110 cases

This shows that a remarkable preponderance of fractures of the shaft of the femur in Great Britain occur in childhood.

My own American statistics, not worked out as regards the special regions, show:

5. Fractures of whole shaft considered together.[8]

0 to 10 year period	90 cases
10 to 20 year period	65 cases
20 to 50 year period	122 cases
50 to 70 year period	55 cases
70 to 90 year period	12 cases
Total	344 cases

This indicates that the age period of active hard labor has more fractures of the shaft of the femur in America.

Diagnosis.—Distortion, "false mobility," great pain and local tenderness, ecchymosis, swelling and crepitus, if all are present in any case, one may easily conclude a fracture has occurred. Sometimes distortion is difficult to appreciate, no crepitus is felt, and there is fixity of the extremity, only great pain and local tenderness are present, perhaps considerable swelling and some ecchymosis. Such cases may be extremely difficult to determine, especially if the lesion be near a joint.

Careful ocular examination and comparison with the uninjured limb, if the uninjured one is a normal member, careful measurements and the gentlest possible manipulation, continued for only a very short time, may be employed. If this does not suffice to establish the diagnosis, fixation in the position assumed by the extremity should be secured and a radiographic investigation by a competent operator should be made as soon as practicable.

Prolonged manipulation and careless handling or forceful attempts to elicit crepitus should always be avoided. The dreadful pain from these methods of diagnosing causes spasm of the muscles, and on account of the incongruous positions which follow may make the determination doubly difficult.

In obscure cases difficult to diagnose, if manipulation is necessary to establish the diagnosis, it should be postponed until the physician is prepared and ready to make his permanent dressing; then a general anæsthetic should be given, if the patient's general condition will admit of it, and setting should immediately follow the manipulation; or, better still, the manipulations should accomplish the setting, and the permanent splint or dressing be applied at once. Much better, however, is it to reach the correct diagnosis by a skiagram or by fluoroscopic examination.

I very much doubt that a physician who cannot give his patient the benefit of a well-taken skiagram, or himself be able to make a fluoroscopic examination, should, in these modern days, attempt to treat major fracture cases.

The first thing to do is to find out the condition of the individual as regards his strength, condition of shock, manifestations and result of his pain, etc. The general requirements should first be done, then the special ones be attended to.

Shock in many cases is marked and requires care and discrimination in managing it. The early shock, that which comes on immediately after the injury, is a psychical one, or due to "anoci associations." This is best treated by morphia given in full doses. Persistent or late shock means hemorrhage, as a rule. This may require exploration by incision, and packing of the lacerated cavity, or ligation of bleeding vessels.

Pain and muscular spasm are the special ever-present and overpowering immediate sequel of fractures of the femur. The pain is so severe and trying in many cases it rapidly exhausts the patient. The position of the fragments sometimes aggravates the pain. One should try rapidly and gently to ascertain in a general way whether the fragments are pressing against the skin or the nerves, and place the limb in such a position that this pressure shall be relieved. Then give a full dose of morphia, and immobilize and fix the extremity, unless one is prepared at once to reduce and splint the fracture. In this latter case a general anæsthetic should be given and all manipulations be done in anæsthesia.

In complete fractures of the shaft of the femur there is always more or less hemorrhage. I have seen tremendous extravasation of blood subcutaneously and between the muscles in some cases. One should estimate the severity of the hemorrhage by the tension and general quality of the pulse, and by the size of the hæmatoma about the fracture, and should direct his measures accordingly.

Active stimulation, hypodermo- or proctoclysis, and in a few instances intravenous saline solutions, must be used. Unless the physician has the benefit of a well-equipped operation room and thoroughly aseptic technic he should open the soft tissues only from dire necessity; these instances will be very rare. A tourniquet or elastic bandage should be used only when nothing else avails.

The first aid or preliminary treatment should be only gentle extension and fixation of the limb in extension, until the patient may be taken for his permament dressing.

Prolonged attempts at reduction, or manipulations for the establishment of the accurate relative positions of the fragments when the examiner is not prepared immediately to put on his permanent or final dressing are reprehensible, because they are unnecessary and brutal.

When the patient must be transported the limb should be fixed in the position in which it is found, unless the fragments are evidently pressing on the skin or on some nerve trunk. In the latter case sufficient variation of the position must be made to relieve this pressure, then the limb should be fixed.

Except in cases of fracture of the neck within the capsular ligament, a general anæsthetic should be employed in manipulating and reducing the fracture. This is best, even in cases where Buck's extension or some variation of the Buck's extension is to be used.

It must always be borne in mind that no two cases of fracture are exactly alike. For this reason the same apparatus cannot without modification be used with different individuals, even though the fracture of the bone seems exactly alike. The apparatus must be adapted to each individual case and not the case to the apparatus.

Fractures of the femur may bring about the death of the injured person. The 760 cases studied showed a death-rate of 3.69 per cent. Shock,[8] pneumonia and delirium tremens following the fracture caused most of the deaths.

General Management of Fractures of the Femur.—It should always be borne in mind that text-book statements are at best average statements; they, as a rule, try to note what the ordinary displacements, signs and indications of a particular fracture should be. Usually these statements are based on anatomic and mechanical considerations entirely. The physiologic and pathologic forces are not usually recognized or regarded. For instance, fractures of the upper third of the shaft of the femur are stated to be followed by upward and outward displacements of the proximal fragment and upward and inward displacement of the distal fragment, according to the books, and anatomically it should be so. As a matter of fact, in one case at least, I have seen almost the reverse condition.

Displacements and distortion in every case will depend upon the extent and severity of the injury to the contiguous soft tissues. A muscle which ordinarily should produce a certain special deviation of the fragments may be almost or completely paralyzed by the severity of the injury, and another muscle which ordinarily cannot successfully oppose it may be stimulated to tetanic spasm, and by its superviolence produce an entirely different or widely varying distortion and displacement from that the books and ordinary experience have taught us to expect.

Again, most of the innervating nerves may be severed, or the main nerve trunk be almost crushed by the leverage and weight of a fractured femur. Paresis of the muscles may follow; gravity and leverage alone will then determine the displacement. Congenital or acquired previous distortions also influence displacements. Therefore, a safe postulate for handling and treating any case of fracture of the femur is, never take anything for granted, determine each individual case accurately and carefully and treat it according to its individual requirements.

Some years ago I was called in consultation and asked to reduce a fracture of the lower third of the femur in the case of an old man. The physician in charge told me he had tried repeatedly, always unsuccessfully, to reduce the fracture. It was a fracture almost transverse and the old gentleman was rather thin. I thought by etherizing him I should certainly be able to reduce and retain the fracture in place. I was astonished and greatly chagrined to find that my assistant and I by any of the ordinary means and methods could not reduce the fracture. Finally, it occurred to me to examine the uninjured lower extremity. I found the most exaggerated case of bow-legs I had ever seen. This gave me the necessary indication. By changing the direction of the traction and using a fulcrum just above the knee-joint, the adjustment was quickly and easily done.

TREATMENT OF THE FRACTURES OF THE SEVERAL REGIONS OF THE FEMUR

Fracture of the Neck.—This fracture usually occurs in old people or in middle-aged women, unless it is produced by direct violence.

In the senile cases it is commonly intracapsular. When it occurs in healthy adults, the fracture is apt to be near the junction of the neck with the shaft and it is partially extracapsular, especially posteriorly. The last form may be impacted, the former never.

The age of the patient, the history of the case, viz., a sudden trip and fall followed by inability to stand, great pain in and about the hip sometimes running down to and also felt in the knee; extremity easily moved at the hip by manipulation, eversion of the foot, shortening of the extremity, elevation of the trochanter major shown by Nélaton's line or Bryant's triangle, local tenderness, great pain when the extremity is moved, especially when rotation is attempted, will serve to make the diagnosis, provided one may exclude fracture of the pelvis about and including the acetabulum. It is not necessary to attempt to obtain crepitus; to do this is very painful.

The fracture at the junction with the shaft usually shows crepitus by even gentle passive movement. This, in addition to the signs indicated above, will make a diagnosis of fracture easy, but it is not always easy to differentiate between the two, even though one has constantly in mind the fact that crepitus is much more easily elicited in the latter than in the former case. A good skiagram may be necessary to clear up the diagnosis.

Treatment.—Senile cases demand attention to their general condition at once. They are usually in shock on account of the great pain produced, and will require full doses of morphia the first twenty-four hours. While it is true that some old people do not stand confinement in bed well, it is not true of all cases by any means. One must early judge this feature and be guided in his treatment by this determination. As a rule, a dressing and apparatus should be employed which will enable the patient to move about a little in bed and to change position from time to time. It is rigid fixation in one position in bed and pain which prove so exhausting to old people. Strong traction and the necessity of remaining fixed on the back are very irksome, and are apt to be painful; hence the ordinary traction devices should not be used for any length of time in cases of old people.

I have found the old Hodgen splint, or the Nathan Smith wire frame splint, most useful in cases of fracture of the neck of the femur.

When the fracture is at the junction of the head and neck, I use more than the 45 degrees of abduction, suggested by Royal Whitman. The injured limb should be swung free of the bed and supported in the Hodgen apparatus, and this, in turn, held by an overhead bar. Traction may be obtained by so arranging the cords which attach the splint to the overhead bar that they are continually drawing downwards, that is, towards the foot of the bed. This is necessary in most cases to overcome the spasm of the muscles and to relieve the grind on the head of the bone.

I have recently treated three unpromising cases in this way with great comfort to the patient, and with a very successful and happy result of the treatment.

For the fractures of the neck at the junction with the shaft, the overhead bar should be only a little obliquely placed as regards the bed, so as to obtain very little abduction. Swinging entirely free of the surface of the bed, suspended, and continually in traction, the limb is comfortable, and the apparatus permits great freedom of movement of the body of the patient and many changes of position. The patient may sit up in bed, and use the bed-pan without difficulty. In a sunshiny, well-ventilated room, near a window, an old person can stand this apparatus in most instances eight weeks without serious detriment.

Cases which will not endure this method of treatment should have adapted an extension apparatus like the Hutchinson hip-joint brace, or the Thomas brace, and be taken out of bed, placed in a comfortable wheel-chair and wheeled into the fresh air. Massage and alcohol rubs are very grateful and useful adjuncts to the treatment.

Some preparation of nux vomica internally, careful feeding, and diversion, are also very useful in these cases.

Fractures of the Upper Third of the Femur.—These fractures occur most frequently in childhood (NOTE.—See the last paragraphs under "General Considerations," page 76), and are the most difficult of all fractures of the femur successfully to treat, without an open operation.

The signs and symptoms are usually quite classical in these fractures; no difficulty is found in diagnosing the fracture, but it is difficult, especially in a stout, fat or full-muscled person, to determine whether the fracture is oblique or spiral. It is nearly always one or the other.

The tilting upwards, and outward rotation of the proximal fragment, may be overcome by general anæsthesia, which relaxes the spasm of the muscles, and one may accomplish a fair restitution of the fragments, but it is very difficult to hold them in proper place afterwards. In children this may be done by a well-applied plaster cast put on in anæsthesia and reinforced by flexible wood strips laid in on the anterior and outer surface, and carefully fitted and snugly applied from the knee to the umbilical region. Occasionally one may succeed with a similar dressing in cases of thin, weak adults, but for strong, robust individuals, in order to preserve the position of the fragments, it will be necessary to employ a system of downward and outward cross-traction, with powerful extension of the extremity by weights, like the Bardenheuer method. I think, however, a better method is to use the Nathan Smith anterior wire frame, curved at the knee so as to obtain flexion at the knee. It should carefully be bandaged in place and then the extremity suspended in a sufficiently rotated position to meet the displaced proximal fragment.

In a recent case, in which there had been extensive superficial lacerations and serious infection, we tried all manner of dressings and positions, without being able to retain good apposition. On account of the infection, no open operation could be employed. The child (nine years old), nevertheless, obtained good union (though the fragments overlapped), and had a perfectly useful limb afterwards. I shall return to this point later on.

As was said before, this is the region of the femur in which, when a fracture occurs, an open operation for replacing and directly plating the fragments themselves is indicated.

Fracture of the Middle Third of the Femur.—These are the most frequent of femoral fractures. They are easily diagnosed as a rule. I have no record of, nor can I remember ever to have seen, but one incomplete or green-stick fracture of the femur; this was in this region. Usually fractures in this region are oblique or spiral; they are sometimes transverse, however. The distal fragment is usually drawn upwards above the end of the proximal fragment, but it may lie in any position as regards the horizontal directions. I have seen anterior, posterior, internal and external positions of the distal fragment as regards the proximal fragment. It all depends upon the nature and extent of the injury.

Middle third fractures are usually considered the ones especially requiring some form of traction method for their treatment. Except in a few selected cases, I have quite lost my preference for traction methods of treating these fractures, since skiagrams so persistently showed me overlapped fragments, inaccurate apposition and nearly always a little angulation, as a part of the result. Besides, a stiff, painful knee-joint is apt to persist for many weeks.

For transverse fractures, I have had better results with a plaster-of-Paris fixed dressing, after reduction in general anæsthesia. This should be removed in three weeks, the limb carefully washed with alcohol, massaged, the joints very carefully moved, and another plaster dressing applied.

Also for oblique or spiral fractures, in most instances, the plaster splint applied in complete general anæsthesia is best and most comfortable. These splints should be applied while the limb is powerfully extended by means of a Lemon or a Lambotte apparatus. Manual extension cannot be kept up unvaryingly for a sufficient length of time. If one has the benefit of a first-class modern fluoroscope to see just what he is doing, he will be very fortunate indeed.

For the traction method I have been accustomed to use for many years a modification of the Volkmann leg- and foot-piece to prevent rotation of the foot, and to lessen friction. My apparatus consists of a leg- and foot-piece, which is bandaged to the leg and foot after the adhesive plaster strips have been laid on. Cross-pieces go out on either side from under the leg-piece and ride on two pieces of hard wood planed to a narrow edge. These are made like an ordinary railroad into flat sections, of varying sizes and lengths. This apparatus raises the leg and foot a little, keeps them off the bed and slides easily in the running grooves on the track of hard wood. When properly applied the apparatus keeps the foot constantly in proper position and prevents any deviation of the leg.

In some instances Steinmann's nails may be used for extension. I must confess to a prejudice against this method. I prefer plating the fragments when any operation is necessary.

While the little operation of thrusting an aseptic nail through the extremity, including the bone, may itself be attended by little danger, it is quite a different matter during the weeks of traction on this nail, for the soft tissues must be irritated by the pull and movements, produced by the varying position of the patient, and infection is very apt to follow the irritation.

After any method of reduction and dressing, especially after a fixed dressing, such as plaster-of-Paris, has been put on, a skiagram should be taken or a fluoroscopic examination be made to find out clearly whether the fragments are held in good apposition. Overlapping to a slight extent in cases of oblique and spiral fractures will not very much hinder good union and satisfactory function afterwards, provided there is no angulation or rotation of the fragments on the proper axis of the bone.

Overlapping in cases of transverse, or short, irregularly oblique fractures, will make a great difference, however; much deformity, doubtful union, and usually long delayed and never complete function will result. When I find serious overlapping after attempting to reduce and fix a fracture, I make another attempt, and if again unsuccessful in restoring the fragments to proper position, my rule is to operate.

Whatever apparatus is used, in about three weeks at least the limb should be carefully inspected, carefully washed off with alcohol and massaged. The ankle-joint should be thoroughly moved and the knee-joint should also be flexed as much as practicable without provoking spasm of the muscles and displacement of the fragments.

In many instances a surgeon waits too long before he begins massage and passive movements. I would not go so far as Championniere in regard to massage in fractures, but it seems to me it should be employed as early as practicable.

Fractures of the Lower Third of the Femur.—The diagnosis of these fractures is usually easy. The displacement of the ends of the fragments follows the general rule of fractures of the femur below the upper third. The distal fragment is usually drawn upwards as regards the proximal fragment (except in cases of the specific fracture to be

mentioned presently); unless they are badly lacerated, the abductors are very apt to draw the proximal fragment inward; in which case the distal fragment will be found displaced upwards, a little backwards and to the outside.

There is a fracture, however, usually transverse, the displacement of which is, distal fragment backwards and tilted so that the end presses backwards into the upper part of the popliteal space. This fracture is produced by the whirling motion caused by a rotating wheel. Children who jump on wagons and whose lower extremity is caught in the wheel, and workmen caught in slowly revolving large machine wheels, have this special kind of fracture.

The condition is a very characteristic one. It is an extremely painful one, because the end of the lower fragments presses firmly against the blood-vessels and nerves which pass through the popliteal space. Also grave injury to the vessels may result from this pressure. It is, therefore, necessary to reduce this fracture very soon to prevent thrombosis in, or laceration of, the vessels. If it is not practicable to reduce the fracture at once, the leg should be flexed at the knee and immobilized in this position until an anæsthetic may be given and reduction accomplished.

One must have in mind that this fracture is the analogue of fracture of the lower third of the humerus, just above the condyles. Jones, of Liverpool, has taught us that to reduce and to hold the fragments of the humerus in place it is necessary to acutely flex the forearm on the arm and fix it in this position. A similar method of reduction should be used in the supracondyloid femoral fracture, namely, extreme flexion of the knee-joint and manipulation of the distal fragment into place. Ordinarily this may be accomplished, and when reduced, as it is a transverse fracture, one has only to jam the fragments end to end and have them held in this position while the leg is slowly and carefully brought to its proper position. A fixed dressing of plaster-of-Paris may then be applied.

When the violence has been great, however, the displaced lower fragment may be caught between the heads of the gastrocnemius and the hamstring tendons, and lacerated shreds from the fibrous structures may be so wrapped about the ragged ends of the fragments that they will firmly be held, and no manipulation or position will suffice to release them. In this case an open operation will be necessary in order to obtain good restitution of the fragments. Jones, of Liverpool, however, says a Thomas extension splint will accomplish the restitution.[4, 5, 6]

Ordinary fracture of the lower third may be treated by traction

methods, with Hamilton's coaptation splints to prevent deviation. For children, and for some not very strong and thin adults, a fixed dressing of moulded splints, preferably plaster-of-Paris, applied in general anæsthesia, may be used to advantage. When the plaster has hardened, the extremity may be swung clear of the bed by attaching bandage supports and cords carried to a bar above the bed. When the reduction has been good, the method of treatment is a very grateful one. Skiagrams should be taken soon after the dressing is applied in order to be sure of the reduction.

Results of Fracture of the Femur.—Up to this time there has not been established any authoritative standard by which surgeons might compare their results after fracture of the femur.

In 1890 the American Surgical Association appointed a commission to determine and report what should be the conditions which should be considered as indicating good end-results after fractures of the femur.

The summary of the report of this commission is as follows:

1. There must be firm bony union.
2. There must be correct axial relations of the fragments.
3. Correct relations of the anterior planes of the upper and lower fragments must be maintained.
4. Shortening must not exceed from one-eighth to one inch.
5. Lameness must not occur as a result of shortening over one inch.
6. The conditions attending the treatment, however, may prevent these satisfactory results.

This is a standardization from an authoritative source, certainly, but it was made before the era of X-ray, and the surgeons of that time did not practise open method for the treatment of fractures.

A committee of the British Medical Association made a report on the results of fractures in Great Britain in 1912, but did not attempt standardization, either of results or disability.

The American Surgical Association has a committee working on this matter of standardization. It is to be hoped that this committee will be able in another year to formulate a standardization which will bring the condition up to date.

Last year this committee made a preliminary report and in regard to fractures of the shaft of the femur its conclusions were as follows: "Fracture of the shaft of the femur should not result in shortening greater than 2 cm., nor in a fixed position of angulation or rotation which will affect the joints and require new habits of balancing or tilting of the pelvis; joint function should be good. No permanent disability of the affected member should result."

Taking the above standardization as existing at present, what is the average result obtained by surgeons who treat fractures of the femur?

In 1912 I made a study of 760 cases of fractures of the femur, collected from many surgeons. Unfortunately, the records of these cases were so incomplete, in most instances, that it was impossible to deduce accurate data from them. Seven hundred of these cases were reported to have made satisfactory recoveries. I presume this may mean that 700 out of 760 cases had bony union.[3]

The Committee of the British Medical Association analyzed 726 fractures of the shaft of the femur and noted 60 per cent. good results.[2] The Committee of the American Surgical Association last year studied 364 non-operative cases, and reported 67 per cent. good anatomical and functional results.[1]

In regard to correct axial relation of the fragments, 620 of my cases had this point noted, 114 of these cases (or 18.1 per cent.) had serious axial displacements.[2]

The average shortening of the reported cases did not exceed 2 cm.

This matter of shortening, however, is a very uncertain one. It is well established that a man's femora are rarely the same length. Sometimes they vary, in what seems normal conditions, as much as 2 cm.[5] I had, not very long ago, a thirteen-year-old girl under treatment, one of whose femora was nearly 3 cm. longer than the other. This was a case of unequal development apparently, however, with the same conditions of the legs on both sides, and like conditions of development, etc.

Then, too, measurements are frequently very carelessly and inaccurately taken and may not be trusted. Therefore, unless lameness results as a consequence of the shortening, or serious tilting of the pelvis and spinal curvature develop as a consequence, I think not more than 3 cm. shortening may result in a good functional result. If there is this much shortening, however, as a result of the fracture, it is surely due to overlapping of the fragments. This will require a large callus to assure firm union, and this, in turn, will produce some deformity and usually cause a good deal of pain for some time.

One must bear in mind now that the almost universal use of X-ray, and the demand of a patient to have a print of the plate, require of the surgeon not only good functional result but good mechanical and good cosmetic results also.

In the report of the 760 cases of fracture of the femur, which I studied, only 130 were reported as skiagraphed; 83 of these, or 63 per cent., showed good apposition.[3] These X-ray cases came from the best and most systematic surgeons, and cannot be considered the average result obtained by all surgeons by any means. Also, if I may judge by my own experience, this does not express the result of the old conservative treatment, but it is the average result of both methods, viz., conservative and open methods.

Of 299 of my own cases of fracture of the shaft of the femur, 100 of which were compound, comminuted or complicated fractures, the average shortening when they left the hospital was 1½ cm.

All but one of these cases had firm bony union. Only about 2 per cent. of those treated by the conservative method showed accurate reposition of the fragments, when skiagraphed after the permanent dressings were applied.

In one case of compound comminuted fracture, when the fragments were cleared away, I found there was a loss of five centimetres of the shaft, yet this patient made a good functional recovery, and by the use of a high shoe was able to work again.

Axial displacement is a very serious matter in a final result. This not only is apt to lead to distortion of the pelvis and spinal column, but results in persistent pain in the ankle- and knee-joints, and it usually incapacitates a man for further laborious work.

The cases I have been able to trace and follow up have only been about 30 per cent. of my fractures; these have been able to return to their former jobs. These cases had no serious axial displacements. When, some time ago, I found, by the old method of extension, external splints, etc., as I said, only about 2 per cent. of my cases showed accurate apposition, and in many instances cases which seemed in perfect alignment, and showed very little shortening by the usual methods of measuring, when skiagraphed, exhibited overlapping and poor apposition, I became so disgusted that I began seriously to consider, and to practise far more generally, the operative method and direct splinting of the bone.

Of the last 65 fractures of the femur we have treated at St. Luke's Hospital, I find 25 of them were plated, 38.46 per cent., whereas five years ago only 7 per cent. were plated. So far we have had no fatality from these operations, and but one case has been seriously infected out of 25 cases operated. This case passed through the operation and operative convalescence without any infection, but was infected when the pegs were removed. It was a streptococcal infection. He made a good recovery and the union was not disturbed.

What are the advantages of the open method, and when or in which cases ought it to be used?

It will be better to take the last question first. In my clinic at St. Luke's Hospital it is the rule in simple fractures of the femur to attempt reduction in general anæsthesia and while the patient is relaxed and unconscious to apply a permanent dressing. Then the fracture is skiagraphed. If the reposition is not good, especially if the fragments are not in alignment, another effort at reduction is made and again a skiagram is taken. If again the position is bad, the state of affairs is explained to the patient and he is offered the operation. We find patients very rarely refuse to have the operation. Within ten days after the fracture the operation is performed.

To treat the question dogmatically, I would say, fractures of the neck within the capsule should always be treated conservatively.* The open method may be used on such cases only when the head has been dislocated from the acetabulum.

Fractures of the upper third offer especial and cogent indications for the open method.

Fractures of the middle third may best be treated by the open method if they are transverse, and cannot be reduced by general anæsthesia, traction and manipulation. Oblique fractures which have short, irregular bevels or shoulders, and those which have markedly been displaced and have gathered on the ends and between the fragments a quantity of fascia, muscles, etc., are indications for the open method.

A fracture of the lower third, if it be one which has the lower fragment tilted backward in such a way that it has been entangled in the lacerated fibres and fascia of the heads of the gastrocnemius muscle and hamstring tendons and cannot be replaced under ether by manipulation and flexion, should, as a rule, be treated by the open method.

In general, a fracture of any part of the femur, except its neck, which cannot be reduced in anæsthesia, and retained in position by some proper apparatus by the middle of the second week, should have the benefit of an open operation, unless there is a contra-indication in the condition of the patient or there exists some strong social or medico-legal consideration against it.

In determining the question of open or closed method, the surgeon should never forget that a finite operator doing an open operation on a human being can never be sure he is not introducing some sort of sepsis. There is, therefore, always a possible added danger in open operations.

Furthermore, open operations for fractures of the femur require large wounds and are not easy operations to perform. They may prove

* I am aware of J. B. Murphy's opinion to the contrary.

a serious tax on the strength of a patient and must never be lightly undertaken.

The surgeon should not forget all this and he should make the patient appreciate the main factors of the probable result without the operation, and its added danger if undertaken.

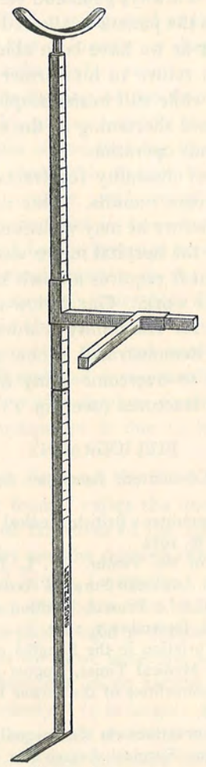

FIG. 1.—Measuring rod used for accurate determination of shortening or angulation after fractures or in deformities of the limbs.

The advantages of the operation are (1) direct ocular examination of the condition of the fragments; (2) reposition and fixation by direct splinting of the bone while under one's eyes; (3) evacuation of the blood and detritus from about the fragments; (4) a condition

almost painless during after-treatment and convalescence; (5) much more freedom of movement in bed while convalescing; (6) earlier employment of passive movements and massage.

As regards results, our experience has been that the operated cases require a little longer period of hospital disability, probably three weeks longer. The alignment is always good and very rarely does any bowing occur afterwards, unless the patient is allowed to bear weight too early. In every instance, so far as we have been able to follow our cases, the patient has been able to return to his former job, except in one case, who fractured his bone while still in the hospital. He has considerable overlapping and callus and shortening as the result of his last fracture, which was treated without operation.

The average period of disability for fracture of the femur worked out in our cases is thirteen months. This means the time a laborer may count as necessary before he may with confidence return to his hard work. Most cases leave the hospital in ten weeks, walking with the aid of a cane or crutches, but it requires a much longer period for them to be able to do a full day's work. Our follow-up system shows, as said above, the average time for full ability is thirteen months.

NOTE.—The author demonstrated a new measuring rod which in his opinion enables one to overcome many of the difficulties and inaccuracies of measuring fractures (see Fig. 1).

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DR. GEORGE P. MÜLLER said that most of the mistakes one sees in consultation practice are due to the neglect or inability to use the X-ray. Dr. Estes has accurately formulated the indications for operation. In oblique fractures of the femur it is practically impossible to effect satisfactory reduction. Dr. Martin has stated that where a fracture can be

reduced and held, there is no necessity of doing anything further, but if it is not held then means should be taken to this end. It is at this point that the speaker became radical in his opinion. There is no use waiting week after week, and trying method after method to reduce and hold a fracture of the femur, humerus, or tibia. At the end of this time there is hopeless shortening with the prospect of a dangerous operation; whereas, if the irreducibility is recognized at the end of the first week, an operation will correct the deformity or displacement, can be easily done, and will give practically perfect results.

Dr. Estes spoke of the bowing of the femur, and he had tried to take advantage of this by proper support during the application of the plate. Dr. Roberts has stated that the ideal method of the future will be the use of some absorbable fixation material which will hold the fragments accurately together, and he mentions the use of fascia and of catgut. Such fixation material is, however, too weak to stand the strain of the force exerted by the leverage action of a long bone. No one has introduced a method superior to the steel plates now in use. He did not believe in the common statements that the plate, *per se*, prevents callus formation, nor that the screws induce necrosis or softening of the ends of the fragments. He had made some very interesting observations upon a small series of cases, carefully studied, which show that it is not the plate but the absolute fixation that prevents callus. As to necrosis, this complication is due to infection and not to the presence of the screws.

DR. JOHN B. ROBERTS discussed the third and fifth propositions of Dr. Estes's paper. The former raises the question of the importance of general management of fractures of the femur; the latter discusses results, period of disability and the relative value of the bloodless (non-operative) and the blood-letting (operative) methods of treatment.

Dr. Roberts said that he had a firm conviction that the serious nature of the mechanico-physiologic problems presented by a broken thigh bone is not realized by those surgeons who leave this portion of the treatment to the discretion of an inexperienced hospital interne, a nurse, or a hospital orderly. It is largely this negligent attitude of hospital surgeons which has made statistics when collected from many sources so discouraging. These statistics have driven a considerable proportion of surgeons to adopt incision, with direct fixation by means of metal plates, as a routine treatment. The same type of fracture treated by non-operative means in private practice is followed by better cure, because the responsibility is more direct, the pecuniary reward greater, and censorious criticism more likely. The recently enacted

Workingman's Compensation Law in Pennsylvania will indubitably improve statistics by fixing the attention of hospital surgeons on this item of fracture treatment.

Dr. Estes's fifth proposition is concerned with the disability after fracture of the femur, and the relative value, as to functional cure, of the non-operative and the operative or open methods of treatment. It comprises, indeed, the most important topic of his admirable address. This phase of the discussion was of supreme interest to him for the reason that of late years he had been compelled to take a stand which would seem to show that his opinion as to fracture treatment had changed on the question of operation. Years ago he was an advocate of the profession operating by incision upon fractures, although few men operated for this lesion of bones. Now, however, he was constantly declaiming against the frequent use in surgery of fixation of fractures of bones of the extremities with metal plates. The fact is that his opinion has differed very little from that which governed his practice in the earlier years mentioned, except that he operates now rather more frequently than he formerly did. The trend of events, or what he might call a curious herd-like or gregarious change of opinion, has caused many practitioners of medicine and surgery to rush into operative treatment of all kinds because of a mistaken view of the part which nature plays in the cure of many medical, and a considerable number of surgical, lesions. The human mind is apt to be so swayed by the shifting winds of popular thought on the one hand, or set like gypsum, by routine and non-appreciation of psychic movements on the other hand, that many cease to grow mentally, or have our mental development actually choked as the vines of a jungle destroy young growing trees. We cease to think in terms of logic, and are either controlled by a stony conservatism, or follow the lead of some great operator with a tarantella-like childishness. Personally, he believed that the furore for operative treatment of fracture of the femur and other long bones is about to lessen, and that within the next decade fewer fractures of long bones, rather than more, will be subjected to operative attack as a routine of treatment. Scarcely more than 15 or 20 per cent. of closed fractures of long bones need be treated by operative incision for reduction and fixation. The bloodless or subcutaneous treatment is sufficient in skilled hands, with careful general treatment and frequent observation, for about 80 or 85 per cent. of broken bones of the extremities. The essentials on the part of the surgeon are that he, when undertaking to treat a fracture, look at a bare bone, remember the muscular attachments in the neighborhood,

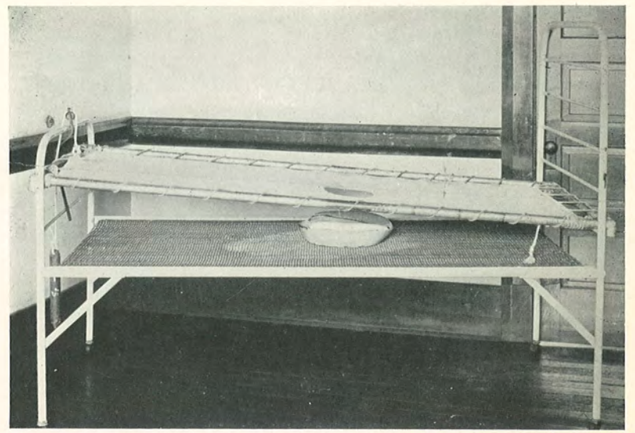


FIG. 4.—Drum-tight canvas and gas-pipe frame used by Dr. E. A. Bryant of Los Angeles, Cal., for reducing countertraction in fractures of the femur. Notice how it is hooked upon the braces of the head and foot pieces of the ordinary metal bed and thus obtains counterextension by the weight of the patient's body. Beneath it on the spring mattress of the bed may be placed any sort of a receptacle for fæces, since the canvas has an opening through which defecation may take place. The Buck's traction apparatus is attached to the limb of the patient by adhesive plaster and a stirrup, in the usual way.

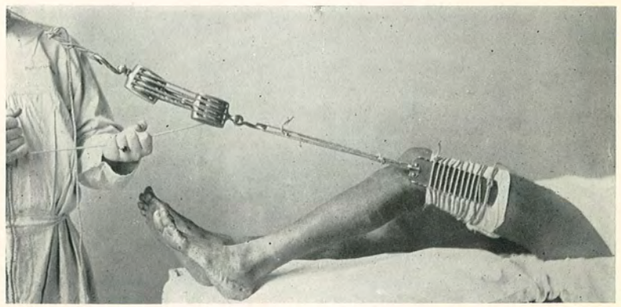


FIG. 5.—Method of reducing overlapping fragments of a fractured femur, when operating for fixation by plate and screws. The Levis traction plate and a set of compound pulleys make the reduction easy.

compare the limb with the normal limb on the opposite side, give an anæsthetic to determine the presence or absence of fracture, and the probable line of break if one exists, reduce the fragments so that the injured limb looks like the normal one, steady the bones with contour splints or gypsum gauze with or without traction as the case may be, examine the position every day for the first week, and at less frequent intervals later, and use light massage and careful mobilization of joints from the beginning to the end of treatment. A great aid to anæsthesia is the use of the X-ray to prove the existence of fracture and to check up the results of his anatomical examination under ether. Too much reliance, however, must not be put upon this method of examination. The surgeon must have some knowledge of X-ray appearance of bones, and will need to connote his knowledge of anatomy with the radiologist's knowledge of shadow pictures. It is probable that a practitioner with a good knowledge of bare bones and their muscular attachments, and with the mechanical instinct of the carpenter and plasterer, will do better without radiography than a radiographer without a knowledge of the practical side of surgery. The man who has the knowledge of the X-ray expert to help him, will, however, be often benefited. The greatest defects in hospital treatment of fractures of the femur are the sagging spring-mattress on the bed, an ignorant orderly with a douche-pan instead of a bed-pan, and a careless attention to steady traction. The drumhead canvas bed-frame adjustable to the ordinary fracture bed, so as to give counter-traction, used by Dr. E. A. Bryant, of California, is a cheap way of solving some of these difficulties (see Fig. 4). In operations for the exposure and treatment of deformed fractures of the femur, with long-standing contraction of muscles, he knew of no better way for continuing strong traction during application of the metal plate, after the malunion has been cut apart, than the Levis thigh plate and compound pulley (Fig. 5). This gives an easy method for maintaining the extension during the application of the necessary fixation by metal plates.

There is a great need for some form of absorbable mechanical support applied directly to the broken bone that will give fixation and prevent overlapping as does the metal plate with screws. The osteogenetic inlay of Albee will often be found valuable, particularly in malunited and ununited fractures. He had suggested some variations in shape and material of plates, such as using aluminum instead of steel; and he had applied an artificial periosteum made of a graft or transplant of fascia lata taken from the opposite thigh for maintaining a fracture in reduction. It should be borne in mind that the fixation

appliance is to prevent overlapping and rotary or lateral or antero-posterior displacement, rather than to give perfect rigidity. Hardly anyone depends upon the plate to give rigidity, but for that purpose uses the gypsum encasement or some form of rigid external support in addition to the fixation plate. Traction is usually employed after operation to prevent recurrence of overriding in femoral fracture. Another misconception of the problem is a too rigid belief in the value of measuring with tape measure or other standard unit. The shortening of a man's leg may be in the femur, or in the tibia, or in both. If the patient is placed squarely on his back, with legs extended and the line connecting the anterior spinous processes of the two ilia at right angles with the long axis of the body, the surgeon's eyes may readily see whether or not undesirable shortening exists in the femur by comparing the relative positions of the two patellæ. This is as easy as telling whether a large picture hanging on his office wall is horizontal, and throws out of account a possible difference in length of limb due to asymmetry of the tibias.

The surgeon should not forget in reconstructing a femur that the normal femur of muscular individuals is arched forward. This is seen when the shaft is viewed laterally. He was one of those who believe that it is hardly necessary for a man to carry a large amount of steel buried in the muscles of his leg after the bone has united. He saw, therefore, no particular reason against cutting down and taking a steel plate out of a man's thigh after union has been secured. This must be done, of course, with an aseptic technic, and is more necessary in those whose occupation takes them away from surgical observation than in those whose business and residence permit them to have surgical aid at hand in the event of future trouble from the buried metal splint.

Dr. A. P. C. Ashhurst regretted that Dr. Estes did not have time to go more fully into the question of fractures of the neck of the femur, a subject which often is overshadowed in interest by fractures of the shaft. In fracture of the neck more emphasis should be placed upon keeping the patients in bed until union occurs; but remaining in bed is not alone sufficient to secure union. The primary impaction, which results from the accident, often is slight, and if no efficient treatment is instituted these patients will recover, or rather fail to recover, with non-union. In primarily unimpacted fractures Cotton, of Boston, has undertaken to hammer on the trochanter with a wooden mallet until he produces artificial impaction; his reported end-results so far are few, but encouraging. But the idea of a hammer is not very attractive, and for the last five years he had been practising Cotton's artificial impaction in what seemed to him an equally efficient but less theatrical manner: he had found it sufficient to anæsthetize the patients, reduce the fracture in the ordinary way, and then simply abduct the limb until one hears the bones crunch, when the fragments will stay together; they are then held in this position by a gypsum dressing. Now the question arises, what patients will stand all this? His first patient was a lad of fourteen years; he secured an anatomically and functionally perfect result, except for 0.5 cm. shortening, and moderate loss of abduction, which inconveniences him not at all except in gymnastic exercises. Any reasonably healthy patient up to sixty years, perhaps older, will stand this method. Even in the case of impacted fractures with deformity, in such patients, the position of the fragments should be improved by this method.

Next, in the case of patients who cannot endure such radical treatment, the surgeon should not wash his hands of all responsibility for securing a useful limb. If they are abandoned to themselves non-union is inevitable. For these cases no method is so satisfactory as that of Phillips, Maxwell and Ruth. Under this treatment, which can be instituted in every case, no matter how feeble the patient, a certain proportion of fractures, even when entirely intracapsular, will result in union without impaction, *provided one first reduces the fracture.* Attention must be given to flex the hip up to about a right angle, make vertical extension upward, and finally bring the limb down in abduction and inversion; then apply the Phillips dressing, with an apparatus like Volkmann's sliding splint, to prevent outward rotation of the limb.

Old fractures at the hip, with non-union, usually are the result of inefficient treatment when the fracture was recent, as has been repeatedly pointed out here by Dr. G. G. Davis. Such patients deserve to be treated more energetically than heretofore. Many of them are otherwise sound physically. Two operative procedures are open to us: one for patients who will endure long fixation, the other for those who will not. (1) The speaker had done three bone-peg operations for non-union: the first patient was a man of 30 years, and is the only one with an entirely satisfactory result. He has some shortening and a little limp, but with good solid union was able to return to his work less than a year after operation. The second patient was 42 years old, and though he seems to have solid union, without much shortening, he seems to have no intention of returning to work so long as he can find someone to support him. The third patient, aged 52 years, returned to work (cigarmaker) about six months after operation, and though he uses a crutch on the street, requires no support walking

about the house. (2) In patients incapacitated by non-union of neck fractures there is another method of treatment suitable for those who cannot endure long confinement to bed after operation. This is simple excision of the head fragment, as advocated by Lambotte. The patients can then be gotten out of bed in ten days or two weeks, and though walking with a limp, and perhaps requiring a crutch, are said to be markedly relieved of their pain and disability.

Finally, in regard to fractures of the shaft, he inquired of Dr. Estes whether he thought the condition of the soft parts (in simple fractures with much swelling) is improved by early operation, say on the first to third day, or whether it is better to wait until the swelling has subsided of itself, which may be in such cases as late as the fifteenth day. Lambotte claims for the operative treatment of recent fractures, when once the form of the bone has been restored by an absolutely rigid support applied directly to the shaft, that it enables the surgeon to disregard the bone and to take care of the soft parts as if no fracture had existed. He goes so far as to say that he believes that when a femur has been properly plated, it would be possible for the patient to walk on it the next day; but he adds that it is not expedient to make the experiment. This theory (that rigid fixation of the bone enables one to eliminate a fracture as a factor in the subsequent treatment and to pay proper attention to the soft parts) is seductive, but in practice it cannot always be carried out; and in most fracture operations, especially those involving the femur, external retentive apparatus is required, and in difficult femur cases he had seen Lambotte himself apply plaster-of-Paris dressings. Yet he believed that when a plate tears out it is the fault not of the plate but of the surgeon, who did not put it on correctly. In most such cases one or two screws have been used, where there should have been six or eight; or else the plate has not been placed across the obliquity of the fracture, so as to bring the pull of the fragments in a plane at right angles to that in which the screws are inserted. In cases where the fragments are difficult to retain, there need be no limit to the amount of internal fixation appliances employed; several plates may be used, or the plates and fragments both may be encircled with wire. So long as rigid fixation is secured, so long as the metal is sufficiently covered by the soft parts, and so long as no infection occurs, there is very little likelihood of the plates subsequently requiring removal. Of course a plate *may* work its way out years later. Dr. Edward Martin had told him of a patient who came to him seventeen years after Dr. John Ashhurst had inserted a plate in his leg; only after that long interval did it begin to cause trouble. But even if a plate may

remain quiescent for so many years and then begin to work its way out, one does not have to abandon the use of plates on that account. They are in my opinion the most reliable means of fixation for recent shaft fractures.

Dr. Estes in closing, said that the Steinmann nail is being used much abroad at present in the cases of terrible shattering of limbs, and with excellent results. This frequent use is because of its easy application.

In treatment of fractures of the neck of the femur the most satisfactory treatment is by the old Hodgen splint. By this method any degree of abduction desired can be secured. It also carries out the idea of Murphy, by bringing the two fragments of the bone together. He agreed with Dr. Roberts in what he has said concerning the open operation. But the men who treat fractures most, who have the largest clientèle of fracture practice, are doing the open operation more and more. It seemed to him that the revelations of the X-ray have rather disturbed former belief in our excellent results. His paper stated that there was always danger of infection in the open operation and that always should one attempt reduction by the closed conservative procedure before attempting the open method. After proper reduction, proven by skiagram, there is no reason for doing the open operation, provided one can hold the fragments by some apparatus.

The fascia fixation mentioned by Dr. Roberts is excellent in some bones, but is not sufficiently rigid in the large bones.

STATED MEETING, HELD APRIL 3, 1916

The President, Dr. Charles H. Frazier, in the Chair

SUBACROMIAL BURSITIS, SHOWING RECOVERY FROM OPERATION

Dr. James K. Young exhibited a man, aged thirty-five years, referred to him by Dr. Thomas A. Erck, on account of a painful condition of the shoulder-joint. Eight months before the man had a fall from a height of 26 feet, and caught on something with his right hand, injuring the shoulder; since that time there has been noted severe pain in the shoulder-joint, especially beneath the deltoid muscle.

Examination showed considerable disability of the shoulder-joint, with inability to lift the arm shoulder high. The X-ray showed a shadow due apparently to a localized infiltration of the soft parts just below the tip of the acromion process on the right side. A diagnosis of subacromion bursitis was made, and the Codman operation was performed by him, following the technic accurately. An incision was made on point of shoulder about 2½ inches in length, extending down to but not beyond the centre of the deltoid, at which point the circumflex nerve winds around the neck of the humerus. The fibres of the deltoid were separated, the bursa was exposed and found to be adherent to the muscle, these bands were separated, the sac was opened and a white fluid evacuated; there was no calcification of the sac and no loose fragments of bone; there was one firm band of adhesion in the upper part of the sac which was divided. No deep sutures were used and the wound was closed with silk gut sutures. The arm was elevated to a right angle and suspended in bed for forty-eight hours; primary union occurred; four weeks later the arm was manipulated and massaged, and perfect recovery resulted.

The interesting features of this case were: (1) Prolonged and ineffectual treatment which he had for eight months before applying for operation; (2) the possibility of making a diagnosis from the X-ray in a bursa in which there was no calcification; (3) the simple character of and prompt recovery from the operation.

There are many such cases in every large orthopædic clinic, some are

simple without injury to the bone, and in some which he operated upon recently, there were fragments of bone lying beneath the bursa, which required attention after the bursa had been opened. It has been said that manipulation is more important in these patients than operation, but in this particular individual the operation seems to have been more important than the manipulation itself. It has also been stated that these patients recover within a given space of time without any operation, but in this particular individual there was no improvement whatever eight months after the accident and he was totally incapacitated for work. It has been a question whether time is shortened by operation, and it appears in this patient that the time was distinctly shortened by the operation.

Dr. Gwilym G. Davis said that Dr. Young's case of subacromial bursitis brought up the question of the advisability of operating in cases of disability in which restriction of motion of the shoulder-joint is present. He thought the disability to be due to the normal motion being restricted by effusion or contraction or by bands; and, if by some means the causes which limit the motion are eliminated, there will ensue a return of function. That being so, if these cases were treated by some method of persistent stretching, by some form of exercise, by free movement of the joint under anæsthetization; or, if the patients were put in bed and weight traction made to increase abduction, or by any means to obtain a normal range of motion, the symptoms will be eliminated. In these cases of disability the question arises as to whether or not the improvement is due to the operation itself. He was inclined to believe that the improvement is not due to the cutting part of the operation, but to the improved position in which the limb is placed after the operation is completed; in other words, to the freer motion and the placing of the arm during the process of healing in the most extreme position. If this be true, then the same result ought to be brought about by persistent conservative methods which will stretch the adhesions; or by radical movements under an anæsthetic, which will rupture or stretch adhesions and increase the range of motion, this to be followed by exercise of the parts.

Dr. A. P. C. Ashhurst said that he saw a great many stiff and painful shoulders, but it is impossible to secure hospital accommodations enough to operate on even a small proportion of them. He never saw but one patient that he thought he could certainly diagnose as a subacromial bursitis without other lesion, yet at operation on this patient, no bursa at all was present, but under the thinned deltoid he did find inside the capsule two osteophytes, which he removed; and the patient's

disability was completely relieved (ANNALS OF SURGERY, 1916, I, 174). If one could treat these patients with periarthritis of the shoulder in the manner Dr. Davis suggests, without operation but by persistent abduction in a plaster case, retained for from four to eight weeks, one might be able to cure them; but it is difficult to induce an adult patient to have his arm fixed so long in this position. Operative treatment, therefore, is not entirely to be condemned if it will get a patient well in a shorter time. He asked Dr. Young how long he kept the patient in bed, whether the time of treatment was lengthened or shortened by operation, and whether, if he had given an anæsthetic and instituted abduction and done no operation, he would not have kept the patient in bed the same length of time.

DR. DAMON B. PFEIFFER had been trying for some time to get some information regarding stiff and painful shoulders. He had been impressed with the uncertainty in the etiology of stiff and painful shoulders and with the lack of a definite underlying pathology. Dr. Ashhurst's case of a spur of bone which seemed to be the cause of disability reminded him of a case on which he operated about six months ago: a man fell into a hole, receiving an injury to the shoulder-joint; following the injury he had a very rigid shoulder, the arm could not be abducted to a right angle, and was almost without power. The man was under observation for two months, the X-ray showing absolutely nothing, but the patient's condition nevertheless demanded relief. There was a peculiar grating in the shoulder on motion which he attributed to subacromial bursitis. Making the usual incision, he found a small triangular gap in the capsule of the joint, evidently due to a rupture at the time of the accident. At the base of the triangle there was a rough protruding ridge of bone from which the capsule had been torn, and this gave the grating sensation by infringing upon the acromion. He attempted to close the defect, first chiselling away the bone and making it smooth, but was unable to do this because the tissue was detracted and dense. He then mobilized the capsule by undermining it and shifted it across in order to close the defect. A plaster dressing was applied and the arm kept in hyperabduction for four weeks. The arm was much improved when he left the hospital, but he had not been seen since. These cases emphasize the uncertainty of the underlying pathology prior to operation and the fact that here, as in the abdomen, the exploratory incision is justified in certain cases.

DR. T. TURNER THOMAS had seen the same condition described by Dr. Pfeiffer of a perforation in the joint capsule and overlying rotator tendons. It would seem to be due to the tearing away of the capsule and the overlying tendons from the greater tuberosity to which they are attached. He thought the tearing away of the capsule with the fragments of bone gives the calcification that we hear so much about in connection with subacromial bursitis.

TUBERCULOUS AND LUETIC INFECTION OF KNEE-JOINT

DR. JAMES K. YOUNG also reported a case of a youth fourteen years old suffering from mixed infection of the knee-joint—tuberculous and luetic. Three months before he first saw him he fell, striking his right knee, and acute inflammation and swelling occurred, and two weeks later he was taken to a large general hospital where he remained three weeks. He left the hospital because amputation was advised.

Examination at this time showed the right knee greatly enlarged, indurated and flexed to 10 degrees; the joint could be flexed but could not be extended. The family history was negative. The X-ray showed a large amount of periosteal inflammation with some enlargement of the bone; the disease did not extend into the cartilage of the knee-joint. The tuberculin test was positive and the Wassermann test was slightly positive. The limb was straightened by dividing the hamstring tendons and forcible correction under an anæsthetic. Subsequent to this operation an abscess formed and a sequestrum was removed. Later a circular seat brace was used to take the weight off the joint, and the limb was kept in an extended position. In addition to the mixed treatment he was given local applications of the X-ray. The result has been most gratifying, there is a complete restoration of all the movements of the joint and entire freedom from pain. The interesting feature of this case was the diagnosis which was confirmed by the Röntgen examination. The pathological condition present has to be distinguished from sarcoma. There was marked periosteal thickening in the negative taken four months after the onset of the disease, the striated appearance being characteristic of specific disease.

Specific osteomyelitis shows more sclerosis and less infiltrating destruction of the bone than occurs in acute pyogenic osteomyelitis.

In sarcoma the ossification progresses in an irregular and ragged way, the effect in the X-ray being not uniform but spotted quite different from the regular bony layers observed in chronic specific periosteitis. The exudate has a smoky appearance.

TOXIC GOITRE IN GIRL TEN YEARS OLD

DR. A. W. SAWYER, by invitation, described the case of a girl, ten years of age, who was admitted to Dr. Frazier's service, University

Hospital, March 8, 1916, with a complaint of goitre and nervousness. She is a school-girl, ordinarily industrious and does well in her studies. She sleeps well, but gets easily tired and excited. She has had measles, mumps, pertussis and scarlet fever. She is subject to colds. Menstrual periods have not begun.

Father is an alcoholic and on many occasions had returned home in a drunken condition threatening to either turn the family out into the street or kill them all. Naturally, this has always greatly upset the child, and may be a possible etiological factor in her case. At present the father is suffering from tuberculosis at Mt. Alto, so that disturbing element in the family life is eliminated. The mother, four sisters and one brother are living and well. Two brothers are dead, one dying at birth, the other in infancy of unknown cause. Two aunts died of cancer of the breast and one of toxic goitre.

With reference to the present history, two years ago, patient developed shortness of breath upon exertion, and attacks of palpitation of the heart. At this time a swelling was noticed in the neck. Nervousness came on shortly after and dyspnœa, and palpitation gradually increased. For the past year and a half she has had pain about the heart which becomes marked upon exertion. This is not always severe, but it is discomforting. At times she is cyanotic upon exertion and for the past two years has had night sweats and becomes easily excited.

There is no cough or other symptom referable to the lungs. Appetite is poor and at times she suffers from indigestion. No vomiting. Bowels are regular. No difficulty in breathing or swallowing. No swelling of the ankles. Former headaches have been relieved by glasses. Mother stated that child was unusually thin and had no desire to work or play.

She was a thin, rather poorly nourished young girl, with flushed cheeks and watery eyes. Pupils were slightly dilated. They reacted to light and accommodation, there was no widening of the palpebral fissure, no exophthalmos or von Graefe sign. Voice was husky. Laryngoscopic examination was negative. Upon admission pulse ranged between 90 and 105.

Thyroid gland is moderately enlarged. Both lobes about equal. There was an expansile pulsation felt over the gland, also a slight thrill, and at times a bruit was heard. There was slight enlargement of the posterior cervical lymphatics. There was a marked systolic pulsation in the vessels of the neck and in the episternal notch, and a systolic murmur was heard in the carotids.

The chest was thin, lungs normal, except for the right apex, which showed increased harshness of the breath sound both anteriorly and posteriorly with slight increase of vocal resonance. No whispered voice sounds or râles were heard.

Heart was slightly enlarged both to the right and left, muscular quality good. Rate was somewhat rapid and there was a marked respiratory arrhythmia. At the apex there was a soft systolic murmur and a harsh systolic murmur at the aortic area transmitted to the vessels of the neck.

Abdomen negative. Hands and feet were sweaty. There was no tremor and no œdema of the ankles. Reflexes normal.

With the exception of a slight trace of albumin, urine was negative.

Blood showed 18 per cent. of lymphocytes in the differential. Blood-pressure, systolic 114, diastolic, 48.

Fluoroscopic examination of the chest revealed no substernal thyroid or thymus. She was put to bed at once on routine anoci treatment in preparation for operation, which was performed twelve days later. During this time she improved but slightly.

Operation was performed by Dr. Frazier under anoci technic. Both lobes were found to be enlarged, but because of the child's age, it was thought wise to do only a single lobectomy. The right was removed, together with the isthmus as far as the left side of the trachea, leaving the posterior capsule behind. Wound was closed with drainage which was removed in twenty-four hours, stitches were taken out in seven days, wound healing by first intention.

Patient is making an uneventful recovery with gradual improvement in the symptoms. She feels better, is not so nervous and does not flush up as easily. Heart rate is about the same, although the chart shows that it has not reached the high points that it did previous to operation.

Blood-pressure, systolic, 108; diastolic, 68.

The signs which were present in the heart before operation have disappeared so that there are now no abnormalities. Electric cardiograph tracings made both before and after operation show a change in the temperature wave which might perhaps be taken to mean that the ventricular action of the heart is somewhat lessened. Blood picture is approximately the same as on admission.

Pathological report gives a diagnosis of colloid and exophthalmic goitre, the toxic hyperplasia being secondary.

Except as to the age of the patient the case was not an unusual one, but because it was the youngest case of goitre with which they had had to deal it was deemed worthy of note. Dr. Frazier has had one case of sarcoma of the thyroid in a boy of eleven years, and he recently saw a

girl of twelve years who had a non-toxic goitre of several months standing. In this case there was also an etiology of a drunken parent upsetting the nervous mechanism of the child.

The reporter referred to an article by Dr. Coleman Buford, of Chicago, in which he speaks of the condition as rather common. To be sure, Chicago is in a goitrous territory, and therefore many more goitres of all ages are seen.

Dr. Buford divides the cases into three groups: (1) Those of infancy under one year of age; (2) those of childhood from one year to adolescence; (3) those of adolescence.

In the first group, namely those under one year of age, he finds that they are not so frequent. He cites a case of an infant under one year at the Cook County Hospital, who had a goitre but this was accompanied by an enlarged thymus. Reference is also made to a case of goitre in a 6-months' fœtus, and he says that there are other scattered references through the literature of goitre in infants under one year. No reference was found in the pathological records of late years. Dr. Joseph B. DeLee has seen goitre present at birth, one in an infant born of a goitrous mother, in which the goitre was so large that the child's head was forced backward because of it. He says it is not uncommon for goitres to appear in children the second or third day after birth, and then in a few days to quickly disappear.

In the second group, namely from one year to adolescence, to which this case belongs, goitres occur with increasing frequency, according to Dr. Buford, and between six years and adolescence they are very numerous, at least in the region about Chicago.

They are usually goitres involving a well-defined area of the gland, and 9 out of every 10 will show the lesion in the lower pole of the right lobe. From this Dr. Buford assumes that possibly the thyroid gland has a division of function. They are usually benign adenomas with varying degrees of toxicity. Some are very toxic. Unilateral thyroidectomy is not often indicated. Usually, removing the encapsulated nodule or mass is sufficient, while the majority are benefited and relieved from symptoms by thyroid feeding, removal of focal infections, such as badly diseased tonsils, adenoids and teeth, and proper hygiene. He finds goitres often associated with diseased tonsils; the sort that look innocent enough until the pillar is pulled aside and the tonsil turned out of its bed.

The symptom-complex which he gives indicates a low grade of health and the case just recited falls under this list very readily. The children, mostly girls, are frail and thin with soft muscles which easily fatigue. They are irritable, do not enjoy play and are slow in school. The eyes are usually bright and watery. No exophthalmos. Hair is gritty and dry. There is a faint flush of the cheeks, complexion is muddy and skin frequently shows eruptions. Extremities are cold and the pulse ranges between 80 and 120. The heart is tumultuous but shows no tachycardia in the usual sense. Occasionally fine tremors of the choreiform type are present.

No characteristic blood picture and no chlorosis. The history of this ten-year-old patient fits into this syndrome very well.

Out of about 3000 cases of goitre in the Mayo Clinic, 10 per cent. were under twenty years of age and only *five cases* were below ten years. The youngest was four, who showed a typical exophthalmic type. There were 3 cases of seven years, and one of eight. All were girls.

PERFORATION AT THE STOMA TWO YEARS AFTER A GASTRO-JEJUNOSTOMY FOR DUODENAL ULCER

Drs. George G. Ross and William B. Swartley reported the case of a man, thirty-three years of age, who was admitted to the Germantown Dispensary and Hospital, November 3, 1912, and discharged December 12, 1912, as improved. He presented the symptoms of duodenal ulcer, and was so greatly improved by dietetic treatment that he was discharged after five weeks.

He was readmitted to the surgical ward of the Germantown Dispensary and Hospital, January 27, 1913, in the service of Dr. G. H. Ross, stating that two weeks after discharge from the hospital his previous symptoms began to recur with increased severity. He treated himself as before in order to get relief, but the symptoms were so extreme that he returned to the hospital.

Operation (January 29, 1913).—The peritoneal cavity was opened by an upper right rectus incision, and an ulcer found on the duodenal side of the pylorus. A posterior gastrojejunostomy was performed and the pylorus was plicated and the abdomen closed in the usual manner. Patient had a satisfactory recovery from this operation and was discharged as cured on February 21, 1913.

He was again readmitted to the surgical ward of the Germantown Dispensary and Hospital on the service of Dr. Francis T. Stewart, April 28, 1915, with the following history: Three weeks after his second discharge from the hospital, he noticed a burning persistent pain in his lower abdomen just above the pubis. Diet and " Sprudel salts " gave relief. He would have a period of malaise, nausea and vomiting almost every month. The pain would often come on about one-half

to one hour after a heavy meal, and as a rule was accompanied by pain shooting to both shoulders. Most often he had a gnawing and burning pain on an empty stomach, most pronounced about 5 P.M. These symptoms continued; always has gas and an oily fatty taste upon belching and a great deal of "heart-burn." In the morning of April 28, 1915, he did not feel well and ate nothing, but took a dose of salts with temporary improvement. He carried a bucket of coal from the cellar and on his arrival upstairs he had a sudden, sharp, stabbing and cramp-like pain in his upper abdomen, most severe around the umbilicus, and soon becoming general. This pain was accompanied by cold sweats. The physician who saw him then said he had board-like rigidity of the entire abdomen and was greatly shocked. He did not vomit, but was nauseated. His bowels had been regular and three weeks before admission they were a tarry black color. When admitted the abdomen was somewhat distended and absolutely quiescent. Respiration was entirely thoracic. The abdominal muscles were in a condition of tonic rigidity. The entire abdomen was tender, but tenderness was most marked in the lower abdomen and at a point one and a half inches to the left and on a level with the umbilicus. This point was the location of the original pain. Some dulness in the flanks upon percussion but mostly in the left side. No audible peristalsis. Four or five hours after the initial pain, the abdomen was opened by an incision 2 cm. to the left and parallel to the previous incision. The belly wall was very thin. There were many adhesions to the old scar of the previous operation. On opening the peritoneal cavity, gas and free seropurulent fluid escaped. The adhesions to the old scar of the previous operation were so dense that examination to the right of the incision was impossible. The transverse colon appeared under the incision. This and the small gut were greatly inflamed. Search revealed a perforation to be on the jejunal side of the anastomosis and just at the point of anastomosis. The perforation was about 8 to 9 mm. in diameter and of a typical punched-out type. There was no suture material found at the site of the perforation. The perforation was invaginated with a purse-string suture of linen thread. A second suture of linen thread was used to reinforce and cover over the perforated area. A counter opening was made in the midline, midway between the umbilicus and the pubis, and a large rubber tube was inserted into the pelvis for drainage. Seropurulent fluid escaped from the pelvis. The wound was closed by layer suture and four tension sutures. One long piece of gauze drainage was allowed to remain at the lower end of the upper incision. The abdominal cavity was not flushed out with salt solution. Patient was placed in the Fowler position and given proctoclysis. He was given nothing by mouth until the fifth day, when he had a few fluid drachms of albumin water. This was increased until he was given liquid diet without milk and soft diet on the tenth day. The rubber drainage tube in the pelvis was removed on the fourth day, while the gauze drainage in the upper incision was entirely removed on the seventh day after operation. All stitches were removed on the tenth day and the patient allowed out of bed in a wheel chair. The highest temperature was 102° F. on the day after operation. The temperature gradually returned to normal and remained so until the fifteenth day, when it rose to 101 4/5°. This temperature was reactionary, after shock due to a profuse hemorrhage from the bowel and stomach. After the bowel movement, which consisted almost entirely of blood, the patient fainted and was put back to bed, having all the symptoms of shock. After being returned to bed, he began vomiting large quantities of fresh blood. The bleeding was so severe that adrenalin chloride (1 to 1000) in two fluidrachms of water was given by mouth and morphine sulphate, gr. ⅙, by hypodermic. The vomiting of blood decreased gradually and after three days they again began to give patient water in small quantities by mouth and peptonized milk by rectum. On the eighteenth day after operation he was again given liquids, and on the nineteenth day allowed out of bed with no recurrence of complications. He was discharged as greatly improved on June 11, 1915. Since patient has returned to his home, he has been working regularly and has had very little pain in the stomach. After eating a big meal or after eating fried foods, he has had discomfort and vomited several times, but is now feeling better and has gained weight. Ten days after his discharge from the hospital the patient was married, and is now the happy father of twins.

Statistics show that jejunal ulceration occurs in 1.5 per cent. of all gastro-enterostomies. Keen states that all of these cases were of the perforating character, and therefore were not recognized, causing death by abscess, or in other ways in which adhesions and complications so obscured the parts that even an autopsy failed to reveal the true nature of the disease. Mikulicz says that in 34 instances in which the location of the gastro-enterostomy anastomosis was mentioned, it occurred 25 times by the anterior and 6 times by the posterior method. In the posterior operations the jejunal opening is about 9 inches distant from the beginning of the jejunum; in the anterior it is from 16 to 20 inches distant from this point. It would appear, therefore, that the lower the point of anastomosis in the jejunum, the more susceptible the mucosa to digestive action of the peptic juices.

The jejunal ulcer develops most frequently within the first six months following the original gastro-enterostomy. Of the 146 cases collected by Schwarz in 1914, 50 developed within this period, 22 within the second half of the year, 20 between the second and fifth years, and 13 between the fifth and tenth years. As a rule, the ulcer lies close to, and is exactly on the line of, the anastomosis, but sometimes it may be an inch or two away in the bowel, at either side of the anastomosis.

In 58 cases Van Roojen found the position to be:

In the closest proximity to, or exactly upon, the suture line in....	42
In the proximal limb of the jejunum in.....	6
In the distal limb of the jejunum in.....	8
In or near the point of an entero-anastomosis in.....	2

AMŒBIC ABSCESS OF THE LIVER*

By Alfred C. Wood, M.D.
of Philadelphia

Abscess of the liver may result from a number of conditions. Writers on the subject mention as the more common causes, the following: Traumatism, extension from adjacent suppurating foci, parasites, gall-stones, infection through the portal vein (from appendicitis and other lesions of the alimentary tract), infection through the hepatic artery from certain septic conditions (otitis media, ulcerative endocarditis, typhoid fever, etc.), and tropical dysentery. The latter condition gives rise in a certain number of cases to the so-called amœbic or tropical liver abscesses. As the case to be reported appears to belong to this class, the other forms will not now be considered.

Members of the white races, who visit certain tropical countries, are very subject to amœbic dysentery. Although dysentery is common in both sexes and at all ages, abscess of the liver occurs chiefly in adult males. It has been stated that men are affected thirty times as frequently as women. In the absence of any explanation as to how these figures were obtained, the question arises whether this ratio may not correspond with that of the two sexes visiting the tropics. The natives are relatively immune to dysentery and hence to amœbic abscess of the liver.

Tropical liver abscess may be latent, or at least develop without any manifestations that attract attention to the seat of trouble. The usual symptoms are, in addition to dysentery (or a history of a previous attack), pain in the right hypochondrium, commonly reflected to the back and right shoulder, fever, acceleration of pulse and respiration, leucocytosis, sallow skin, furred tongue, loss of appetite, digestive disturbances, and weakness.

The physical examination will show restricted respiratory action in the right lower chest, increased liver dulness, tenderness to pressure, upper right rectus rigidity, etc. Involvement of any adjacent structure from extension of the infection will modify or add to the above, in accordance with the part affected. Examination with the fluoroscope will reveal the enlarged liver area, and more or less restriction of motion of the diaphragm on the right side.

Abscess of the liver, if not relieved, leads to a fatal termination

*Read before the Philadelphia Academy of Surgery, April 3, 1916.

from septicæmia, with or without secondary involvement of adjacent organs or cavities. We have no reason to suppose that a cure may be obtained by any other means than evacuation, either spontaneously or by surgical aid. It is stated that about 28 per cent. rupture, and that rather more than one-half of these empty into the pleural cavity or lung. Cases are reported in which the discharge took place into the peritoneal cavity, gall-bladder, stomach, duodenum, colon, and inferior vena cava. Such a case may under exceptional circumstances recover, but the risk is too great and the outcome too uncertain to permit the pus to take one of these courses.

Some form of operative relief must therefore be considered. Aspiration is recommended by some, and one gets the impression from the literature that the trocar and cannula still have a place in the treatment of these cases. While special indications must always be given due consideration, an increasing tendency is apparent, in the absence of pointing or other guide to the focus of suppuration, to open the abdominal cavity and in this way to locate and deal with the abscess in the most direct and thorough manner. Introducing a needle into the liver through the chest wall as a means of locating an abscess, unless the latter be very large, is not to be relied upon as conclusive, if no pus is found. Of course, if pus is thus obtained the diagnosis is established. It is very properly urged by some recent writers that even this exploration should not be undertaken without having made every preparation to proceed at once to secure adequate drainage if the abscess is located. The needle should invariably be allowed to remain as a guide, until the focus of suppuration has been adequately drained. The reason for this injunction will appear in the following quotation. "It is surprising how many exploratory aspirations have been made without disclosing a large abscess, and how many times, when pus is shown by aspiration, and the needle removed, it has been impossible to find the abscess at operation performed later." (W. J. and C. H. Mayo.)

A minor detail developed in this case that seems sufficiently important to record. The aspirating needle was introduced into the liver at several points, sometimes without any result, and occasionally a few drops of blood were obtained. In one or two instances, the appearance of the fluid suggested a slight admixture of pus. Dr. Austin, who was present, examined the fluid with the microscope and reported it entirely free from pus. When the abscess was finally tapped, the fluid obtained could not have been distinguished by the naked eye from blood obtained from the seat of a severe, chronic congestion, but when a drop was placed under the microscope, Dr. Austin at once reported the presence

of pus. Without this help, the search would no doubt have continued further, and the collection might even have been overlooked. On the other hand it prevented further investigation at one or two points where the blood obtained had a "suspicious" appearance. This difficulty would probably not occur in abscesses of longer standing, as the purulent characteristics would be more fully developed.

As 70 to 75 per cent. of these abscesses are located in the right lobe, and most frequently in the upper and posterior part, when exploratory puncture is decided upon, the needle should be introduced in the eighth or ninth intercostal space, in the posterior axillary line. The intelligent manipulation of the needle will be greatly facilitated if guided by visual inspection through a previously made abdominal incision.

Dependent drainage is desirable in these cases as elsewhere if it can be obtained, and to secure this it will be necessary in many cases to resect a portion of one or more ribs, usually the ninth or tenth in the axillary line. If the pleura is exposed it should be reflected upward, when possible, but if unavoidably opened, the two layers should be sutured together before proceeding to open the abscess. Whether it is advisable to suture the liver to the opening in the diaphragm or to protect the abdominal cavity by a gauze coffer dam must be decided at the time of the operation. The suture is recommended and is theoretically to be adopted, but it will not always be found practicable. In such cases proper gauze protection will be required.

In the case the report of which follows I adopted the plan of exposing the liver by an abdominal incision for the following reasons: First, the symptoms of liver abscess had existed but seven days, and it seemed reasonable to suppose that an abscess, if present, might be relatively small, hence easily missed by the uncertain method of introducing a needle through the lateral chest wall. Second, the patient appeared so ill that it would have been a serious, if not fatal, blunder to have overlooked the abscess. I was prepared, therefore, to make the most thorough exploration. Third, with proper technic, I believe it is a safer method than the blind use of the exploring needle.

The method was found to be very suitable in this case, as it is probable that either the intrahepatic or the extrahepatic abscess or both might otherwise have been missed.

The subjoined history appears to show that the amœbic infection occurred six years before the illness described. It may be assumed that the patient was the host of the amœbæ during all of this period. The symptoms of liver abscess developed three days after the beginning

of a severe attack of dysentery and seven days later the operation was performed.

It is to be noted that, although the patient has been cured of his liver abscess, the amœbiasis remains unchanged, notwithstanding the active use of emetine hypodermatically.

Case Report.—A. V., male, aged thirty-three years, a sailor, was admitted on September 3, 1915, to the service of Dr. E. H. Siter, Hospital of the University of Pennsylvania, from the British Consulate, and was transferred to the medical service of Dr. Stengel. I am indebted to Dr. S. S. Leopold, house physician, and Dr. N. R. Goldsmith, house surgeon, for the following notes:

Chief Complaint.—Pain in the right hypochondrium, fever and malaise.

History of Present Illness.—Eleven days ago, the patient sailed from Liverpool, feeling well. Three days later, a very severe diarrhœa developed, lasting three days. He does not recall how often the bowels moved, but thinks it may have been 9 or 10 times during a four-hour watch. He describes the stools as liquid, grayish or brown, often frothy, but never containing blood or large amounts of mucus. Cramp-like pains were present in the abdomen; there was no vomiting at this time. Five days ago the patient became so weak that he was compelled to go to bed; he had severe abdominal pain which seemed to begin in the right hypochondrium and to radiate around to the back, up to the right shoulder and into the neck. The diarrhœa stopped at this time; the movements continued to be liquid, but occurred only about once a day. The patient states that he had a temperature of 102°, five days ago; does not know whether he had any fever before this time. He occasionally vomits large amounts of watery material; has been unable to retain anything but liquid for past five days; has never been jaundiced; complains of occipital headache. There has been no nose-bleed. The urine has a dark brown color.

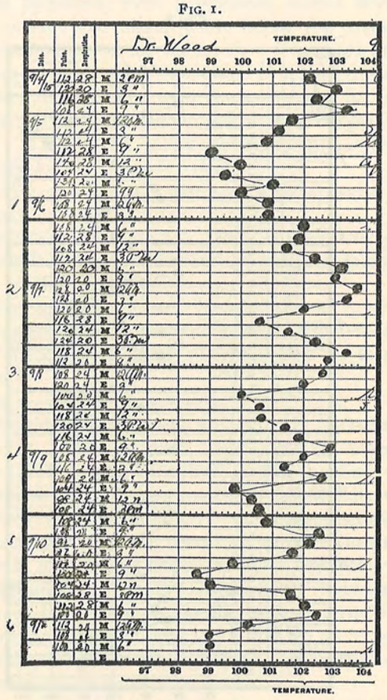
Past Medical History.—The patient says he has been all over the world. He had blood poisoning 6 or 7 times; an attack of malaria fifteen years ago, and suffered from severe dysentery when in Buenos Aires six years ago. Three or 4 other men on the ship were similarly affected. He has never had typhoid fever; does not recall any other illness.

Social History.—He has been a seaman for fifteen years, the last position held being that of second engineer on a steamship owned by the Anglo-American Oil Company. The last two voyages were between Liverpool and America. He has used alcohol and tobacco to excess; has had two attacks of specific urethritis; but says he never had syphilis.

Family History.—Negative.

Physical Examination.—The patient is a fairly well nourished, adult male, of good bony and muscular development, he has the appearance of being very ill. On admission the temperature was $102^{1}/_{5}°$, reaching $103^{2}/_{5}°$ the same evening; pulse 108 to 120; respirations 20 to 28; white blood-cells 16,400; the eyes are dull;

Fig. 1.



Figs. 1-4 show the course of the fever from the time of admission until the thirty-second day, after which the temperature remained normal.

the breath is intensely fetid. He complains of severe abdominal pain.

The superficial vessels are not sclerosed, the radial pulse is regular, of fair volume, and the two sides are equal and synchronous.

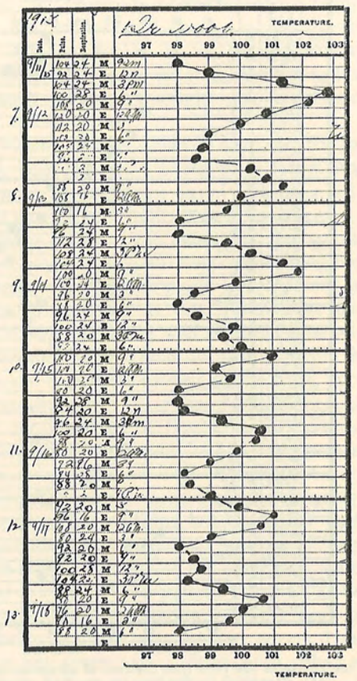
The superficial lymph-nodes: A few post-cervical glands are palpable; there is no general adenopathy.

Eyes: Pupils are equal; irides react promptly to light and to accommodation; ocular movements free in all directions; the sclera are slightly icteroid; conjunctiva pale.

Throat: The tonsils and pharynx slightly congested.

Tongue is thickly coated with a dirty, whitish-brown fur, it is protruded in the midline; there is no tremor. The breath is

FIG. 2.



intensely fetid. The teeth are in poor condition. There is marked pyorrhœa, and many decayed roots. Several teeth are missing.

Thorax is somewhat emaciated; expansion fair.

Lungs: Normal to auscultation and percussion throughout. Right base moves but 2 cm. on deep inspiration.

Heart: Apex beat not visible nor palpable. Supracardiac dul-

ness, first interspace 7½ cm.; second interspace 6 cm. Right base 4¾ cm.; left base 12 cm.; right oblique 4¾ cm.; left oblique 15 cm.; height 9 cm. The sounds are of fair quality, no murmurs are present, rate increased in frequency, second pulmonic is accentuated.

Abdomen: There is distinct rigidity in the right upper quadrant. Light palpation, even percussion, causes severe localized pain, most pronounced about 3 cm. below the costal margin, in the midclavicular line on the right side. There are no other areas of tenderness or rigidity; no fluid could be demonstrated.

Liver extends from the fifth rib downward for a distance of 19 cm. (by percussion) below the costal margin in the right nipple line. It is 7½ cm. below the ensiform, but cannot be felt.

Spleen and kidneys are not palpable.

Extremities: All reflexes are somewhat sluggish; no clonus; no Babinsky.

Blood-pressure: Systolic 118; diastolic 62; pulse-pressure 56.

Fluoroscopic examination shows arching and immobility of the diaphragm on the right side.

September 4, 1915: *Blood:* Red blood-cells 3,390,000; white blood-cells 15,800; hæmoglobin 61 per cent.; polymorphonuclears 87; small leucocytes 9; large mononuclears 2; transitionals 1; eosinophiles 1.

The Wassermann test was negative.

Urine: Slightly cloudy; dark amber; light flocculent sediment; specific gravity, 1024; reaction, acid; albumin, trace; sugar, 0; urobilin, +; faint trace bilirubin; a few hyaline casts; cylindroids, 0; much mucus; occasional red blood-cell; white blood-cells, 10 to field; moderate amount squamous epithelium, crystals, 0.

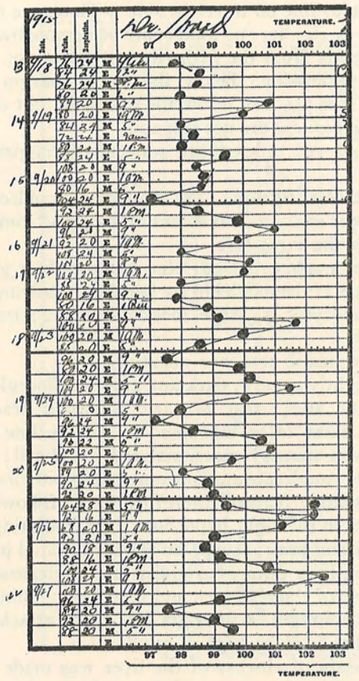
The outstanding features therefore were: following a profuse diarrhœa, pain in the right hypochondrium, radiating to the back, right shoulder and neck; fever; leucocytosis; rapid pulse; prostration; increased liver dulness; rigidity and tenderness in the right upper quadrant of the abdomen and increased arching with immobility of the diaphragm on the right side. The attack of dysentery six years before is to be kept in mind.

The diagnosis of abscess of the liver was made by Dr. J. H. Austin, with whom I had the privilege of examining the patient. Immediate operation was deemed necessary as the conditions present pointed to an extreme degree of sepsis. It may be added that subdiaphragmatic abscess, fluid in the right pleural sac as well as other causes of similar symptoms, were considered, but were ruled out by exclusion.

Operation (September 5, 1915).—Ether anæsthesia. A right, upper transrectus incision was made. The gall-bladder, stomach,

pylorus, duodenum and pancreas were normal. The liver was found much enlarged, and the upper surface more convex than normal. The appearance was such as to suggest a large abscess beneath the upper surface. After having protected the abdominal cavity with gauze pads, a large hollow needle, attached to an aspirator, was introduced into the suspicious area in different

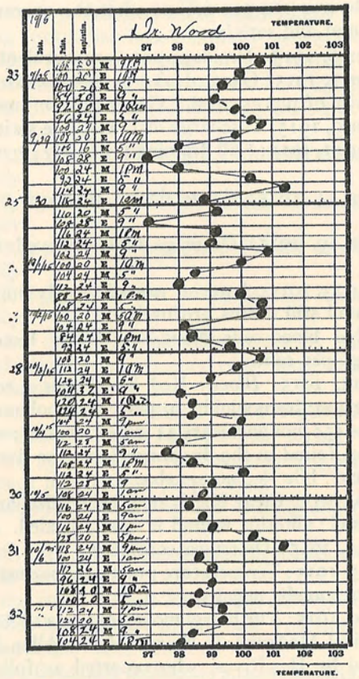
FIG. 3.



directions, but without result. Several other points were investigated in a similar way, and an effort was made to explore the upper, posterior portions by introducing the needle from the under surface, upward and backward, but no pus could be found. A hand was next passed over the right surface, from in front, backward; when the posterior surface was reached some soft adhesions were unavoidably separated, liberating a small amount of pus,

which was removed by sponging. Further exploration of this area led to the conclusion that this small collection did not account for the patient's symptoms. It was then decided to introduce the aspirating needle in the neighborhood of the site usually recommended. The exact point selected in this case was the ninth interspace in the posterior axillary line, which corresponded

FIG. 4.



with the particular area of the right lobe of the liver that appeared most in need of investigation.

The direction of the needle was determined by inspection through the abdominal wound. By this method any portion of the liver adjacent to the right lateral abdominal wall may be systematically explored. An abscess was reached at a depth of about 3 inches. The needle was allowed to remain in place, while a

section of the tenth rib was removed and the liver freely exposed. The pleura was not encountered. After proper gauze protection, the liver was opened along the line of the needle and the finger introduced, the tip of the finger barely reaching the cavity. The matter drained had the characteristic brownish-red color. A rubber tube was inserted and the tract filled with a gauze tampon. Cigarette drains were placed in the abdominal wound and the incision closed about them by layer sutures of catgut. The patient's pulse was 164 per minute after the operation, but reaction was prompt and satisfactory.

September 6, 1915: Drainage not very purulent.

September 7, 1915: Gauze drains in thoracic wound removed; a large quantity of pus escaped. Gauze tampon inserted.

September 9, 1915: Discharge distinctly bile stained to-day.

September 11, 1915: Still draining profusely; general condition good.

September 14, 1915: Gauze drains removed. Still draining copiously.

September 19, 1915: Drainage tube removed from thoracic wound.

September 23, 1915: Anterior wound rapidly improving. The posterior wound still drains profusely.

Blood: Red blood-cells 2,620,000; white blood-cells 8900; hæmoglobin 40 per cent.

October 15, 1915: *Blood:* Red blood-cells 3,100,000; white blood-cells 12,300; hæmoglobin 49 per cent.; polymorphonuclears 76; leucocytes 15; mononuclears 3; transitionals 3; eosinophiles 3.

No amœbæ found in the discharge from the liver abscess.

Fæces: Acid; bile +; no amœbæ.

October 6, 1915: Clear bile is now being discharged from the posterior wound; anterior wound is nearly healed.

October 12, 1915: Diarrhœa continues.

October 15, 1915: Temperature practically normal. Examination of pus for amœba negative.

October 19, 1915: The bowel movement was sent to the laboratory of Tropical Medicine, in charge of Dr. Allen J. Smith, and was examined by Dr. Rivas, who reported as follows: "Fæces green and liquid. *Amœba histolytica* found in both the encysted and vegetative forms." One-half grain of emetine given hypodermatically.

October 20, 1915: Emetine, one-half grain given hypodermatically to-day.

October 21, 1915: Emetine, one-half grain hypodermatically.

Urine: Amber; flocculent sediment; specific gravity 1017; albumin trace; sugar, 0; casts, —; cylindroids, —; mucus, +; red blood-cells, —; white blood-cells, occasional; crystals, occasional.

Blood: Red blood-cells 3,530,000; white blood-cells 12,400; hæmoglobin 46 per cent.; polymorphonuclears 74; small, 26.

October 24, 1915: Diarrhœa continues. Draining profusely. Dr. Rivas reported the presence of amœba as in the previous examination.

October 28, 1915: *Blood:* Red blood cells 3,540,000; white blood-cells, 17,600; hæmoglobin 45 per cent.

November 1, 1915: Allowed up in chair to-day.

November 4, 1915: Diarrhœa continues; general condition better; drainage less profuse; incision rapidly closing. Dr. Rivas reported the presence of the encysted form of amœbæ in larger numbers than in either of the previous examinations. The vegetative form was also seen.

November 5, 1915: Emetine, gr. 1 (sterile ampoule), given hypodermatically.

November 6, 1915: Emetine, gr. ½ (sterile ampoule), given hypodermatically.

November 7, 1915: Emetine, gr. 1 (sterile ampoule), given hypodermatically.

November 8, 1915: Emetine, gr. ½ (sterile ampoule), given hypodermatically.

November 10, 1915: Drainage now contains pus, thin bile-stained material very scanty. General condition greatly improved. Diarrhœa has stopped.

November 12, 1915: Dr. Rivas found vegetative forms of amœbæ in fair numbers and a few encysted forms.

November 15, 1915: *Blood:* Red blood-cells 4,000,000; white blood-cells 17,700; hæmoglobin 74 per cent.

November 20, 1915: Patient up and walking about. No more gauze drainage.

November 26, 1915: Dr. Rivas reports the presence of amœba in large numbers in the fæces.

November 29, 1915: *Blood:* Red blood-cells 3,660,000; white blood-cells 12,600; hæmoglobin 47 per cent.; polymorphonuclears 62; small 34; leucocytes 1.

Urine: Straw; flocculent sediment; specific gravity 1018; albumin, faint trace; alkaline; sugar, 0; casts, an occasional hyaline; cylindroids, —; mucus, +; red blood-cells, —; occasional white blood-cells; epithelium, occasional; crystals, —.

December 1, 1915: Wound has fully healed, patient feels entirely well.

December 12, 1915: Emetine hydrochlor, gr. 1, hypodermatically.

December 15, 1915: Emetine hydrochlor, gr. 1 hypodermatically.

December 17, 1915: Emetine hydrochlor, gr. 1, hypodermatically.

December 19, 1915: Emetine hydrochlor, gr. 1, hypodermatically.

December 20, 1915: Dr. Rivas found the amœba present as in the previous examinations.

December 25, 1915: Patient exhibits no ill effect from emetine treatment. Amœbæ still present in the fæces, although patient is symptomatically entirely well, and is apparently now in good health.

January 5, 1916: Occasional slight attacks of diarrhœa.

February 1, 1916: Examination of fæces; amœbæ present.

February 10, 1916: Examination of fæces; amœbæ present; occult blood was present at every examination.

February 18, 1916: Patient has developed a scarlatinal rash (afebrile).

February 20, 1916: Diagnosed scarlet fever by Dr. Hartzell and sent to the Municipal Hospital.

The patient was returned by the Municipal Hospital to the University Hospital, April 4, having passed through an apparently typical (mild) attack of scarlet fever, followed by desquamation. He was in perfect health and appeared to be normal in every way. There had not been any tendency to diarrhœa.

He requested his discharge on the following day, to return to his former position. It is to be regretted that an examination for amœbæ was not made.

MESENTERIC THROMBOSIS

Dr. George M. Laws reported the case of a boy of ten years, who on January 1, 1915, was seized with acute abdominal pain soon followed by vomiting. He was taken home on a train by his mother and during the hour's ride went into collapse. A course of calomel was administered and followed by the passage of a large quantity of blood. A few hours later there were two small bloody stools. He continued to have severe colicky pains and vomiting and showed the effect of hemorrhage when seen by the reporter, four days after the onset, with Dr. H. L. Sinexon of Paulsboro, N. J. At that time the abdomen was moderately distended and decidedly rigid and tender, especially below and to the right of the navel. Peristalsis was increased. Rectal palpation revealed nothing except the presence of old blood. No attempt had been made to move the bowels since the first day. The patient had a tuberculous history and had never been robust. For several years he had often complained of abdominal pain in the early morning, for which no cause could be discovered. Three months before this attack he had swallowed a penny which was never found, but gave rise to no apparent trouble. He was removed at once to the University Hospital. On admission blood examination was: red blood-cells, 3,350,000; white blood-cells, 17,600; hæmoglobin 46 per cent.; differential polymorphonuclears, 86 per cent.; lymphocytes, 11 per cent.; leucocytes, mononuclear, transitionals 1 per cent.; temperature, 99. Pulse, 107. Respirations, 32.

Dr. Laws, with the assistance and counsel of Dr. J. B. Carnett, opened the abdomen by a right rectus incision; a considerable quantity of bloody fluid poured out of the peritoneal cavity. About two feet of the small intestines presented, distended, œdematous and purplish in color. The line of demarcation was fairly well defined at both ends. Delivery of the loop seemed to straighten out an obstructing kink at the distal end which, however, was regarded as secondary rather than the cause of the trouble. Below this point the intestine was collapsed. The mesentery was studded throughout with hard lymph-nodes of various size, evidently tuberculous. The mesenteric veins corresponding to the damaged segment were thrombosed. It was decided not to resect because of the well-known high mortality, the technical difficulties presented by the condition of the mesentery, and the fact that the gut was still viable after four days, and the patient had not grown progessively worse. The appendix was normal and was not removed. The wound was closed without drainage. The boy was very ill for two days. Vomiting then ceased and distention gradually subsided. After recovery he improved decidedly in general health and has had no return of the former abdominal pain, which was probably due to the tabes mesenterica and may have been benefited by exploratory laparotomy and subsequent treatment.

STREPTOCOCCIC PERITONITIS COMPLICATING ERYSIPELAS

Dr. Laws related the case of a man, aged nineteen years, who was admitted to the Phila. General Hospital, service of Dr. A. C. Wood, Feb. 19, 1916, with the following history. After a prodromal period of four days the patient developed a rapidly spreading facial erysipelas on February 16. At its height the temperature was 101° F.; the pulse 90. The duration was short and by the third day was rapidly subsiding. During the evening of February 17 he had slight pain over the splenic area, but did not call attention to it until the following morning, when it became worse. Abdominal examination was negative and an

ice-bag was applied and the pain relieved. In the evening of the eighteenth he complained of pain in the region of the appendix. There was slight tenderness but no rigidity. Temperature 99; pulse 88. The next morning he began to vomit and had slight abdominal rigidity. Temperature normal; pulse 100. At 4 P.M. he had grown worse—temperature 97°, pulse 120, pain most marked over appendix. He was then sent to the hospital with a diagnosis of appendicitis. By evening he had general abdominal rigidity, tenderness and distention. Peristalsis was absent. Examination of the chest disclosed a pleural friction at the left base and evidence of an inactive tuberculous process at the apex. Under the diagnosis of perforative peritonitis the abdomen was opened by a right rectus incision; free fluid, turbid and flaky, escaped. The appendix was partly covered with inflammatory lymph and was removed. It was not perforated and the fluid was odorless. A large quantity of fluid was present in the pelvis and in both flanks. Assuming that there was a perforation high up in the gastro-intestinal tract, the pyloric region, duodenum and gall-bladder were examined without one being found. A drain was placed in the pelvis and another in the right side. Temperature, pulse and respiration rose steadily until the patient died fourteen hours later. A culture made at operation showed streptococci.

Autopsy.—The intestines for the most part are smooth and shiny but many flakes of fibrin are scattered over their surface and several hundred c.c. of reddish turbid fluid occupy the dependent parts of the abdominal cavity. The appendectomy site is perfectly closed and in good order. There are no adhesions or other disturbances referable to the operation. The intestines were examined from end to end and showed no sign of perforation, nor did the stomach, duodenum, gall-bladder and other viscera. Both pleural cavities contain one hundred to two hundred c.c. of fluid, on the left side cloudy, and slightly blood stained; on the right side clear. The pericardial sac contains a normal amount of fluid. Heart negative. Left lung is attached to the diaphragm by a liberal coating of yellow fibrin. It is highly œdematous and there are scattered groups of minute miliary tubercles in the upper lobe. In the right lung the upper and middle lobes are œdematous. The lower lobe is solid, bright red, flabby, airless, and on section highly glazed and brilliant red, resembling the red hepatization of croupous pneumonia, but differing from it in not being swollen, friable or firm. The spleen is large and contains a considerable number of yellow infarcts of hæmatogenous and pyogenic origin, some on the surface and some deeply situated. The adrenals are quite œdematous, the cortical substance being yellow, the medullary substance bright red. The kidneys present the swelling of the cortex supposed to signify acute parenchymatous nephritis. Ureters, bladder and prostate normal. Duodenum and pancreas normal. Liver appeared normal, but cut surface was highly glazed and has a peculiar orange tint for which no explanation is apparent.

SUPERNUMERARY MUSCLE OF THE DORSUM OF THE HAND

EXTENSOR BREVIS DIGITI MEDII ET INDICIS: A RARE CAUSE OF DISABILITY IN A PIANIST

By Damon B. Pfeiffer, M.D.
of Philadelphia

The following case is reported not only because of its excessive rarity as an anatomical anomaly, but also because of its important practical bearing upon the occupation of the patient.

Mr. L. P., aged twenty-eight years, was referred to me by Dr. Vincent Lyon for an opinion as to the cause and treatment of a lump on the dorsum of his hand. The patient was a pianist and had been engaged in the study of this instrument for seventeen years. As long as ten years ago he had observed a small lump on the back of his right hand, which was situated in the angle between the extensor tendons of the index and middle fingers, its most prominent portion being about one inch below the level of the radiocarpal joint. This had increased gradually in size until at the time he was sent to me it was a quite conspicuous prominence when the fingers were held in extension. As he devoted himself more assiduously to practice, he observed that the lump would become quite sore after prolonged work, the soreness disappearing again after a period of rest. He noted also that the index and middle finger of the right hand seemed stiffer than the corresponding fingers of the left hand and, in fact, stiffer than any other two adjacent fingers of either hand, so that, in spite of the fact that he was right handed, it was more difficult to "trill" with these two fingers than with the others. For these reasons, which were serious because of the hindrance to his professional advancement, he sought relief.

On examination with the fingers flexed, there was a rather soft indefinable sense of fulness in the region indicated. Upon forced extension of the first or second fingers, or both, the prominence appeared and would be traced upward to where it seemed to blend with the annular ligament. It was tender to moderate pressure, which would give rise to an ache that lasted for a short time.

I attributed the condition to a synovitis involving sheaths of the first and second extensor tendons and possibly affecting also the sheaths beneath the annular ligament. There was no evidence of previous local or general infection, but the patient

suggested the element of chronic trauma by saying that he ascribed the condition to playing in a forced and strained manner during his early practice. In view of the long series of recurrences upon exercise, with quiescence after rest, as well as the importance of bettering the condition, I concluded to lay bare the affected tissues in the hope of being able to resect inflamed or adherent structures. An X-ray taken previously showed that the bony structure of the hand presented no abnormalities.

Operation.—March 8, 1916, Presbyterian Hospital. A longitudinal incision was made directly over the mass. On opening the delicate deep fascia the structure of a muscle greeted my eyes. Its fleshy portion ran upward toward the annular ligament. Below, it sent off two tendons, the larger of which joined the radial aspect of the extensor tendon of the middle finger, while the smaller joined the ulnar aspect of the indicator tendon. Though there were two tendons there was apparently but one muscle belly. In view of the unexpected nature of the case, the lack of precedents in procedure, and the importance of doing nothing that might further impair the use of the fingers, after consultation with Dr. Lyon and cautious exploration of the muscle, the operation was terminated. Recovery was rapid and followed by a restoration to the former state.

The findings fully explain the nature of the case. A single-bellied extensor attached to two adjacent fingers would naturally interfere with the "trilling" movement, since extension of one finger would interfere with simultaneous flexion of the other and *vice versa,* though by the action of the more powerful long flexors and extensors the smaller muscle could be overpowered. The early stiffness and forced position to which he attributed the condition was rather a consequence than a cause of the anomaly, and the gradual increase in size was due to work hypertrophy of the muscle. Its antagonistic action, overpowered by stronger muscles, caused stiffness and soreness after exercise. It would seem justifiable, in the event of continued interference with function, to resect the muscle or perform tenotomy of the anomalous tendons, since the normal tendons were seen in their usual position and in a normal state of development.

In some respects this condition recalls the operation of Dr. Wm. S. Forbes,[1] first performed by him in 1857, which consisted in severing the accessory tendons of the ring finger in order to allow its extension unopposed by these bonds of union to the adjacent tendons. Mr. J. R. Zeckwer, whose interest in the subject is due particularly to the fact that his father was the first to advocate the procedure to musicians, states that some 10,000 operations of this kind were performed, with

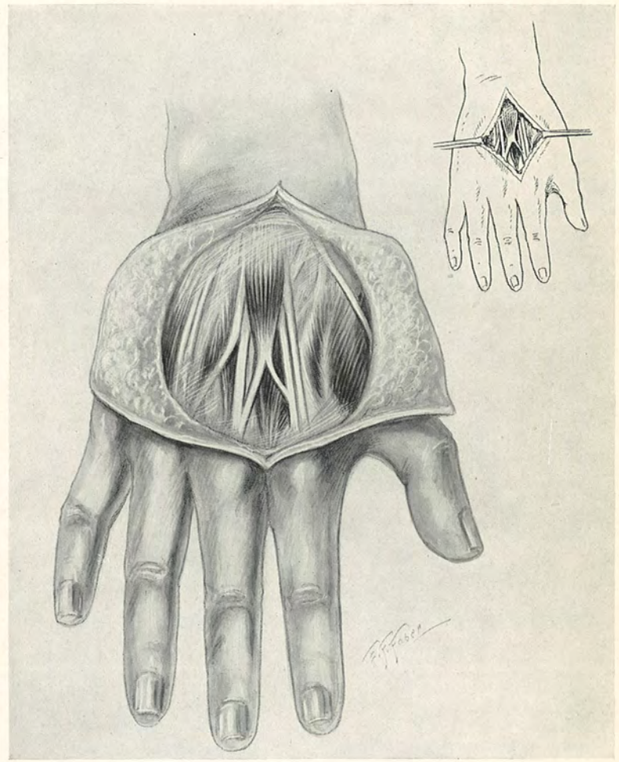


FIG. 1.—Extensor brevis medii digiti et indicis.

brilliant results in certain cases. It is not now thought necesary, though in some instances where restriction is marked it can doubtless be used with benefit.

The present case is a very rare anomaly. The only reference to what is apparently an exactly similar condition is by Gruber,[2] who reports one such instance in 600 dissections (1200 arms). This muscle arose within the sheath of the fourth compartment of the dorsocarpal ligament and from the base of the third metacarpal. In the present case the exact origin was not ascertained, owing to a desire not to inflict unnecessary injury. The insertion of the tendons in the two cases were the same.

Anomalies of various kinds of the extensor muscles and tendons of the hands, however, are not uncommon. Albin,[3] in 1758, reported and pictured an instance somewhat similar to the above, which he named the extensor brevis digitorum manus, and Gruber [4] has recorded some sort of varieties of the short extensor of the hand in 1.417 per cent. of 1200 dissections of the arm and hand. Such muscles are vestigal structures. Owen [5] has pointed out that in the *Lemuridæ* and *Quadrumana* "the homologue of the extensor indicis of man bifurcates, and sends a tendon both to the index and medius digit; the homologue of the extensor minimi digiti also splits and sends a tendon also to the annularis; so that while in man the index and minimus only have two extensor tendons, all four fingers have them in most *Quadrumana*."

Gruber [6] has shown that the *Orang Cynocephalus* and *Cebus apella* as a rule possess an extensor digiti indicis et medii, while MacAlister,[7] Humphrey,[8] and others have shown the normal existence of such short extensors of the digits in the unau, the ae, the two-toed ant-eater and the pangolin.

Ordinarily such variations would escape discovery. In the case reported it derived its importance from its bearing upon the occupation.

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[2] Gruber: Beobachtungen aus der Menschl. und Vergleichenden Anat., Heft. VII, Berlin, 1886, S. 22.
[3] Albin: Annotationes academicae Lib. iv. Leidae, 1758, Cap. vi, p. 25, Tab. V Fig. 3.
[4] Gruber: *Loc. cit.*, p. 32.
[5] Owen: Comparative Anatomy and Physiology of Vertebrates, vol. iii, p. 53.
[6] Gruber: Beobachtungen aus der menschl. u. vergleich. Anatomie, vi Heft, Berlin, 1886, 550–553.
[7] MacAlister: Report of the Anatomy of the Insectivorous Edentates. Trans. of the Royal Irish Acad., vol. xxv, Dublin, 1875, p. 506.
[8] Humphrey: Journ. of Anat. and Phys., vol. iv, 1870, p. 49.

DR. ADDINELL HEWSON said this condition is very rare. The difficulty resembles, in a measure, the bridle between the middle, ring finger and little finger on the extensor tendon of the ring finger and proceeding to the two others named. This bridle prevents the act of trilling with the ring finger, when the middle and little finger must hold the piano key down. The operation as done by the late Dr. W. S. Forbes of this city, in dividing this accessory tendon of the ring finger, has been reported in the literature. The fact, however, that it does give great relief in this mechanical movement of the pianist and flute player, is very evident. Quain's *Anatomy*, page 231, indicates the possibility of the occurrence of the fasciculi as outlined by Dr. Pfeiffer. It seems possible, from the attachment of this accessory muscle to the long extensor tendon, to divide its attachment to the long extensive tendon and thus relieve the bridle effect, or checking effect, upon the tendon in question.

TRAUMATIC SPONDYLITIS

DR. L. W. FRANK, by invitation, presented a man, aged forty-two years, who in May, 1914, tripped and fell, striking his back on a tree. The injury was not severe and he continued his work. That evening he noticed a small lump on his back which later practically disappeared. He could walk, and continued work, though at times he had slight pain in the back with neuralgic pains radiating around both sides of the abdomen. About four months later the pain in his back became quite severe, so much so that he could not lie down and had to sleep in a chair. Turning or twisting caused severe pain in the back radiating down the legs.

Eight months after the accident, the pain was so severe he could not move. He remained quiet for two months, spending most of his time in a chair, after which he got up and wore a brace. Since then he has gradually improved. At present he has no pain while lying down but the slightest jar or twist produces very severe pain in the back radiating down both legs, and he still has neuralgic pain radiating around his abdomen. He has no paræsthesia in the legs or abdomen. Since the accident he has had gradual loss of sexual desire and power. Since the accident patient has had swelling of the right leg which develops during the day and diminishes at night. At times the leg becomes very large indeed. There have been no gastro-intestinal or pulmonary symptoms.

Examination reveals a thin, stoop-shouldered man who holds himself quite rigid, though he has some tendency to bend forward. He walks slowly and with great care. The spine of the twelfth dorsal vertebra is prominent and quite tender to pressure. Below this level there is slight curvature of the spine to the left, and the spine is held rigid and immobile. Above this point the vertebræ are movable. The patient cannot stoop over, and when picking objects off the floor he does so by flexing the thighs and knees. There are no sensory disturbances in the back, abdomen or legs. Both knee-jerks and Achilles jerks were slightly exaggerated. There is no Babinski nor ankle clonus.

The rest of the examination is entirely negative. Urine analysis is negative. Blood count reveals 5,000,000 red blood-cells with 75 per cent. hæmoglobin and normal leucocytes and differential count. Wassermann is negative. Von Pirquet is negative at the end of thirty-six hours. X-ray reveals bone destruction in the lumbar and lower thoracic vertebræ, with curvature and ankylosis of the lumbar spine.

This case conforms with the 3 points characteristic of traumatic spondylitis or Kümmel's disease. First, the injury. Second, period of practical freedom from pain during which neuralgic pains are frequently present. Third, reappearance of the pain with development of cord symptoms and kyphosis.

The only condition from which this disease must be differentiated carefully is Pott's disease. This differentiation is extremely difficult to make. In Pott's disease there is frequently a history of trauma followed later by pain in the back, kyphosis and ankylosis. However, in Pott's disease often other foci of tuberculosis are found, and this condition is more frequently found in children than in adults. The radiogram cannot aid very much in making a differential diagnosis in our case, as the condition had gone on to ankylosis and the X-ray picture of this case cannot be differentiated from that seen in old Pott's disease.

In 1891, at the Congress at Halle, Kümmel described a condition which he called traumatic spondylitis. This condition is always caused by trauma to the spine, either direct or indirect, producing a compression of the vertebral body. At the time of the trauma, patient experiences some pain in the spine, but later this disappears for days, weeks, or months, though in some cases it persists from the time of the trauma, gradually becoming worse. Several weeks or months after the accident, the patient again suffers pain in the back, accompanied by intercostal neuralgia, motor disturbances, sometimes slight in the lower

extremities, with some uncertainty of gait. Later he develops a gibbosity and an associated kyphosis.

Kümmel does not attribute the condition to a fracture of the body of the vertebra for the trauma is always too slight to produce that. He considers that as a result of the trauma there develops a disturbance of nutrition (rarefying osteitis) which leads to atrophy of the two surfaces by compression ulceration. Kümmel considered such cases to be types of traumatic spondylomalacia. Similar cases have been described by Henle, Heidenhain, Schultze and others, and in 1910 Mme. Temkin was able to collect 64 such cases.

Dr. A. P. C. Ashhurst said that in the second volume of the *Episcopal Hospital Reports* (1914) his assistant, Dr. R. L. John, has recorded several cases of traumatic spondylitis. In these cases the diagnosis was based upon the fact that the original injury was very severe, causing the patient to come to the hospital and be laid up for some time. The first patient had fallen out of a third story window, landing on his feet. The second patient put his head in an elevator shaft and the elevator came down on him. The third patient fell nine feet from a ladder, landing on his head. The fourth patient was knocked down by a trolley car. The subsequent disability developed gradually weeks or months after the original injury, and it was necessary to exclude tuberculosis and syphilis as possible factors in the etiology. In the fourth patient, with disease in the lumbar region, about two years after bone transplantation was done for the kyphos which gradually resulted from his traumatic spondylitis, he developed a gumma following another recent injury over the former site of the disease. Though there was no history of syphilitic infection, he had a plus four Wassermann, but that did not change the opinion that the original trouble was traumatic spondylitis, the syphilitic infection being independent. He had been entirely relieved of his spinal symptoms since the operation, and the appearance of the gumma did not cause them to return.

It is a well-known fact that following a single severe traumatism one may get bone atrophy, as is especially seen in fractures of the neck of the femur, which almost universally terminate in shortening even when bony union occurs, and it is quite reasonable to suppose that a severe injury in the vertebral bodies, even without fracture, will produce bone atrophy also. In the cases observed in the cervical spine (Cases II and III), in which region the vertebral bodies are of insignificant size, the bone changes have been confined chiefly to the articular processes, where apparently most of the injury had spent itself.

ENDOTHELIOMA OF THE SPINAL CORD

Dr. Chas. H. Frazier reported a case of endothelioma removed from the spinal cord at the level of the second cervical vertebra. A lady in her sixty-fourth year, first complained of pain in the right shoulder eighteen months before her admission to the University Hospital. The initial period of root irritation continued eight months before the second period was introduced with numbness of the right fingers and hand, and two months later weakness at first, and later complete paralysis of the right upper extremity. The examination elicited, briefly, tenderness in the neighborhood of the third cervical vertebra, spastic paralysis and sensory disturbances of the right upper extremity, paræsthesia of the left arm and leg, total loss of sensation for touch, pain and temperature in the left leg, and partial loss in the right; spasticity of both lower extremities and weakness of right leg and ankle. The biceps and triceps reflexes were exaggerated, and there was ankle clonus and a Babinski reflex on the right side.

The operation, performed under local anæsthesia, included the removal of the second, third, fourth and fifth spinous processes and the laminæ of the second, third and fourth cervical vertebræ. The tumor, when exposed, in the upper portion of the exposed canal, appeared at first to be intramedullary, but when an enveloping membrane, possibly the pia, was removed, the tumor was found to be extramedullary, attached to the dura, from which it probably originated. The cord was displaced to one side, and appeared to be reduced to one-half its normal diameter. The tumor was removed by sharp dissection, and with it one sensory root, which, surrounded by the growth, had to be sacrificed. The wound was closed with five layers of sutures, one each in the dura, muscles, aponeurosis, superficial fascia and skin. Convalescence was uneventful and by the time the patient left the hospital, thirty-five days after the operation, some power had already returned to the paralyzed arm and the patient could stand and walk with a little support. The interesting features of the case were the characteristic history, the accurate localization, the unusually high location of the tumor, the uneventful recovery, and the rapid restoration of function.

SYSTEM OF KEEPING SURGICAL RECORDS*

By Chas. H. Frazier, M.D.
of Philadelphia

In an active hospital service, it is difficult for the chief of the staff to remember in detail the immediate results of the operations which he or his assistant has performed. It is important, therefore, that some system be adopted whereby he may review in abbreviated form large series of cases and in this way see for himself where mistakes have been made, which should be corrected.

In my service at the University Hospital, staff meetings are held once a week, at which all records of patients discharged not less than seven or more than fourteen days before are reviewed. If any important facts have been omitted they are introduced and the interesting features of the case are emphasized. I find this an excellent means of impressing upon the house staff the importance of accurate record keeping.

From this record is entered in a book a summary of the case, some twenty-five cases to the page, and in this summary is the file number, name, address, diagnosis, number of days in hospital, the name of the operation, and in addition the following:

Immediate result .....
Asepsis maintained or not .....
Complications, if any .....
Comment .....
Anæsthesia .....
Anæsthesia complications .....
End result (to be filled in one year later) .....

Under comment is recorded a reason, if apparent, for any mishap, such as wound infection, fatality, mistake in diagnosis and the like, and after Codman's suggestion, these are listed as follows:

Errors due to lack of technical knowledge or skill ..... E-s.
Errors due to lack of surgical judgment ..... E-j.
Errors due to lack of care of equipment ..... E-c.
Errors due to lack of diagnostic skill ..... E-d.
The patient's enfeebled condition ..... P-c.
The patient's unconquerable disease ..... P-d.
The patient's refusal of treatment ..... P-r.
Delayed operation ..... D-o.
The calamities of surgery or those accidents and complications over which we have no control ..... C.

*Read before the Philadelphia Academy of Surgery, April 3, 1916.

This method invites free and frank discussions on all matters pertaining to the case, the diagnosis, selection of operation, time and preparation for operation, technic and after-care. It is at once an analytical criticism or a critical analysis of the routine work of the clinic. As a result of this discussion modifications of technic suggest themselves, means of avoiding wound complications are proposed, and other matters that make for greater efficiency adopted. Above all, it stimulates, all along the line, a livelier and keener interest in the welfare of the patient.

The efficiency of a surgeon's record need not be measured in terms of brilliancy or number of operations per day. These are ephemeral matters. The surgeon's usefulness must be measured in a more telling way; in the percentage of accurate diagnoses, properly chosen operations, percentage of recoveries, the avoidance of wound infection, wisdom in choice of anæsthesia and the avoidance of anæsthesia complications, and, last but not least, the final result.

With a summary as above outlined available, the staff can review the last series of cases, a hundred or more, in a few minutes, and can see at a glance how many or how few errors are chargeable to the service.

STATED MEETING, HELD MAY 8, 1916

The President, Dr. Charles H. Frazier, in the Chair

EXOPHTHALMIC GOITRE *

IMPORTANT FEATURES FROM THE STAND-POINT OF THE CLINICAL SURGEON

By Albert J. Ochsner, M.D.
of Chicago

In order to establish a reasonable basis for employing surgical treatment for the relief of exophthalmic goitre it seems proper to give some attention to the histological findings in portions of the thyroid glands removed from patients suffering from this condition. To what extent this pathological condition may return to normal in cases that have not been operated, it is, of course, impossible to say. There are certain facts, however, which would indicate that the thyroid gland may undergo pathological changes to such an extent as to produce a marked degree of hyperthyroidism, and that under favorable conditions, these pathological changes may subside sufficiently to leave the patient quite free from hyperthyroidism. Many such cases have been observed clinically, and we have a physiological condition which virtually duplicates these pathological changes, and which in most instances, ultimately leaves the patient and her thyroid gland in a perfectly normal condition. I refer to the goitre of adolescence.

Many of the typical symptoms of hyperthyroidism, such as enlargement of the thyroid gland, extreme nervousness, a certain degree of tachycardia, a slight muscular tremor, more or less marked muscular weakness, sweating, and sometimes a slight amount of exophthalmos, may characterize this condition. Notwithstanding these symptoms, physical, mental and emotional rest, good hygiene, pure drinking water and the use of proper diet will result in the disappearance, in the vast majority of cases, of all the symptoms of hyperthyroidism, as soon as the physiological demand for an increased secretion of the thyroid gland for trophic purposes has disappeared. The necessity of the body

* Read by invitation before the Philadelphia Academy of Surgery, May 8, 1916.

to produce marked increase in the size and form of the skeleton, in the breasts, and in other portions of the body, requires a physiological increase in the thyroid secretion during this period of adolescence. So long as there is a reasonable balance between the physiological demand and the physiological secretion, no permanent harm seems to come to the tissues. On the other hand, if the balance is markedly disturbed because of some form of irritation, so that the secretion becomes quite excessive, then the tissues of the body seem to suffer permanently. Landstrom has shown that in all cases in which the hyperthyroidism has resulted in an actual dilatation of the heart, the condition of this organ never returns to normal, even though the removal of a sufficient portion of the thyroid gland to overcome the hyperthyroidism may result in a fairly normal pulse beat and in the disappearance of all other symptoms of hyperthyroidism.

Another illustration of physiological hyperthyroidism is quite common during the period of pregnancy, probably because an unusual amount of new tissue has to be produced as represented especially in the skeleton of the child. Here again, if the balance is not markedly disturbed, conditions almost always return to normal.

Wilms has pointed out an interesting form of hyperthyroidism which occurs in medical students coming from regions where goitre is endemic. He found that these students with greatly enlarged thyroid glands would enter the medical department of the university free from hyperthyroidism, but that in a relatively short time, a more or less marked condition of hyperthyroidism could be determined. His explanation is as follows: The hypertrophy of the thyroid gland is probably a physiological development for the purpose of protecting the individual against the harmful effect of goitre-producing substances contained in the drinking water of these regions. So long as this protection is needed because the individual continues to drink the infected water, hyperthyroidism is not present, but when these individuals go to the city in which the medical school is located and drink water that does not contain the goitre-producing substances, then the enlarged thyroid glands secrete superfluous thyroid substance which cannot be neutralized because of the absence of the irritating material in the drinking water, and consequently the symptoms of hyperthyroidism appear.

Morian has suggested that the normal thyroid gland takes the iodine which enters the human body through the food and changes it into organic iodine, and that when this form of iodine is supplied to the human body through the stomach in the form of thyroid extract in large quantities, or in the form of potassium iodide, that then the thyroid

gland may produce an abnormal amount of this organized iodine; that, on the other hand, the thyroid gland in patients suffering from hyperthyroidism without the ingestion of an abnormal amount of iodine has the peculiar ability of flooding the system with an abnormal iodine product which has the poisonous effect producing the recognized symptoms of hyperthyroidism.

There can be no doubt but what the thyroid gland can be forced to produce an excessive amount of a substance causing a condition which Moebius has called hyperthyroidism, even though the gland had previously supplied only a normal amount of secretion. Ordinarily this increase is the result of some form of physical or mental or emotional irritation. I have personally observed it as a result of extreme physical or mental or emotional exhaustion caused by conditions so varied in character that it seems doubtful whether there can be any cause of such exhaustion which may not result in hyperthyroidism.

The conception of hyperthyroidism by Moebius thirty years ago, if accepted, would naturally have led to the surgical treatment of exophthalmic goitre, had it not been for the fact that the condition of the patient's heart in cases suffering from exophthalmic goitre would naturally be looked upon as a contra-indication to any serious operation. Fortunately, von Rehn had removed two goitres in 1884, notwithstanding the presence of the typical symptoms of exophthalmic goitre, not for the purpose of correcting these symptoms, but for the purpose of curing the goitre to whose presence these symptoms had not been attributed, and, to his astonishment, he found that the patients did not only recover from the goitre operation but also from the symptoms which we now attribute to hyperthyroidism. So that two years later, when Moebius brought out his theory, the foundation for surgical treatment of exophthalmic goitre had already been laid.

I performed my first operation for the relief of exophthalmic goitre in 1891, twenty-five years ago, and repeated the observation which von Rehn had made. The patient's pulse, which had been one hundred and forty beats per minute before the operation, came down to seventy beats during the time that the patient was in the hospital, and the patient has constantly remained normal, so far as any symptoms of hyperthyroidism are concerned, since that time.

About six years ago my attention was directed to the interesting histological findings in specimens of thyroid gland tissue removed from patients suffering from exophthalmic goitre, in a paper read by Louis B. Wilson. I have personally examined carefully the microscopic sections of every thyroid gland which I have removed since that time from

patients suffering from exophthalmic goitre, 507 in all. I can confirm, in a general way, the interesting observations made by Wilson. Dr. Spensely, of the Chicago University, has also made extensive studies which will probably still further clear up this part of the subject. In a general way, every thyroid gland taken from a patient suffering from exophthalmic goitre shows unmistakable evidence of structural conditions which account for increased secretion and for increased absorption of this substance. In many instances, the first section we have examined has failed to show the structural changes, but we have invariably been able to find in some portion of the gland removed, lobules which showed this characteristic hyperplasia, which in many cases is quite circumscribed, while the greater portion of the gland removed may show simple hypertrophy or colloid enlargement.

The subsequent history of cases in which the thyroid gland has been removed for the purpose of relieving the condition of hyperthyroidism has also confirmed the correctness of the theory of Moebius.

Surgical Treatment.—The consideration of exophthalmic goitre by the clinical surgeon begins at the point at which it ends for the practitioner of internal medicine. The patient suffering from this disease should not be considered a surgical patient until the fact has been established that she cannot be permanently relieved of the disease as a result of carefully applied rest, both physical and mental as well as emotional, until a carefully regulated diet has been employed for a reasonable length of time, until she has been subjected to the best possible hygienic conditions that can be obtained for a person in her circumstances, and until the few remedies which seem to be of value in the treatment of such cases have been thoroughly tried.

It might be stated at this point that these remedies should never include the use of thyroid extract, the use of digitalis, or the use of iodine, although the very minutest doses of the last remedy mentioned may at times be harmless, but probably also useless. We have seen a number of deaths that could be fairly attributed to the use of each of these three remedies, and we have never seen a case in which one of these remedies, or any combination of them, has been of the slightest benefit to the patient.

In speaking of the dietetic treatment, not only before, but also during, the time that these patients are under surgical care, and above all things, after the surgical treatment has been concluded, too much stress cannot be laid upon the importance of giving these patients an abundance of absolutely pure drinking water, or, if this is not available, upon insisting that all water taken by the patient be carefully boiled.

Limiting surgical treatment to patients belonging to the class which is covered by the above definition, the time of operation must next be considered. Too frequently the patient and her friends and her family physician become convinced that she requires surgical care because this promises the only hope for her recovery, at a time when the patient is at the height of a period of exacerbation. Under the supposition that the sooner the patient can obtain the benefit of surgical relief the better it will be for her, an immediate operation is planned. Surgeons with a large experience in the treatment of these conditions are agreed upon the fact that this plan must result in a considerable number of avoidable fatalities, because these exacerbations are almost invariably followed by a lull in the severity of the condition, and if this period is awaited, the margin of safety is widened to an amazing extent and the percentage of mortality is correspondingly reduced. By a margin of safety one would mean in these cases a condition which would make it almost certain that the patient under consideration will recover in case the operation is performed, and the more nearly certain the surgeon can be of this, judging from the condition of the patient at the time of the operation, the wider would be the margin of safety. This margin of safety, however, depends not only upon the condition of the patient herself, but also to a large extent upon her mental attitude, upon which Crile and others have laid so much stress. If the patient is not thoroughly convinced that she will recover if the operation is performed, her chances of recovery are greatly diminished, and if the patient is at all frightened at the time for which the operation has been set, this should be postponed until she has attained the necessary confidence.

In cases in which the margin of safety does not seem sufficient to warrant the excision of a sufficient amount of the diseased thyroid gland to promise a complete and permanent recovery to the patient, the surgeon should limit his operative work to the amount that the patient can safely bear. If it seems safe to remove one lobe, that should be done. If it seems safe only to ligate one or two or three of the principal arteries and veins, then this should be the limit of the operation. It is in determining the extent of the operation that the patient can safely bear, that the surgeon has an excellent opportunity of showing surgical judgment in the treatment of these cases.

It has seemed to us that ligations of vessels have been more effective if the regular horse-shoe incision is made, that one uses in performing thyroidectomy, and if the enlarged veins located anteriorly to the thyroid gland are all clamped and ligated, as well as the superior and inferior thyroid arteries and veins on the side of the gland most infected,

and if the patient seems to be in sufficiently good condition, the superior thyroid artery and vein on the opposite side may be ligated at the same time.

As to the use of boiling water in those cases in which the margin of safety is too narrow to warrant a more extensive operation, in a few patients in whom we have tried this we have been very well pleased with this operation, but our experience is too limited for us to speak authoritatively on this subject.

Whatever the preliminary operation may be, however, it seems wise to give the patient the same careful after-treatment as though a radical operation had been made and to make the radical operation when the patient has obtained the greatest amount of benefit from the preliminary operation. Whenever we have failed to make the radical operation because of the apparent improvement after the preliminary operation, we have been disappointed in the ultimate result, because all of these patients have relapsed; while if we have removed the offending gland after the patient has picked up following the preliminary operation, our results have been eminently satisfactory.

This margin of safety can be enormously widened by administering from 400 to 600 c.c. of normal blood at the beginning of the operation for the excision of a thyroid gland by means of the modified Kimpton tube, which was introduced by my colleague, Dr. N. M. Percy. The blood can be introduced into one of the anterior jugular veins. This portion of the operation requires less than ten minutes and can consequently not increase the danger of the operation itself, while it improves the patient's condition enormously. Of course, it is important to have the donor's blood examined in order to choose a donor whose blood will not cause hæmolysis when introduced into the patient's vein.

Next to this comes the danger from the use of anæsthetics. The only general anæsthetic that seems safe to use in these cases by surgeons in general, is ether administered by the drop method. It is, however, very much better to give the patient a hypodermic injection of ¼ grain of morphia and 1/100 grain of atropin one-half hour before the anæsthetic is begun. The advantage of this practice lies in the fact that the patient becomes quiet, is not sensitive to the consideration of the impending operation, and throughout the operation she is far less sensitive to pain, and consequently the total amount of ether which it is necessary to administer is very much less than it would be were this preliminary treatment omitted. Moreover, the patient will be returned to her bed with almost no ether in her circulation, while without this, she will be saturated with this poison. The atropin has also a quieting

effect, but its most important use lies in the fact that it prevents the accumulation of mucus in the pharynx and thus prevents the inspiration of mucus during the operation. Since we have employed this method our patients have been entirely free from ether pneumonia.

There is still a further method by means of which the amount of ether necessary can be greatly reduced. If the patient is thoroughly anæsthetized before the operation is begun, and if then the head of the table is elevated so that the body of the patient takes a position of forty-five degrees, the resulting anæmia of the brain will keep the patient anæsthetized for a sufficient period of time to enable the surgeon to perform the entire operation, from the time of making the first incision to the time of placing the last suture, without giving the patient any additional anæsthetic. Consequently, the patient will exhale ether throughout the period occupied for performing the operation without taking in any additional ether, and as soon as the head of the table is lowered, the patient is quite fully awake, and after the dressing is applied and the patient is placed in her bed, she is quite sufficiently awake to be permitted to sit up, which will further prevent the occurrence of ether pneumonia. Unless this precaution is taken, the patient is often returned to her bed quite saturated with ether, her pharynx is likely to be filled with mucus, and there is frequently a severe irritation of the larynx because of the manipulations necessitated by the operation, and the chances of ether pneumonia are very much greater.

Before returning the patient to her bed, it is of the greatest importance in all cases that have shown marked symptoms of hyperthyroidism to perform gastric lavage, using water at a temperature of 110° F. for this purpose. The mucus which accumulates in the stomach seems to increase the post-operative hyperthyroidism, and patients in whom gastric lavage has been made according to the method described seem to suffer very much less from this post-operative complication.

In order to eliminate entirely the danger from the anæsthetic, thyroidectomy may be performed under local anæsthesia by the use of ½ of 1 per cent. of novocaine with five drops of adrenalin chloride, 1 to 1000, to 1 ounce of the novocaine solution. If the surgeon's personality enables him to have a quieting effect upon the patient to such an extent that she will not suffer mentally from having the operation performed while awake, this method has many advantages. It has the further advantage of preventing traumatism. Many surgeons will perform an operation under local anæsthesia with almost no traumatism, while they habitually traumatize the tissues to a marked extent when operating upon the anæsthetized patient. In case the surgeon is habitually

violent in his surgical manipulations he should perform his thyroidectomies under local anæsthesia. There can be no doubt but what the likelihood of post-operative hyperthyroidism is greatly increased if the tissues are severely traumatized.

The loss of blood seems to have the same effect. It is consequently wise always to clamp each vessel between two hæmostatic forceps, cut between these and ligate. In this manner the entire operation may be performed with the loss of almost no blood, and the field of operation being constantly clean and free from blood, the surgeon is enabled to perform the operation with much greater facility. The tissues at the close of the operation will not be saturated with blood, the absorption of which according to Kocher also increases the likelihood of hyperthyroidism. For the same reason it is well invariably to apply drainage to these cases. Of course, all of these precautions are important from the stand-point of preventing shock at the same time that they prevent hyperthyroidism.

A great deal has been written and said concerning the importance of preventing injury to the recurrent laryngeal nerve and the parathyroid gland. In studying the literature of the subject, I have been struck by the fact that the surgeons who expose these structures for the purpose of protecting them, by laying bare the inferior thyroid artery and ligating the latter at a point external to its crossing the recurrent laryngeal nerve, are likely to have a considerable amount of paralysis of the recurrent laryngeal nerve at least temporary in character; because laying bare the recurrent laryngeal nerve, which is not much larger than an ordinary sewing thread, is very likely to result in an injury to this delicate structure. The ligation of the inferior thyroid artery at this point is likely to interfere with the blood supply of the inferior parathyroid gland, because this structure frequently obtains the greater portion of its blood supply from a branch of the inferior thyroid artery internal to this point. Injury to both of these important structures can, however, easily be prevented by bearing in mind the fact that both of these structures are located at the point at which the lateral lobe of the thyroid gland touches the trachea, and that they are both located behind the posterior capsule of the thyroid gland. Consequently, if the inferior thyroid artery is grasped in front of the posterior capsule of the thyroid gland, and if the portion of the posterior capsule of the thyroid gland is left undisturbed over the area at which the thyroid gland and the trachea are in close apposition, it is quite impossible to injure either the recurrent laryngeal nerve or the inferior parathyroid gland. Occasionally, however, one encounters aberrant arteries in this region, and in this case

one often has quite a little spurt of blood from one of these structures, and in applying forceps for the purpose of stopping this little hemorrhage it is quite possible to grasp through the posterior capsule and to injure one or both of these two important structures.

The veins in exophthalmic goitre are often so greatly dilated that it is well to bear in mind the possibility of air embolism in case one of these veins should be cut during inspiration of the patient and should be held open accidentally by means of forceps. It is also important to guard against rapid injection of novocaine in these cases because there is danger of forcing a considerable quantity of this fluid into a vein which might carry it to the heart, causing immediate death as a result of inhibiting the heart's action.

In patients who have suffered from the presence of a simple goitre for many years, in whom some portion of the goitre has later degenerated into the exophthalmic form, it occasionally happens that the old hard goitre has caused an absorption of one or more tracheal rings, and when the goitre has been removed, the trachea may collapse. If this occurs, the trachea should immediately be opened and a cannula should be inserted.

After-treatment.—By far the most important point in the surgical consideration of this condition consists in the after-treatment, because with careful after-treatment almost all of these patients may become nearly as useful as they were before they began to suffer from exophthalmic goitre, while in cases in which the after-treatment is not carefully carried out, practically all of these patients develop a condition as bad, if not worse, than that with which they presented themselves primarily for surgical treatment. The surgeon should bear in mind in the first place that practically all of these patients belong to a class of neurotics, and that this undoubtedly had much to do with the development of their goitres primarily, and that unless this condition is carefully taken into consideration in the after-treatment, the weakened physical condition of the patient will not be able to bear the wear and tear to which the neurotic tendencies would surely expose the patient. The same is true concerning the diet which is habitually chosen by the patients, which is usually exceedingly unwholesome, and it is consequently important that they be impressed with the fact that unless they will adhere to the use of a reasonable diet, their chances for a permanent recovery will be very slight. We have always given these patients printed directions which contain all of the important rules to be observed, and we have advised the patients to read these directions at regular intervals and to follow them for many years. The following is

a copy of the directions which we use in these cases, and which have proved eminently satisfactory. The patient receives a mild tonic and a laxative and an absolute diet list upon leaving the hospital.

RULES FOR GOITRE PATIENTS

1. You should avoid all excitement or irritation like attending receptions, shopping, church work and politics.

2. You should get an abundance of rest, by going to bed early and taking a nap after luncheon.

3. You should have an abundance of fresh air at night, consequently, you should sleep with wide open windows or on a sleeping porch.

4. You should eat and drink nothing that irritates the nervous system, like tea, coffee, or alcohol. Of course you should not use tobacco in any way.

5. You should eat very little meat. If you are very fond of meat, take a little beef, mutton or breast of chicken or fresh fish once or twice a week or at most three times a week.

6. You should drink a great deal of milk or eat things that are prepared with milk, such as milk soup, milk toast, etc., cream and buttermilk are also especially good for you.

7. You should avoid beef soup or beef tea or any kind of meat broths.

8. You should eat an abundance of cooked fruits and cooked vegetables, or very ripe raw fruits, or drink fruit juices prepared out of ripe fruits.

9. You may eat eggs, bread, butter, toast, rice, cereals.

10. You should drink an abundance of good drinking water, or if this is not available, you should boil your drinking water for twenty minutes or drink distilled water.

With the exception of a very small number of cases in which an insufficient amount of the gland had been primarily removed, or in which the remnant which had been left at the primary operation had increased in size, in practically all of the cases which have come to us with a recurrence, either from among those that we had personally operated or those that had been operated by other surgeons, we have almost invariably found that they had either diregarded the directions given regarding diet and rest and hygiene following their operative treatment, or they had been permitted to return to their homes without definite instructions in this direction. It is therefore very important that written or printed directions be given these patients and that they be thoroughly impressed with the importance of using these directions.

THE SURGICAL TREATMENT OF GOITRE*

HOW CAN THE RESULTS BE IMPROVED?

By Miles F. Porter, M.D.
of Ft. Wayne, Ind.

My title presupposes two things. First, that the results achieved in the surgical treatment of goitre are not satisfactory. Second, that it is possible to improve upon the results heretofore achieved in the surgical treatment of goitre.

It will not be necessary for me to occupy your time or try your patience in presenting proof of the first assumption. You need only recall your own experiences together with the results reported from other sources to bring you into entire agreement with it.

We shall proceed, therefore, at once to consider the various causes of failure in the surgical treatment of goitre and the possible means of avoiding them. We find that a certain percentage of cases of toxic goitre (and I use the term toxic here to include exophthalmic goitre) die without operation; a certain percentage die as a result of operation; another small percentage die in spite of operation, or after operation as the result of recurrence.

Quite a number of those cases of goitre which die without operation have been refused operation largely on the ground of other pathological conditions, among which diabetes and nephritis hold a prominent place. The coexistence of either nephritis or diabetes with hyperthyroidism should be considered rather as an argument for than against operation. O'Day [1] and others have shown that the cure of hyperthyroidism by surgical measures has been followed by the disappearance of sugar from the urine in these patients and the establishment of a normal sugar tolerance, while the disappearance of the signs of kidney inadequacy coincidently with those of hyperthyroidism has frequently been observed.

According to Rogers,[2] "only about 25 per cent. of cases of hyperthyroidism are improved by hemithyroidectomy, and some 10 per cent. of them are not benefited at all or made worse, and the general operative mortality is at least 5 per cent." I feel that the number of deaths from goitre, including those following operation and those occurring without

*Read by invitation before the Philadelphia Academy of Surgery, May 8, 1916.

operation, would be reduced if judicious surgery were employed earlier and more frequently. A more careful search for the vascular phenomena in cases of possible hyperthyroidism may enable one to reach a diagnosis earlier than could otherwise be done. Osler [3] has pointed out the fact that a thrill may be present in the thyroid when the gland is not enlarged. Riesman [4] has recently called attention to a bruit over the eyeball that may be an aid in diagnosis. Rogers,[5] in discussing the subject of goitre before the New York Surgical Society, April 10, 1912, said that excision should never be done in symmetrical enlargement of the thyroid nor in thyroid enlargement in the young, and that the same rule applied in colloid goitre as well as to the goitre of Graves's disease. Of course, no one would advise general or even frequent resort to surgical treatment in goitre occurring in young girls, but in the writer's opinion this teaching, without material qualification, is pernicious, for the reason that in his experience goitre occurring in boys is quite as apt to continue and to give trouble as is goitre occurring at a later age, while some of the most severe cases of toxic goitre that he has seen occurred in women who had carried their goitres from puberty, and the history clearly shows in many of these cases that there was a time when proper surgical treatment might have been carried out with less risk and much greater assurance of a satisfactory result than when they finally submitted to operation. It should be the rule to remove all permanent goitres whether they are producing symptoms or not. Were this rule followed there would be fewer cases of toxic goitre. Personally, I believe that there is as much reason for removing so-called simple goitres with a view to preventing them from becoming toxic as there is for removing or curing by surgical means certain lesions, such as warts, moles, and chronically inflamed areas, to prevent them from becoming malignant. If this rule were followed it would largely eliminate the deaths from so-called degenerating simple or toxic goitre. And it will be remembered in this connection that C. H. Mayo and Plummer [6] place the death-rate in this form of goitre at least 2 per cent. higher than that which obtains in the exophthalmic type.

The authors above quoted place the number of recurrences after operation at 10 per cent. To me it seems the part of better judgment to remove a larger part of the thyroid than is usually done, even at the risk of producing hypothyroidism, for the purpose of preventing recurrence and achieving more complete relief. Personally, for some years, I have not been content with doing a so-called lobectomy, but have removed in all cases from five-sixths to nine-tenths of the gland.

This experience covers more than 100 cases and in none, so far as my knowledge goes, has there been either recurrence or symptoms of hypothyroidism.

On the other hand, within that period I have been called upon to do a number of secondary operations for patients who had previously had one lobe of the gland removed. Frequently not more thyroid tissue has been allowed to remain than would correspond in size to the half of my thumb. Another argument in favor of more complete removal of the gland is the failure to get relief from so-called hemithyroidectomy. According to Rogers,[7] these failures amount to 10 per cent. It seems hardly necessary for me to say that this relatively complete thyroidectomy is not advised in cases wherein it adds seriously to the risk of the operation. In such cases the operation would better be done in two stages. It is well to add here that if relatively complete thyroidectomy were substituted for lobectomy, not a few cases of malignancy would be permanently cured that otherwise would go on to a fatal end. Because of the especial frequency of malignant degeneration in nodular goitres, especial care should be taken to remove all nodular areas completely when doing a thyroidectomy (Figs. 7, 8 and 9). Not frequently deaths occur from hyperthyroidism following operations for the cure of other troubles. Naturally these accidents are growing less frequent, because surgeons are less apt to overlook mild symptoms of hyperthyroidism in these days than formerly. However, that these unfortunate accidents have not been entirely eliminated is proven by the following case, which is under my care at the present writing, suffering with a severe hyperthyroidism of the exophthalmic type.

Mrs. B., aged fifty-two, married, mother of three children, consulted me on March 30, 1916, presenting all of the symptoms of an aggravated type of exophthalmic goitre. Previous and family history were unimportant save for the following: One year prior to her visit to me she had been operated upon for gall-stones. Two days after the operation she suddenly developed severe symptoms of cardiac failure, and for some days it was thought she would die. She said she had one similar attack, not so severe, before she had her operation for gall-stones, but first noticed the enlargement of her neck six months after her gall-stone operation. Had this woman been treated for her hyperthyroidism first and subsequently operated for her gall-stones, it is fair to assume that she would now be enjoying good health.

At this point in the preparation of this paper I was consulted by a very intelligent woman in behalf of the widow of a doctor living in California, regarding the advisability of an operation for goitre. The goitre has existed since girlhood, but never gave her any trouble until quite recently, since which time it has been "bothering her heart." She is the mother of three grown children, and within the last five years she had undergone two surgical operations, the exact nature of which could not be ascertained.

Cases like this and the one above noted are quite common. The first serves to emphasize the desirability of being on the lookout for symptoms of thyroid intoxication in patients upon whom we are about to operate for other conditions, while the second case serves to emphasize the same point; but more particularly to my mind does it emphasize the point brought out earlier in the paper, namely, the desirability of removing all permanent goitres whether they are giving rise to symptoms or not.

There remain to be discussed three sources of dissatisfaction following thyroidectomy, viz.: First, failure to get relief from the symptoms, although there be no recurrence of the goitre. Second, the immediate mortality is too high. Third, too many cases are seen which have gone beyond the point where the question of surgical relief can be entertained with reason.

The first cause of failure or partial failure can be avoided quite often by making a liberal incision and exposing the whole gland before commencing its removal. This will enable one to avoid injuring either the nerves or the parathyroids, and permit one to judge with reasonable accuracy as to the amount of gland tissue left and especially its character. This latter is important, for it is quite possible that failure to get relief after partial thyroidectomy is due to the fact that the trouble-producing part of the gland has not been removed. Very often and perhaps in the majority of cases by careful examination of the gland after uncovering it, it is possible to distinguish the hyperactive or toxic portions of the gland from the inactive or normal portions. The hyperactive and toxic portions are lighter in color, yellowish white rather than red, and not so firm as the normal gland structure. One should endeavor to remove all pathologic tissue and allow to remain only normal tissue in so far as it is possible, and where no healthy gland tissue is found, I think one is warranted in leaving only a very small part of thyroid tissue behind, for it is logical to assume that less hyperactive than normal gland tissue is necessary to perform the physiological function of the thyroid. My observations along these

lines have not as yet gone far enough to warrant me in speaking at all dogmatically, but do warrant the suggestion made.

Figs. 1, 2, 3, 4, 5, 6, 10 and 11 illustrate very clearly the macroscopic and corresponding microscopic differences found in normal or inactive goitre tissue, on the one hand, and hyperactive and toxic goitre tissue on the other. I have made no attempt to keep an accurate account of the cases in which this differentiation can be made at operation, but am certain it can frequently be done. Since this paper was commenced I have been able to make it in 2 of the 4 cases operated within that period.

The immediate mortality of operation can be reduced by substituting boiling water injections into the gland for ligation as a preliminary to thyroidectomy in serious cases, and by using the injections to the exclusion of all operative methods, in mild cases with little or no enlargement of the thyroid, and in extremely grave cases. One or two injections will cure the mild cases and will give as much relief in the extremely grave cases as thyroidectomy and at a much less risk. In some of these extremely grave cases one is surprised by getting a satisfactory result, while in others the result is satisfactory save that the deformity is still disfiguring, and this can now be removed by operation without undue risk. In those cases in which there need be no fear of a slight operation it is better to uncover the isthmus of the gland by a small incision under novocaine and inject both lobes under guidance of the eye. With our present state of knowledge in a certain percentage of cases a certain mortality is perhaps inevitable once the symptoms have become at all pronounced. In my experience anorexia, diarrhœa, and mental derangements are especially unfavorable symptoms. I know of no way of distinguishing between the cardiac symptoms due to myocardial changes and those due to toxæmia. I would like to repeat here a statement made in the earlier part of this paper, to the effect that this so-called inevitable mortality could be reduced by removing all simple goitres before they become either toxic or malignant.

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[5] Rogers: *Loc. cit.*
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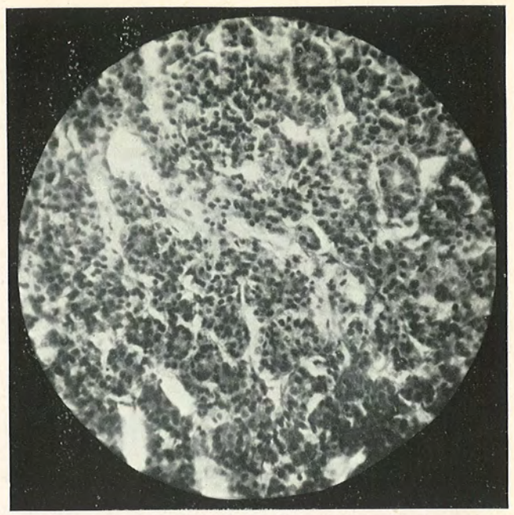

FIG. 1.—Miss B. Taken from the pale portion of the gland. Note the hyperplasia and compare with Figs. 2 and 3.

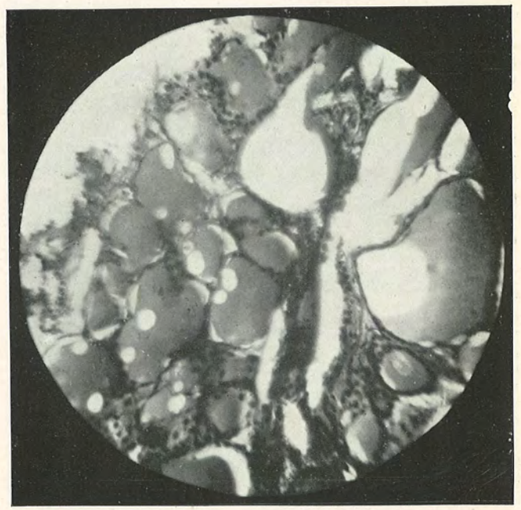

FIG. 2.—Miss B. Section from red portion of thyroid, showing very little hyperplasia and much colloid.

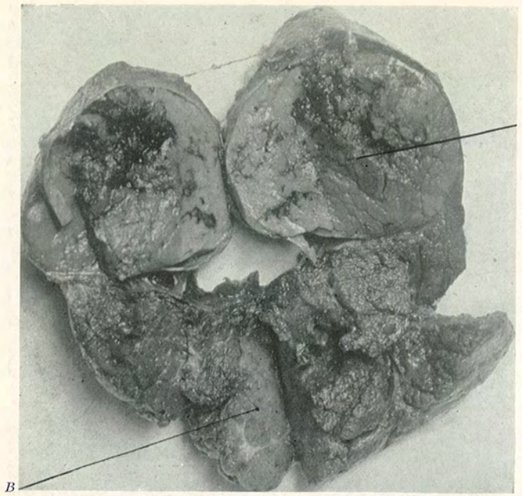

FIG. 3.—Miss B. Photograph of section through gross specimen, showing encapsuled tumor (*A*) in upper half of the picture and dark normal thyroid below (*B*). The tumor contained the trouble-producing tissue and was very much lighter in color and less firm than the non-hyperplastic portion.

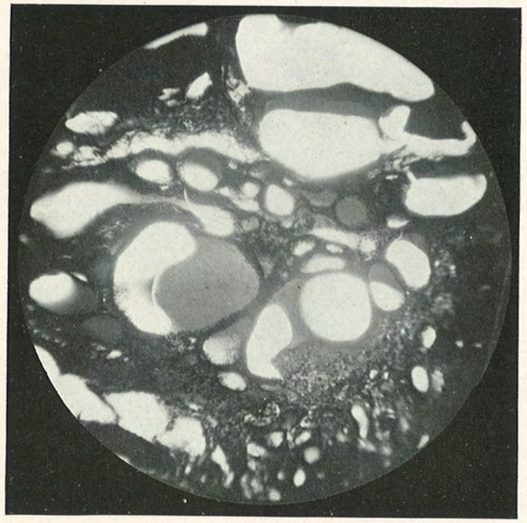

FIG. 4.—Miss D. Section from red portion (see Fig. 6, *A*) of gland, showing simple goitre.

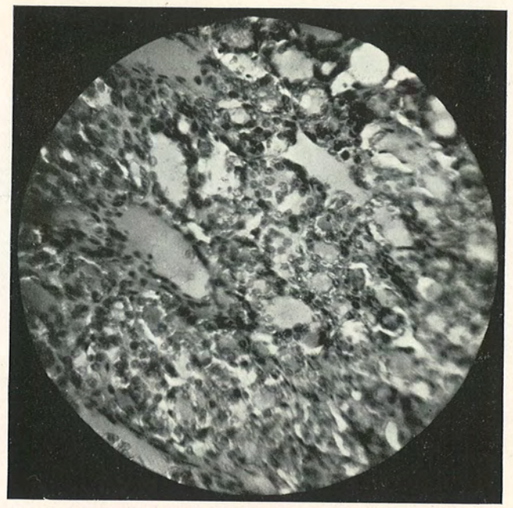

FIG. 5.—Miss D. Section from lighter part of gland (Fig. 6, *C* and *B*), showing hyperplasia.

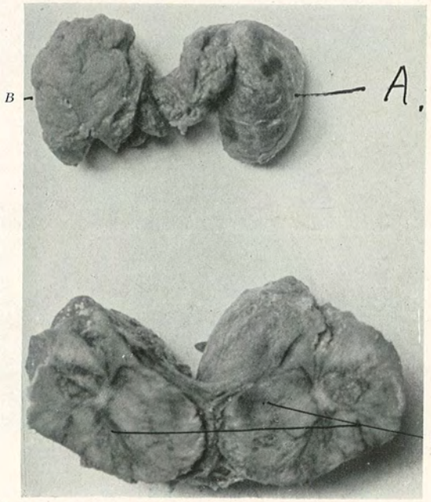

FIG. 6.—Miss D. *A* is the dark and *B* the light lobe, from which Figs. 4 and 5 were made. *C* shows gross section through lighter portion of the gland.

FIG. 7.—Mrs. S. Shows two views of gross appearance of the thyroid. The nodular condition suggests malignancy, while the light color prevailing suggests hyperplasia. This case presented aggravated symptoms of hyperthyroidism with exophthalmos. Compare with Figs. 8 and 9. In this case the toxic symptoms and malignancy developed in a goitre of long standing. A timely operation in this case might have prevented both the toxic symptoms and the malignancy.

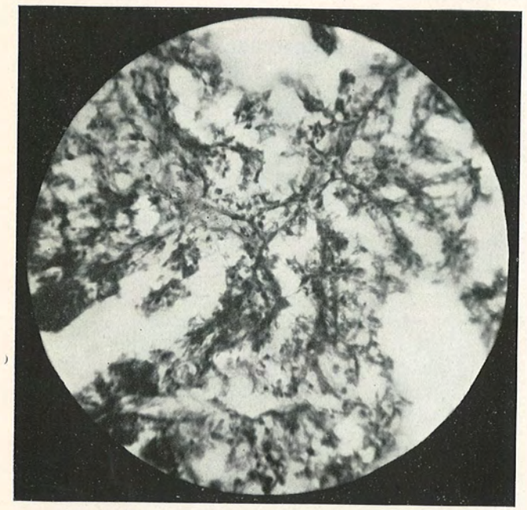

FIG. 8.—Mrs. S. Section showing hyperplasia with cytolysis.

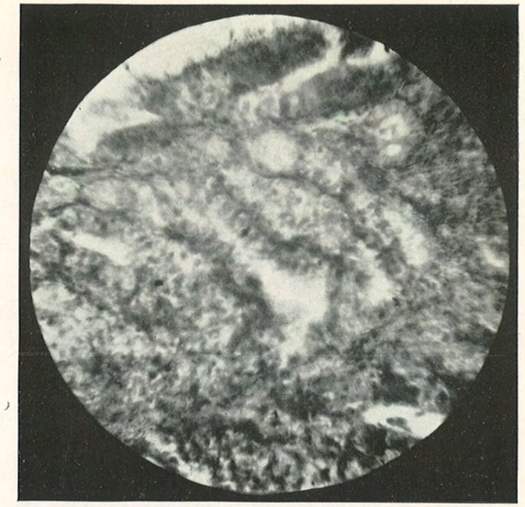

FIG. 9.—Mrs. S. Section showing hyperplasia of malignant adenomatous type.

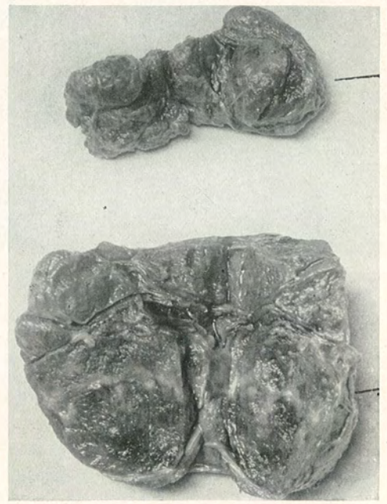

FIG. 10.—Mrs. M. Showing surface and contour of gross specimen (*A*) and gross section (*B*). This was a goitre of long standing in which symptoms of hyperthyroidism later developed. In *B* may be seen the white spots and streaks indicative of fibrous and calcareous changes.

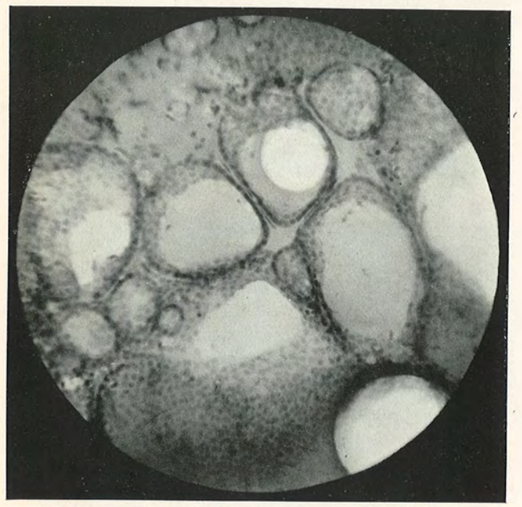

FIG. 11.—Mrs. M. Section showing marked hyperplasia.

DR. GRANVILLE T. MATLACK, of Wilkes-Barre, said that in relation to the treatment of exophthalmic goitre it should be kept in mind that this disease is one in which distinct remissions may be expected, irrespective of treatment. This remission in some cases is very marked and lasts many times for several weeks. The patient may express herself as being well, put on weight, and gain in strength, and then the symptoms recur. If any form of treatment was being used at this time, it would naturally get the credit for the improvement.

The mortality records following operations for exophthalmic goitre have improved not because the operation has become any easier to perform, but because more consideration is given to what the patient can have done with reasonable safety; when to do it, how much to do, and the proper care before and after operation.

Preliminary ligation, either one or more poles, is regularly done in the acute, severe exophthalmic goitres with chronic and secondary symptoms, cardiac dilatation and loss in weight. The ones that are bad mentally, and those whose sleep is more or less disturbed, are certainly cases for ligation. Marked improvement is shown by this operation, and a safe thyroidectomy can be done in from two to four months, depending on the condition of the patient. These cases, however, will invariably relapse to their former condition if a thyroidectomy is not done. It is well to impress upon the patient and the patient's caretaker the importance of the thyroidectomy after ligation, as the patient may consider herself well afterward, and you may not hear from her until she has developed a state that is decidedly worse than when the ligation was performed.

Regarding the operative cures, cases are seen which come late for operation with secondary effects in the heart and kidneys. In these cases, of course, one would not expect to get a permanent cure, because the damage was done before the gland was removed. In some cases in which there has been resection of both lobes, in a few months or a year or two the gland will seem to replace itself, and these patients will have a return of symptoms and a second operation is necessary. Many times, clinically, in the non-hyperplastic thyroids, there will occur an almost exact exophthalmic goitre syndrome. The surgeon will think he is dealing with a regular type of exophthalmic goitre, and the difference between these two types of goitre, clinically, is sometimes very hard to tell. A late case is a dangerous case of goitre, and one not improved by ligation of the superior poles. These patients are improved simply by rest in bed and some medical treatment, such as digitalis. This prepares them for a thyroidectomy. They will not

bear ether very well and it is better to operate under local anæsthesia. In his own work he gives ether in nearly all exophthalmic goitre cases with one-tenth per cent. novocaine, with ten minims of adrenalin to the ounce. In five years, from 1907 to 1911 inclusive, he had done 119 thyroidectomies for exophthalmic goitre, with two deaths. Eighty-two of these patients have made a permanent recovery. Twenty of these 119 cases received preliminary ligation; one died following operation; two of the cases have recovered simply by ligation.

Dr. John B. Deaver stated that he believed that the majority of exophthalmic goitres originate in a simple goitre. Therefore, the simple goitres are not medical cases, should not see the medical man, but should be referred at once to the surgeon. This has been his teaching for the last few years, also that an exophthalmic goitre seen early should be operated upon immediately. He appreciated the statement that a certain percentage of these cases will get well or be greatly improved, but he believed a much larger percentage will come to operation or will die of toxæmia consequent upon that goitre. Therefore, the question goes back to the original proposition that it is a great deal better to subject the patient to operation in the incipiency of the disease. He had never lost a case of exophthalmic goitre when the conditions were at all favorable for operation. He had, like other men, lost cases in which there was a degenerated heart, whether it was due to myocarditis, advanced nephritis, or what not. A certain percentage will die. If these cases could be seen early they probably would get well. From his experience in following up cases, he said that after early operation many get well and stay well. In the late cases or cases pretty well advanced, although about 50 per cent. do not come to secondary operation, they are not greatly benefited by the original operation.

In the question of boiled water treatment he had had but one experience. The patient was treated at the German Hospital; one of his assistants carried out the treatment and in fifteen minutes the patient was dead.

Dr. John D. McLean said that in his experience in Philadelphia very few goitres are seen by the medical man. He related, however, a case which he had been watching for seventeen years. The first intimation he had that the patient had exophthalmic goitre was when she developed an extensive and obstinate lupus erythematosus of both eyelids, extending from the temples and back to the ears. The patient had received almost every form of treatment without benefit. The condition was left alone for about two months when it disappeared entirely. Shortly after that the eyeballs began to get a little prominent

and the thyroid to enlarge. During the course of this disease the patient developed an abscess of the right kidney which was operated upon with recovery. The greatest improvement in her condition was due to morphine, which was used because she could not sleep. The pulse was so rapid it could not be counted. About two years ago she was sent away from the city to an institution where she was kept at absolute rest of both mind and body for three months, and since then the improvement has been permanent. The gland is almost normal in size, the exophthalmos just the same as at the beginning of the disease. She is in excellent health with the exception that at the slightest exertion her heart becomes very rapid. Concerning treatment he was of the opinion that nothing will do more good than absolute rest of mind and body.

Dr. Charles H. Frazier said that the incidence of goitre on the Atlantic seaboard is insignificant compared with that in the goitre zone farther west. However that may be with regard to simple goitre, there is no doubt that toxic goitre is much more prevalent in the East than it used to be, so that in the eastern clinics we are being confronted with an increasingly large number of such cases. Emphasis should be placed upon the pathology of toxic goitre, because a clear understanding of the pathology is absolutely fundamental to the intelligent management of the disease. In his own clinics he had adopted the classification of Plummer: (1) The non-toxic non-hyperplastic; (2) the toxic non-hyperplastic, and (3) the toxic hyperplastic or typical exophthalmic goitre.

Attention has been drawn recently to the clinical syndrome of toxic goitre with gastric disturbance. Diarrhœa is frequently observed as a symptom of toxic goitre, but his attention had never been called, until recently, to gastric disorders, and he was rather surprised to learn from the writings of Ewart that he regarded gastric dilatation with gastric disturbance as more or less fundamental to the clinical syndrome of toxic goitre. He said it was the rule rather than the exception.

Another point with which he had been impressed in his rather limited experience was the relationship of tonsillitis to the etiology of toxic goitre. More emphasis should be placed upon this definite relationship in the pathogenesis of the disease. He had been struck by the frequency with which the tonsils have been diseased in his toxic goitre cases. He had seen many cases in which the signs of toxicity followed closely upon attacks of acute tonsillitis, and what is still more convincing, he had seen marked improvement follow the removal of tonsils in such cases. So that now he advocates, where the tonsils are dis-

eased, a tonsillectomy preliminary to ligation or lobectomy. Although his own experience does not include any cases in which either the X-ray or the operation revealed enlargement of the thymus gland, quite a large number of cases are on record now, where there is an associated enlargement of the thymus gland. The exacerbation of the disease in these cases has been attributed to the thymus involvement and the removal of the thymus was followed by very striking relief. Von Haberer gives the records of two or three cases, in which operation upon the thyroid gland itself had failed, and the partial removal of an enlarged thymus gland was followed by striking and immediate relief. It has been recommended that routinely the thymus gland, if found enlarged at the time of operation, be removed. He doubted very much the advisability of this, as it would undoubtedly increase the mortality, and the part which the thymus gland plays in the pathogenesis of the disease is not sufficiently constant.

One of the most important factors is the selection of the time and the character of operation. He was entirely in accord with what the previous speakers had said regarding the avoidance of operating during the acute exacerbation of the disease. He never, at the first visit, gave an opinion as to whether operation was required, of what character it should be, or when it should be performed. This opinion is always reserved, no matter how insistent the attending physician may be that operation be done without delay, or how much better he thinks he understands the patient's peculiarities, until the patient has been under observation at least one, and sometimes two, weeks, usually in the hospital, and always in bed. When in doubt always err on the side of conservatism; boiling water injection is safer than a single ligation, a single than a double ligation, a double ligation than a lobectomy. Upon the theory that in ligation of the superior pole the nerve supply is included, superior pole ligation should be given preference to ligation of the inferior pole. There is no doubt that the functional activity of the gland responds very positively to nerve stimulus, and, if we ligate the entire substance of the superior pole, including the nerves as well as the vessels, we accomplish more than by ligation of the vessels alone. The secondary operation of lobectomy is very much easier to perform if the superior poles are exposed through independent incisions one-half inch below the upper margin of the thyroid cartilage.

It is a curious fact that there is no consensus of opinion upon the selection of an anæsthetic. Looking the world over we see in three large clinics Kocher using local anæsthesia, Ochsner using ether, and Crile, nitrous oxide. As each anæsthetic is advocated in equally strong

terms the choice must be left to one's own judgment and experience. A strong argument can be made for general narcosis as against local anæsthesia, in all forms of toxic goitre, and an equally strong argument for nitrous oxide as against ether. He believed absolutely in the application of the general principles of anoci-association.

Except in one or two cases he had not employed boiling water injections, so that he could not speak of this procedure from personal experience. In very severe cases the mortality may be as high perhaps as in ligation. Statistics from the Mayo Clinic give two deaths from ligation and two from the boiling water injection. This is not offered as a criticism against the latter treatment, but merely to show that no matter which method is used in the very severe cases, there are bound to be fatalities.

The expectation of life in the natural history of goitre is an important question as applied to the indication for surgical therapy. In the untreated cases the tendency in the gland to undergo a process of retrograde metamorphosis, and for the condition to be transformed from one of hyperthyroidism into one of hypothyroidism, is not to be lost sight of. The possible sequence of events is one of the strongest arguments in favor of early operation, since in the terminal stages the prognosis is invariably grave and surgical intervention futile.

Dr. Ochsner, in closing, remarked that as to tonsillar infection in goitre of adolescence, he believed that at least 75 per cent. of the cases that he had seen became permanently well by removal of the infected tonsils, by drinking boiled water and following a sensible diet and hygiene, and by getting 8 to 10 hours of sleep with open windows. In certain places in Michigan and Illinois there were goitre wells. Farmers whose children were free from goitre when living in a certain section found that they began to develop goitres upon moving to another farm. In these cases no further goitres develop if all drinking water is boiled. He referred to experience quoted by Dr. Bircher. Seventy per cent. of the entire population of Rapperswyl in Switzerland had goitres so long as they used the water from alluvial soil on one side of the valley, but when the water was used from the granite rocks from the other side of the valley, the goitres disappeared from the children in the village. The same conditions were noted in two young ladies' seminaries situated a mile and a half apart.

Hyperthyroidism seems to affect certain muscle groups. A patient coming into one's office may suddenly, when she sits down, drop her weight into the chair. Perhaps a woman brings her daughter, and says she constantly drops the dishes or anything she attempts to carry; that

when she goes upstairs her heart beats rapidly, and her legs refuse to carry her. He had seen cases sent to the hospital for operation for dilatation of the stomach in which the stomach muscles were affected and the stomach relaxed because of hyperthyroidism and in which tremor and tachycardia were present, in which no attention had been paid to the thyroid gland.

He had not been able to make out the enlarged thymus gland as an accompaniment of hyperthyroidism. He had not been able to outline a thymus gland in his thyroid cases, although the X-ray plates have shown frequently that the hyperthyroidism is accompanied with enlargement of the thymus gland.

X-ray treatment seems to increase the general hyperæmia and he had had a lot of cases upon which he had operated who had previously received X-ray treatment for a while. Several years ago C. H. Mayo wrote a paper on "X-ray in Hyperthyroidism," and he used the treatment in a series of cases at that time. He thought at first that it might improve the condition of these patients, but he could see no permanent benefit. It is so very easy to imagine that this or that form of treatment helps a case of hyperthyroidism. In this connection he had a very peculiar experience. A friend of his whom he had known for many years and who had practised in Colorado, found that goats that were infected with a certain parasite had goitres, and that if they were dipped the goitres disappeared. Also if some form of mercury was administered the goitres disappeared. He thought that the same remedy would cure exophthalmic goitres in man and tried it upon all the cases he could get. There were at that time two patients in the hospital nearly dead with hyperthyroidism. In one of these Dr. Ochsner tried the remedy, while the other one was so seriously ill that he did not dare to risk the use of any remedy, and in three weeks both were so much improved that he was justified in removing the gland and they both got well. He had a patient who came from Michigan with bad hyperthyroidism whom he intended to treat in the same way, but as he was going out of the city for a time and had not the remedy at hand, he simply gave her a diet list and general directions for rest and hygiene, and in three weeks when he returned, the goitre was almost well. She had come from a goitre-well region. He had had any number of similar experiences. In one case a woman came from Mexico, Mo., who had consulted a physician in St. Louis, who advised her to use a certain kind of pad said to cure goitres. When she returned to learn how to apply the pad a few weeks later, the condition had improved remarkably and this improvement was at once credited

to the action of the pad by the medical man, when in reality the pad had not been worn at all. Under almost any quieting treatment these cases will improve to a certain point where it is safe to operate. He had been so convinced of this that during 1915 he operated upon 106 cases and used this plan throughout, with but one death. The fatal case was a big strapping fellow from the South, who seemed in such good general condition that he felt he could operate at once, notwithstanding rather marked hyperthyroidism. The year before he had operated upon a daughter of this man who was in a fearful condition, keeping her quiet for ten days prior to operation. This man was one of the stubborn sort who would not keep still; he would jump up and exert himself unreasonably, and in one of his jumps he had an acute dilatation of the heart and died. Had he kept him still for a few days before the operation, he would probably have lived through the operation. Of 561 cases operated during six years previously, he had lost 16 cases, so that the death-rate was three times as high before he carried out this plan absolutely.

No doubt local anæsthesia is the best if one can treat his patients as Kocher does. When he talks to them they hold still, no matter what happens. If one can do that, it works. Recently he had one of these patients. When the patient was brought up the anæsthetist said, "I don't think we had better risk that case." The pulse was 160 and went to 170 and 180. Dr. Ochsner went out and spoke to her about local anæsthesia and she said, "Anything you say is all right." He knew that in that frame of mind taking out the thyroid would not do her any harm. He used novocaine and she sat up the same afternoon and was out of bed the next day.

Regarding gastric lavage after thyroidectomy, it should not be forgotten that if the stomach is washed out with water at 100° F., the patient will be very much less likely to suffer from post-operative hyperthyroidism.

Dr. Porter, in closing, said that in the vast majority of the so-called simple goitre cases later hyperthyroidism develops and in the end myxœdema. All of the myxœdema cases at one time or other were cases of hyperthyroidism, so-called. If they live through they will become myxœdemic. That is the reason they become fat.

He would emphasize the point made by Dr. Deaver that the majority of cases of exophthalmic goitre were once simple goitres. It corresponds with what we know of the history of goitre checked up with the microscope. It is true that an occasional case of so-called exoph-

thalmic goitre is met with without a palpable goitre. While this is possible, it is very rare.

He had never seen a malignant thyroid which was not engrafted upon a simple thyroid. If that be true, and it be true that exophthalmic and toxic goitres were once simple goitres, surgeons are abundantly warranted in saying that every simple goitre should come out.

Regarding the end results in thyroidectomy, he was not unmindful of the fact that the thyroid is a protective agent perhaps against all sorts of infection and intoxication; but, if by thyroidectomy one happens to make a little too extensive removal of the thyroid, one has not done anything more than Nature will do if the individual lives long enough. Ultimately the thyroid will undergo cytolysis; all the cells will be broken down and the individual will be in the position of the myxœdemic patient.

One word about the injection of boiling water. *Per se* the treatment is without risk. A certain per cent. of these patients will die in spite of any treatment. The mortality that follows the boiling water injections is the result of the disease rather than the treatment. That the boiling water treatment is a life-saving procedure in properly selected cases has been proven. It has been said that the way to cure hyperthyroidism is to take out the thyroid. This should be the treatment of choice when it can be done without risk.

STATED MEETING, HELD OCTOBER 2, 1916

The President, Dr. Charles H. Frazier, in the Chair.

FRACTURE OF SKULL, DECOMPRESSION AND DRAINAGE

Dr. Nathaniel Ginsburg presented a youth, aged fifteen years, who was admitted to the Jewish Hospital, September 4, 1916, on account of a cranial injury sustained a half-hour previously. He was in partial stupor, with a rapid pulse which quickly slowed down to sixty beats to the minute while the examination was taking place. There was a large hæmatoma of the scalp to the right of the external occipital protuberance, with a rupture of the soft parts about two centimeters in extent, extending down to the bone. The pupils upon admission were equal, but within a short time, the right pupil became widely dilated, and the inequality remained marked. The skin was cold, and perspiration profuse. Vomiting at first of normal gastric fluid was quickly followed by fluid containing fresh blood, and was projectile in type. The oropharynx showed free bleeding from above. There was ecchymosis of the left upper eyelid, and a small hæmatoma was present over the left frontal region. The left ear was almost totally avulsed from its attachment. The patient had had one convulsive seizure.

He was immediately taken to the operating room, and lumbar puncture revealed intracranial hemorrhage, the fluid being deeply colored by blood. Under ether anæsthesia, the scalp was incised down to the bone, employing a vertical incision over the right occipital area, the incision extending equally above and below the line of the lateral sinus. A fissure fracture of the occipital bone was revealed with free bleeding externally. The skull was quickly opened by drill and rongeur forceps, the gutter in the bone extending to the superior limit of the break. The inferior extent of the fracture apparently passed into the foramen magnum and it was not deemed advisable to remove all the bone down to this point. Free bleeding from the diploic vessels was easily controlled by Horsley's bone wax. The extradural clots were wiped away and the dura was incised above and below the tentorium, avoiding the lateral sinus and exposing the cerebral and cerebellar cortices. Blood-tinged cerebrospinal fluid under much pressure escaped, and the dural incisions about two centimeters each in length

were not sutured. A small piece of rubber tissue was introduced down to the dura in the lower angle of the wound and the scalp sutured by interrupted iodized catgut and silkworm gut sutures. The drain was removed twenty-four hours later. The wound was dressed with gauze moistened with solution (1–4000) bichloride.

The nasal and oral cavities were sprayed hourly with an antiseptic solution, no packing of the nares being employed.

Except for free vomiting and extreme restlessness and headache during the first twenty-four hours, convalescence was uninterrupted, and the boy left the hospital well on September 17, thirteen days after the injury.

The important features of this case are prompt operation with drainage above and below the tentorium cerebelli, by dural incisions, frequent washing of the pharynx, and final recovery.

Dr. Ginsburg said that he resorted to immediate decompression with drainage above and below the tentorium cerebelli in this case, because he regarded the presence of free blood in the cerebrospinal fluid as evidence of intradural hemorrhage. The symptoms of cerebral compression were indisputable, and prompt relief of intracranial pressure would give the best chance of recovery.

Although he could not say that this patient would not have recovered without the prompt occipital decompression and the drainage which was thereby established, it was true that at the operation, the bloody cerebrospinal fluid, which escaped when the dura was incised over the cerebral and cerebellar cortices, was under great pressure, and rapid recovery ensued following decompression.

FEMORAL ARTERIOVENOUS ANEURISM

Dr. Edward B. Hodge presented a man, twenty-three years of age, who was admitted to the Presbyterian Hospital, April 3, 1916, with an egg-sized pulsating swelling in the right thigh, with a history that three months before admission, in a machinery accident, a piece of steel about an inch in length, had been driven into the inner anterior surface of his right thigh. Two days later, he noticed a non-painful swelling, egg size, near the site of injury. This had varied in size, but was now larger than at first. In the last three weeks, there had been a peculiar sore feeling on the inner part of the lower leg. The general examination was negative. About seven inches below Poupart's ligament and in line with the femoral vessels, was an egg-sized pulsating swelling. A plain thrill was felt here and also over the femoral

vessels as high as Poupart's ligament and for three inches below the tumor. There was a loud continuous bruit heard over the mass accentuated with the beat of the artery. This was also heard from Poupart's ligament as far down as the popliteal space. There was no tenderness nor pain nor was there tenderness over the "sore" area in the lower leg. Proximal pressure obliterated the thrill, while distal pressure had no effect. There was a good pulsation in both tibials.

Operation (April 7).—Under gas-ether. Tourniquet applied high upon thigh. On incising the soft parts, there was found much inflammatory reaction, matting the tissues together over and about the sac. The latter was located at the beginning of Hunter's canal. After considerable difficulty from the infiltration of the muscles and from oozing, the mass was cleared into healthy tissue above and below. Temporary tape ligatures were placed on both sides of the sac. The vessels were found tightly adherent for about two inches. The foreign body was felt posterior to them and was removed. It was found impossible to close the communication between vein and artery without opening the sac, as had been done in a previous case. The sac was incised and the vein found lying in front and to the inner side of the artery with a communication between the two about three-quarters of an inch long. There was considerable bleeding which could be checked by the provisional tape ligatures. An attempt was made to suture the communication from within the sac, but the tissues were so friable that the suture would not hold. After many attempts, this plan was abandoned and quadruple ligation with excision of the involved vessels was done. Hæmostasis was completed after the removal of the tourniquet and wound closed in layer suture. The operation was long, taking over two hours, due to the oozing and the many attempts to suture the opening. Patient had a rapid pulse at its conclusion, but soon reacted and had a normal convalescence, with a temperature of 100.2° for its highest. Two days after operation, the right leg was one and three-quarter inches larger than the left just above the knee. The elevated foot remained warm and of good color at all times, and on the eighth day, pulsation in the tibials was felt. He was discharged cured on the 17th day. The foreign body proved to be a piece of steel, shaped like an arrow head, about one-third of an inch long.

Dr. John H. Gibbon said that the application of a temporary ligature in the case of traumatic aneurism is feasible, but when dealing with an aneurism, the result of a diseased blood-vessel, the employment of such a ligature is dangerous. The failures and fatalities which have followed the performance of the Matas operation have been