STATED MEETING, HELD FEBRUARY 3, 1913.

The President, Dr. Gwilym G. Davis, in the Chair.

SYMMETRICAL ODONTOMA OF BOTH SUPERIOR MAXILLÆ.

Dr. Morris Booth Miller presented a female mulatto child two years of age. The history briefly is as follows: She was born on February 3, 1911, prematurely a little less than seven months after conception. Her mother has since given birth to another child by the Cæsarean route. While the child was prematurely born, she seemed to get along well until last summer, when it was noted that her face was changing in outline, and the mother and grandmother thought she was getting fat. The dentition of the milk teeth was apparently normal so far as could be learned. There is nothing else of significance in the history.

There are abundant signs of rickets as shown by the beaded condition of the ribs, epiphyseal enlargement, and bowing of the limbs. The child shows a positive von Pirquet reaction, negative Wassermann, and the blood count gives no variation from the normal except a low polymorphonuclear count, 31 per cent., the lymphocytes being 41 per cent. and the large mononuclears 22 per cent. There is nothing of interest in reference to the nose condition.

It will be seen on examination that there is an extensive overgrowth of the entire alveolar portion of both jaws but not extending beyond the alveoli (Figs. 1 and 2). The general effect upon the face is to slope the facial angle to an accentuated degree of prognathousness. The palate arch is lowered. The overgrowth in each jaw is perfectly symmetrical on either side of the midline, and from within out there is an equal amount of swelling on both sides of the line of the teeth (Broca's sign) (Fig. 2). The latter are widely spaced, show the loss of enamel often seen with rickets, and are distinctly springy when pressed on. The mucous membrane is tense, but otherwise not altered. To the touch the growth feels cystic, or rather as though a cyst or cysts were under a thin lamella of bone.

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Slow growing unilateral jaw tumors are not infrequent in colored people and often attain huge size. These are commonly odontomata and are either cystic or adamantine in character. In this case the symmetry and the involvement of both jaws would place it within a separate class. The appearance of the growth subsequent to the eruption of the first teeth would assign it to irritation of all of the dental follicles of the permanent teeth occurring simultaneously and evenly in both jaws. The

FIG. 1.

Odontoma of superior maxilla.

skiagraphs show very immature and widely scattered teeth of the permanent set.

This child was seen at the Polyclinic Hospital by Drs. Hamill, Cryer, Müller, and Bloodgood of Baltimore, and such a condition had not been seen by any of them before.

INCISED WOUNDS OF WRIST AND FOREARM.

DR. MILLER presented a man aged thirty-five, who was admitted to the Polyclinic Hospital, October 22, 1906, with an extensive injury of the left forearm as the result of being struck in two places with a butcher's cleaver. On the anterior and radial aspect of the arm near the wrist there was a long oblique wound which severed the tendons of the flexor carpi radialis, extensor ossis metacarpi pollicis, extensor primi internodi pol-

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FIG. 2.

Odontoma involving both superior maxillæ as seen upon retraction of lips.

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licis, the radial artery and the radial nerve. The radius had a chip cut from its lower end, a slice of bone was cut from the base of the metacarpal of the thumb, and the wrist joint was opened. On the ulnar surface there was a transverse wound which cut through the ulna and the adjacent muscles at the junction of the upper and middle thirds.

In the wrist wound the pieces of bone were sutured in place and the joint closed without drainage. The radial artery was tied but the severed nerve and tendons were carefully sutured. The upper arm wound also involved muscle suturing. The patient made a smooth aseptic recovery. Six years have now elapsed and it is interesting to note the full strength and normal mobility of the structures affected and the perfect restoration of sensation over the distribution of the radial nerve.

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"DUMB-BELL" KIDNEY.

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AND

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AN unusual difficulty which might be met in renal surgery on the living patient is illustrated by a recent experience in attempting nephrectomy on a cadaver in the Laboratory of Anatomy of the University of Pennsylvania. The body was that of a male aged seventy-one years, whose length of life and whose clinical history would preclude any suggestion of inadequacy of renal function. The specimen was found while attempting to remove the kidney through a lumbar incision, which we were unable to do. After complete exposure of the kidney through the left loin, the cause of the impossibility of delivery was found to be due to a congenital abnormality, the main feature of which was a continuity of the renal tissue of one side with that of the other across the spinal column. This could be determined readily by means of a finger passed along the dorsal surface of the renal tissue. In freeing the kidney a large renal artery from the left common iliac to the left lower pole was torn away in the supposition that we were dealing with a perirenal adhesion, an unlikely mistake in the living, in the presence of pulsation.

The specimen consists of two lateral masses of kidney substance with a connecting bar of the same tissue. These masses are flattened from before backward and with the intervening tissue suggest, on anterior view, the form of a dumb-bell (Fig. 1).

Right Half.—This portion is, like its fellow, irregularly rounded in outline but of somewhat greater transverse diameter. The posterior surface is made up entirely of smooth renal tissue, while the anterior surface is hollowed out in its central portion to form what is really the hilum. The ring of kidney substance surrounding the hilum varies from one-half to three-quarters of an inch in width. Mesially it joins with the

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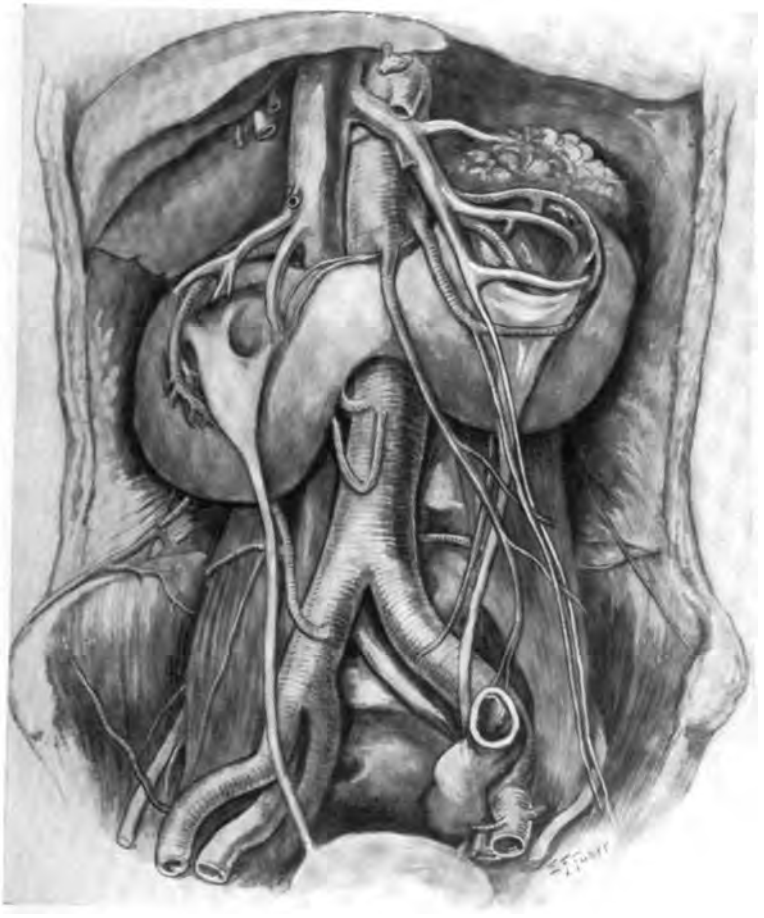
FIG. 1.



Dumb-bell kidney.

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isthmus over the vena cava inferior, the isthmus being two inches in diameter at this point.

Measurements.—This portion is placed obliquely, pointing downward and inward, and in this, its greatest transverse diameter, it measures three and one-half inches. The greatest vertical diameter is along the outer edge where it measures three and one-half inches but in passing towards the mid-line it contracts to two and one-half inches, its minimum vertical diameter. The thickness varies from an inch at the outer and upper border to a very narrow edge at the lower inner aspect. The hilum measures two and one-half by one and one-half inches, is regular in outline, and is formed at the expense of the central portion of the renal tissue, a thin plate of which, however, persists posteriorly.

Relations.—The upper pole is on a level with the lower border of the first lumbar vertebra, while the lower border is on a line with the lower border of the third.

Left Half.—This is more circular in outline than the right and is approximately three and one-half inches in all diameters. Areas of variation in thickness are seen similar to those in the right portion. The hilum is of the same depth as on the right and measures two and one-quarter inches in all directions.

Relations.—This portion is higher than the right, its upper and lower borders being opposite the upper borders of the first and third lumbar vertebræ respectively.

The Isthmus.—This is approximately quadrilateral and expands slightly at either extremity to fuse with the annular rims surrounding the hila. The upper and lower edges are sharp and thicken gradually as they fuse with the lateral masses. It arches over the great vessels, describing an angle the apex of which is over the aorta. Tracing the isthmus from left to right we find it passing downward and forward to the anterior surface of the aorta and from this point the right half passes horizontally and backward, an arrangement explained by the higher position of the left kidney.

Measurements.—Transverse, two inches; vertical, one inch; thickness, one-eighth inch.

Relations.—The isthmus crosses the mid-line over the intervertebral disc between the third and fourth lumbar vertebræ, joining the right kidney at the right margin of the inferior cava and the left kidney at a point one-half inch distant from the mid-line. The highest point on the right half is one-quarter inch lower than the highest point on the left half.

The Ureters.—The pelvis of each ureter is dilated to three times the normal size. This, together with a dilated bladder, which presents in the right lateral wall a diverticulum the size of a hen's egg, is explained by the enlarged prostate gland present, and has together with the remaining parts of the urogenital system, no relationship with the embryological defects of the kidneys and upper ureters. From the common iliac arteries, the ureters pass upward, on both sides crossing from within outward a renal artery from the common iliac. The uretero-pelvic

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junction is at the lower margin of the kidney substance, and the pelves soon divide into calices, six on the right and four on the left side, one on each side apparently draining the isthmus. The greatest width of the right pelvis is two inches and that of the left, one and one-half inches. The pelves and ureters are placed anterior to the kidney tissue and for the most part below the renal vessels.

Blood Vessels.—There will be noted a deflection of the aorta and the vena cava to the right and an apparent difference in length and topography of the iliac vessels; these are artefacts due to the injection of the cadaver. In consequence the right common iliac artery has a more vertical and apparently a shorter course than its fellow.

The branches of the aorta present many anomalies. They arise, from above downward, in order as follows: (1) Inferior phrenic artery; (2) cœliac axis; (3) superior mesenteric; (4) right renal; one-half inch below the preceding; (5) left renal; (6) left spermatic; probably a renal giving a spermatic branch; (7) inferior mesenteric; (8) first lumbar; (9) second lumbar; (10) renal, from the anterior surface of the aorta, one and one-half inches from the bifurcation and just above another renal; (11) renal, just below the preceding; (12) third lumbar; (13) median sacral.

There will be noted as being absent from this list the suprarenal, right spermatic and fourth lumbar arteries. The suprarenals come from the renals, the right spermatic from a renal branch given off from the right common iliac, and the fourth lumbars from the common iliacs. With the exception of the right spermatic nature has compensated for the absence of the suprarenals and fourth lumbars by the addition of two anomalous renals, thus establishing the normal quota of branches derived from the abdominal aorta.

Renal Arteries.—Seven arteries are given to this dumb-bell kidney. Four of these come from the aorta, one from each common iliac artery, and one from the left spermatic. This latter is probably as explained above, a renal artery giving origin to the spermatic.

Considering the renal arteries from above downward, the first one arises from the right antero-lateral surface of the aorta, one-half inch below the point of origin of the superior mesenteric, passes behind the vena cava, and gives off the right suprarenal and a slender branch to the upper pole of the right kidney. Then, crossing the upper portion of the renal tissue to reach the hilum, it sweeps around the outer edge of the latter, half encircling it, and finally turns directly transversely to enter the substance of the kidney at its centre. It gives eight branches to the kidney.

The second renal arises from the aorta one inch below the preceding vessel and at a corresponding point, and has a similar course. In addition to the four branches which it gives directly to the kidney, a large branch arises one inch from its origin. This soon divides into a mesial and a lateral branch. The mesial branch gives off two slender twigs which course along the upper margin of the isthmus to enter the right hilum, a third to the left end of the isthmus and a large terminal to the mesial

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border of the left hilum. The lateral branch enters the hilum near its point of origin.

The third renal (left spermatic) arises just below the preceding, passes downward and outward, crosses the renal pelvis and enters the hilum at its infero-lateral angle. The left spermatic artery arises from this vessel at its mid-point.

A fourth renal arises from the anterior surface of the aorta two inches above its bifurcation and, passing upward and to the right, enters the middle of the posterior surface of the right kidney at its junction with the isthmus.

A fifth aortic renal arises just below the preceding vessel and runs downward for a distance of one inch, being adherent to the aortic wall. It then turns at an acute angle and ascends to the margin of the right kidney at its infero-mesial aspect.

A large renal artery is given from each common iliac at the mid-point of its internal surface. These vessels curve around the anterior surface and are directed upward and outward. The right passes behind the ureter, to which it gives two branches, and after giving origin to the right spermatic, enters the lower margin of the kidney. The left gives off one ureteral branch and then enters the left kidney at the mid-point of its lower margin.

Veins.—Three veins emerge from the right hilum. Two, with a communicating branch from the upper outer aspect, pass upward and inward to enter the right margin of the vena cava. A third emerges from the lower internal margin of the hilum and passes upward to the anterior surface of cava, opposite the first lumbar vertebra, the others being one-half inch above this level. The veins are, anterior to the arteries.

The left renal veins number three, one emerging from the upper, one from the lower and a third from the lateral edge of the hilum, the latter receiving the left spermatic vein. They pass upward and inward and unite in a single trunk which joins with the splenic vein to enter the cava on a level with the highest renal on the right side. The portal vein is made, therefore, entirely of the superior mesenteric vein. There is no abnormality of relationship of the structures entering the portal fissure. The physiological importance of hepatic influence on the blood of the splenic vein is a question for consideration in the presence of this rare vascular anomaly.

Explanation.—The primitive kidney is a pelvic organ derived from a portion of the paravertebral mesoblastic tissue of the pelvic wall, the renal blastema, and from the branching subdivisions of the expanded ends of the primitive ureter, which contribute that portion of the uriniferous tubular system represented by the straight collecting tubules. Each organ is formed independently, and possibly as a result of changes in the line of curvature of the caudal extremity of the spinal column, ascends until by the end of the third month of fetal

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life has reached its adult position. Fusion of the renal masses, as in this case, would cause retardation in the ascent, probably as a result of the development of the sacral promontory, which would offer obstruction to the isthmus in the mid-line and prevent the normal passage upward of the lateral masses along the ilio-lumbar grooves. Nature vascularizes the renal tissue from adjacent vessels and this would contribute to the difficulty of ascent, as illustrated by the markedly angular course of those renal arteries in our specimen which are derived from the anterior surface of the aorta near its bifurcation. It is our conception that the dumb-bell type illustrates fusion of the lower poles of the primitive kidneys which in ascending were rotated as it were on their backs and transversely, as a direct result of retardation in ascent of the mid-portion or isthmus.

Review of Literature.—The horseshoe kidney, a rare variety of which we present and describe as a "dumb-bell" kidney, is the most common type of a single mass of misplaced kidney tissue of abnormal form. The bases of Morris' convenient classification are abnormalities in number, position and form, and our specimen deviates from the normal in all three of these essentials. We will confine our remarks to a consideration of numerical congenital anomalies, at the same time calling attention to the almost constant association therewith of morphologic and topographic defects.

The numerical congenital abnormalities may be divided into three groups: (A) Absence of both kidneys; (B) supernumerary kidneys; (C) single kidney.

(A) The absence of both kidneys is not merely a "teratological curiosity of the first months of embryonic life" as held by Guiteras,[1] for the vital functions can go on in both intrauterine and extrauterine life in the complete absence of renal tissue.

Ballowitz[2] and Mayer[3] report the congenital absence of the kidneys in a large number of living and still-born children. The extraordinary case of Moulon[4] of a girl, who reached the age of fourteen and in whom post-mortem examination proved the entire absence of renal tissue, would indicate the

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possibility of life in the total absence of these "vital organs." In this case the liver had apparently vicariously assumed the kidney function, as a patulous umbilical vein discharged a fluid with chemical characteristics resembling urine. That the liver and intestines can assume the renal function for a time at least is undoubted, as in the case reported by Seth Gordon,[5] whose patient lived for twenty-seven days after the removal of a single kidney. Vieusseux,[6] of Geneva, reports a case of total suppression of urine without uræmia for a period of seventeen months, followed by a re-establishment of renal function and the survival of the patient.

The rarity of these cases is so great that but little practical importance can be attached to them.

(B) Supernumerary kidneys. This condition is even more rare than is complete absence of renal tissue.

Isaya[7] reports the case of a female aged twenty-seven, who had suffered with recurring attacks of abdominal pain since childhood. Operation showed a movable tumor present in the abdomen to be a supernumerary kidney, the recurring pains being caused by twists of its ureter. This author collected fifteen cases, ten of which were found post mortem, the others at operation. Cobb and Giddings[8] found only seven cases of true supernumerary kidney in all the literature and add a case of cyst-adenoma of an accessory organ. Oleson[9] found two adventitious kidneys in one case, one at either superior pole of a horse-shoe kidney. Cheyne,[10] and more recently, A. F. Dixon,[11] found supernumerary kidneys at the pelvic brim. These cases usually become of clinical significance as a result of undue mobility.

(C) Single kidney. The body may contain one mass of renal tissue as a result of (*a*) Congenital absence or rudimentary development of one kidney—unsymmetrical kidney; (*b*) atrophy of one kidney, the result of disease; (*c*) congenital fusion of the kidneys—solitary kidney; (*d*) surgical removal of one kidney.

(*a*) Congenital absence of one kidney or extreme types of unilateral rudimentary development are rare abnormalities.

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Anders [12] collected 286 cases from the literature up to March 1912. This author, from a review of 92,690 autopsies, estimates the frequency of this defect as one in 1817 cases, and quotes the estimate of Dennis [13] of one in 2650 cases.

In our own studies we have found three instances of the condition in a series of 2479 autopsy reports kindly placed at our disposal by Dr. Allen J. Smith. The complete list of the congenital defects of the kidneys found in this series is given in the following statistics (total cases, 2479):

a. Unsymmetrical kidney—3 cases:

Infant three days old. Left kidney unusually large and malformed; right kidney absent; patulous foramen ovale and ductus arteriosus.

Young girl. Right kidney and ureter absent; left kidney twice the normal size; congenital recto-vaginal fistula.

Male, aged sixty-three. Right kidney, ureter and vessels absent.

Congenital misplacement	3
Movable kidney	11
Type not stated	8

b. Abnormalities in shape:

Horse-shoe	3

Male, aged fifty. Pelvis arising from posterior surface of right kidney; both kidneys nodular.

Male, aged eighty-four. Slight irregularity in shape.

Male, aged sixty-three. Right kidney low in position and hilum pointing anteriorly.

Persistent fetal lobulation	10

Morris [14] estimates the frequency of unsymmetrical kidney from the records of 15,904 autopsies and the collected statistics of several authors as one in 2400 cases. Ransohoff [15] collected the statistics of eleven operations on unsymmetrical kidneys, four nephrotomies and seven nephrectomies. A list of 226 cases is given by Craven Moore [16] from collected autopsy statistics.

Laparotomy for pelvic tumor in a female aged seventeen

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years, recently performed by Cullen [17] showed absence of the uterus, the ovaries in the inguinal canals, absence of the left kidney and a large right kidney in the pelvis simulating a neoplasm. Guiteras had the unusual experience of meeting with three cases at operation in a small hospital service within a period of ten months. Seth Gordon has met with two cases at the operating table and it is of interest to recall that Paasler performed the first nephrectomy on a single kidney misplaced in the pelvis in the belief that he was dealing with an ovarian mass.

The kidney when lacking is usually absent on the left side and the remaining organ, while often in its normal position, may be found in any part of the abdomen or pelvis. They are usually functionally sufficient, as evidenced by the seventeen cases reported by Newman [18] all of whom lived beyond the age of sixty. This is explained by a true hyperplasia of the renal tissue. The ureter and blood vessels of a single unilateral kidney are normal in the majority of cases but may show many variations.

Rudimentary development of one kidney is of the same practical importance as unsymmetrical kidney and of the same comparative frequency.

(*b*) The very much more practical question of unsymmetrical kidney resulting from pathological destruction to its fellow is of too wide scope to be discussed in this paper.

(*c*) Congenital fusion of the kidneys. Solitary kidney. This abnormality finds its most frequent expression in the horse-shoe kidney, the simplest type, which Rokitansky [19] calls the "lowest degree of fusion." On the other hand the kidneys may be fused into a discoidal mass lying usually in the median line, misplaced downwards, and often provided with a double pelvis and two ureters. This represents the "highest degree of fusion," and between these extremes are grouped the various intermediate forms. These morphologic variations are best understood if we recall Epstein's conception of their formation as the result of "fusion of the two kidneys at single points." It is impractical to satisfactorily classify the

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various grotesque forms described by Broesike,[20] Vaughn,[21] Botez,[22] and others.

The horse-shoe kidney occurs once in a thousand cases, as Morris estimated from 18,244 autopsy records from four London hospitals. J. E. Thompson [23] quotes Both who found five examples of the anomaly in 1630 autopsies. We found three such kidneys recorded in 2479 autopsies.

Associated Congenital Anomalies.—Congenital defects of other structures and organs are frequently found in association with solitary and unsymmetrical kidneys, especially the latter. The organs derived from the Wolffian and Müllerian systems are likely to be malformed or absent, usually on the side of the renal defect. Associated congenital defects of the external genitalia or of the cloacal orifice are frequently found. Persistence of the ductus Botalli, foramen ovale and ductus arteriosus have been reported. Craven Moore estimates the frequency of association of unsymmetrical kidney with defective development of the genital system as thirty-three per cent. Of 61 cases of unsymmetrical kidney collected by Anders, 21 had other congenital defects, in the majority of cases involving the genital organs. Since the ureter is developed as an out-growth from the Wolffian duct, faulty development of the latter may be primary and thereby explain the association of urinary and genital defects. In the female, however, the urinary defect is no doubt primary, since the Müllerian ducts are not fully formed until the kidney is well developed and has ascended into the loin space; but having a common mesoblastic origin defects in the renal system would likely be associated with defects in structures derived from the genital cord. The practical importance of this association can be most forcibly expressed by reference to Moore's case cited above.

Clinical Importance.—The malformed kidney as a rule gives rise to no clinical symptoms unless complicated or through pressure as the result of misplacement. Any disease to which the normal kidney is subject may affect the malformed organ, but hydronephrosis and its frequent sequel,

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pyonephrosis, are the most frequent complications. Pressure of anomalous vessels on the ureter, as Wm. J. Mayo [24] has shown, is the cause in the majority of cases. Rovsing [25] has demonstrated that pain across the abdomen from one renal region to the other, relieved by rest, increased by exertion, especially hyperextension of the spine, in the presence of an abdominal tumor in the mid-line, is suggestive of horse-shoe kidney, although tuberculous mesenteric lymph nodes may give the same symptoms. This author divided the isthmus of a horse-shoe kidney transperitoneally with relief of all symptoms. Mackenzie operated for pelvic tumor and found a large ectopic horse-shoe kidney. Papin and Christian [26] found at autopsy hydronephrosis in fifteen horse-shoe kidneys, and note that patients have been operated on for this condition by Albarran,[27] Israel,[27] and others. Thompson collected six cases of hydronephrosis, six cases of calculus, two of which had pyonephrosis, one case of pyonephrosis without calculus and one case of sarcoma. He successfully performed heminephrectomy for pyonephrosis in the left half of a fused kidney. Eisendrath [28] and Deaver [29] did laparotomies in the belief that they were dealing with inflammatory masses of appendiceal origin and found hydronephrotic horse-shoe kidneys. Bockenheimer [30] successfully removed a cystic tumor and Harris [31] divided the isthmus and removed the left half for tuberculous infection. Similar cases have been reported by Sutherland [32] and Edington.[32] Morris illustrates calculi impacted in each ureter of a horse-shoe kidney. Of twelve cases of unsymmetrical kidney found in the literature by Nessler, nine died of stone in the pelvis or in the ureter. A. D. Whiting [33] recently had a case of anuria from calculus obstruction of the ureter of a single kidney. Polk's case of nephrectomy of a single kidney for the relief of ovarian pressure pain illustrates the pelvic pressure symptoms which may arise from this condition. Obstructed labor has been caused in a number of instances.

Manley [34] and Gould report carcinoma, and Gordon sarcoma in unsymmetrical kidneys. The modern methods of

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kidney diagnosis furnish pre-operative evidence of the futility of operative treatment in these fortunately rare cases.

Important steps in the recent progress of the surgery of the horse-shoe kidney are the division of anomalous blood vessels causing ureteric obstruction, division of the isthmus to relieve pressure symptoms, uretero-pelvic anastomosis, plastic operations on the renal pelvis for hydronephrosis and heminephrectomy by the transperitoneal route.

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DR. J. CHALMERS DA COSTA said that recently he had blundered on one of these cases in his clinic. He thought he had a hypernephroma to deal with and after working for an indefinite period found out what he really had, and decided to retreat. The renal band went from the top of one kidney across to the other. The ureters had been catheterized before operation and there was no suspicion of such a thing as a horse-shoe kidney existing.

DR. GEORGE G. ROSS related a recent experience in kidney surgery as follows:

A woman came to him with a tumor in her right loin which had been present for 12 years. She had been operated on once with a mistaken diagnosis of gall-stones. The diagnosis of pus kidney, however, was plain. The usual incision was made and as soon as he exposed kidney, which was 10 inches long, 4 to 5 inches thick, a broad and adventitious vessel, ⅛ inch in diameter, was seen going from the lateral wall into this kidney. The kidney was drained and she went on to convalescence. She left the hospital for home, got as far as Baltimore, where the wound broke down, discharging pus and urine. She returned to Philadelphia and a second time he attacked this kidney, but again stopped at drainage. Last month he tackled it the third time. She came into the hospital with myocarditis, dyspnœa, etc., and he had her under treatment before the last operation for seven weeks. At the last operation he had loosened the kidney at its superior pole, when in twisting his finger the vena cava was torn in two and in less than a minute the patient was dead.

SPRAIN FRACTURE OF THE SPINOUS PROCESS OF THE FIRST THORACIC VERTEBRA.

DR. PENN G. SKILLERN, JR., reported the case of a man, aged twenty-two, who, while lifting a heavy object from the ground with both arms, felt something snap at the root of the neck posteriorly. He applied for treatment at the Surgical Outpatient Department of the University Hospital where he was examined by Dr. B. A. Thomas, who made a clinical diagnosis of fracture of the spinous process of the first thoracic vertebra. The signs upon which this diagnosis was based were localized tenderness, preternatural mobility and crepitus. A skiagram (Fig. 3) confirmed the diagnosis. It is noted that the spinous

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process of the first thoracic vertebra is displaced downward from its base of attachment to the body of the vertebra for a distance equivalent to its own diameter, so that the interspinous interval between it and the spinous process of the second thoracic vertebra on the one hand is diminished, whilst that between it and the spinous process of the seventh cervical vertebra on the other hand, is increased.

The text-books merely mention these fractures. Gurlt (Handbuch der Lehre von der Knochenbrüchen, 1862) says: "It is known that fracture limited to a spinous process is exceedingly rare." Stimson (Fractures and Dislocations, 1907, p. 145) says: "Isolated fracture of a spinous process may occur as the result of direct violence, or of *muscular action*, and the displacement is either *directly downward* or to one side. Muscular action is very rare. The spinous processes are broken most frequently at those points where they are longest and thinnest, more than one-half the cases occurring in the thoracic region: and often several adjoining ones are broken at the same time." Scudder (Treatment of Fractures, 1911, p. 92) says: "More than 50 per cent. of fractures of cervical vertebræ are fractures of the spinous processes." My case is, then, a sprain-fracture from muscular violence, most likely from intense contraction of the thromboidei minores muscles. Owing to the downward displacement, a pseudarthrosis is liable to ensue. Of 21 cases of complete pseudarthrosis Gurlt (*loc. cit.*) found 4 involving the spinous processes. This result is immaterial, however, and the spinous process could readily be excised.

SERRATUS MAGNUS PALSY WITH PROPOSAL OF A NEW OPERATION FOR INTRACTABLE CASES.

Dr. Penn G. Skillern, Jr., reported the case of a man, aged twenty-four, who reported at the Surgical Out-patient Department of the University Hospital, service of Dr. B. A. Thomas, October 19, 1912, complaining of inability to elevate the right arm above the shoulder.

He is an apprentice machinist, and had been working at a machine which required full reaching forward of arms 800 times a night, and to this he attributes his present trouble. He awoke one morning with pains about right shoulder which on subsiding left stiffness and the lameness of which he complains.

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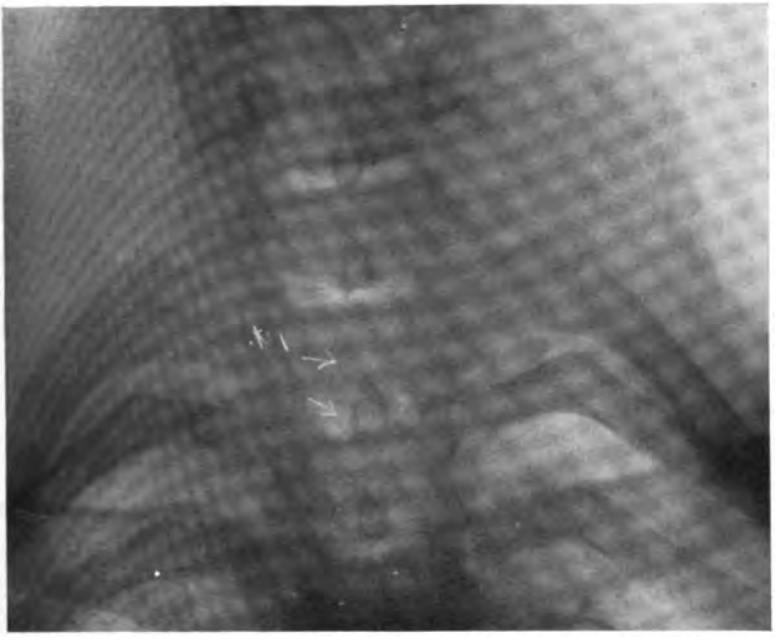
FIG. 3.



Sprain-fracture of spinous process of first thoracic vertebra. Upper arrow points to area of detachment; lower to displaced process.

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FIG. 4.

"Winged scapula" in serratus magnus palsy. Arms flexed. Profile view. Position of maximum projection of inferior angle.

FIG. 5.

"Winged scapula" in serratus magnus palsy. Arms flexed. Posterior view. Note fossette just below inferior angle. Note slope of right shoulder.

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The patient was stripped to the waist. The eye was caught immediately by the "winged" appearance of the lower part of the scapula (Figs. 4 and 5). Seen from before there was drooping of the "point" of the shoulder (acromion). Viewed from the side the projecting inferior angle of the scapula was seen in profile behind, whilst before, with the arms elevated to the limit of their power, on the left (sound) side the lower five digitations of the serratus magnus were plainly visible, embossed in contraction between the external oblique before and the latissimus dorsi behind and were palpable as definite muscular cushions for the ribs: on the right side, however, these digitations were neither seen nor felt, and the ribs, having lost their muscular cushions, felt hard and bare. This is a sign indicative of atrophy of the serratus magnus. Behind, the scapulæ were outlined in black and the muscles inserting into them were marked on the surface with colored crayons. The inferior angle projected most when the upper extremity was flexed sagitally to right angle, and now two fingers could be introduced into the little fossa below the overhanging angle and pushed up as far as their knuckles (2) in the subscapular fossa. A fold of skin ran downward and outward from the inferior angle which projected 1½ inches from back. It was evident that the unopposed antagonists of the serratus magnus were responsible for the following conditions. The inferior angle had slipped from under the upper border of the latissimus dorsi owing to rotation of the scapula on an anteroposterior axis projected through its centre from contraction of the levator scapulæ and of the rhomboids, so that the acromial angle drooped from gravity and from pull of latissimus dorsi and pectoral muscles, and the lower angle was drawn enough upward and inward to release it from the binding of the latissimus. This resulted in obliteration of the triangle of auscultation and in its stead a cord-like swelling produced by shelving of the lower border of the trapezius. There was no atrophy of the supraspinatus. Elevation of the right arm beyond the domain of the deltoid was incompletely accomplished by the compensatory action of the elevator portion of the trapezius, for the occipitoclavicular and spino-acromial fibres forming its upper rounded border were strongly contracted to such extent that the head was also drawn over toward the lame side. The extremity soon became fatigued and dropped to the side.

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It seemed to him that the criterion of unilateral isolated palsy of the serratus magnus must reside in the relations which the angles of the scapulæ bear to the mid-dorsal line in the various rotations of the shoulder-blades. To emphasize this he had prepared the following table.

TABLE TO SHOW RELATIONS OF ANGLES OF SCAPULÆ TO MID-DORSAL LINE IN VARIOUS POSITIONS OF THE UPPER EXTREMITIES (Distance Given in *Inches.*)

	Upper Angle			Lower Angle		
	R	*L*	*Difference*	*R*	*L.*	*Difference*
(1) Resting by side	½	2½	L + 1	2	2¾	L + ¾
(2) Flexed forward to right angle.	2½	3½	L + 1	2	5½	L + 3½
(3) Abducted to right angle	2	2½	L + ½	1½	5¾	L + 4¼
(4) Vertical elevation	1½	2	L + ½	2¼	7	L + 4¼

From this table a graphic chart (Fig. 6) has been prepared which shows at a glance the excursions of the superior and inferior angles and most strikingly of the intervening vertebral border of the scapula from the mid-dorsal line. By connecting the respective dots on the right (lame) side it is seen that the vertebral border remains almost vertical, or parallel with the mid-dorsal line, in all positions, whilst on the left side the inferior angle is constantly carried well forward and outward with coincident increasing degrees of obliquity of the vertebral border until in vertical elevation of the limb this border forms a wide angle with the mid-dorsal line, the inferior angle reaching almost to the mid-axillary line. In fact, by actual measurement the left half of the chest from the mid-sternal to the mid-dorsal line was 16 inches, and 7 of the 16 inches, or just less than half, were traversed by the inferior angle of the sound scapula during its excursion outward and forward. The extent of the excursion of this inferior angle is not ordinarily appreciated, and the contrast on the two sides, in conjunction with the visible and palpable atrophy of the lower digitations as seen on the side of the chest, furnishes the most convincing proof that the serratus magnus is the muscle affected, and that it is pathognomonic of this malady.

With the arms folded across the back no abnormal deviation of the lamed scapula was noticeable, since here the rhomboids exercised their normal and unopposed function of adducting the vertebral borders of the scapulæ toward the mid-dorsal line and therefore toward each other.

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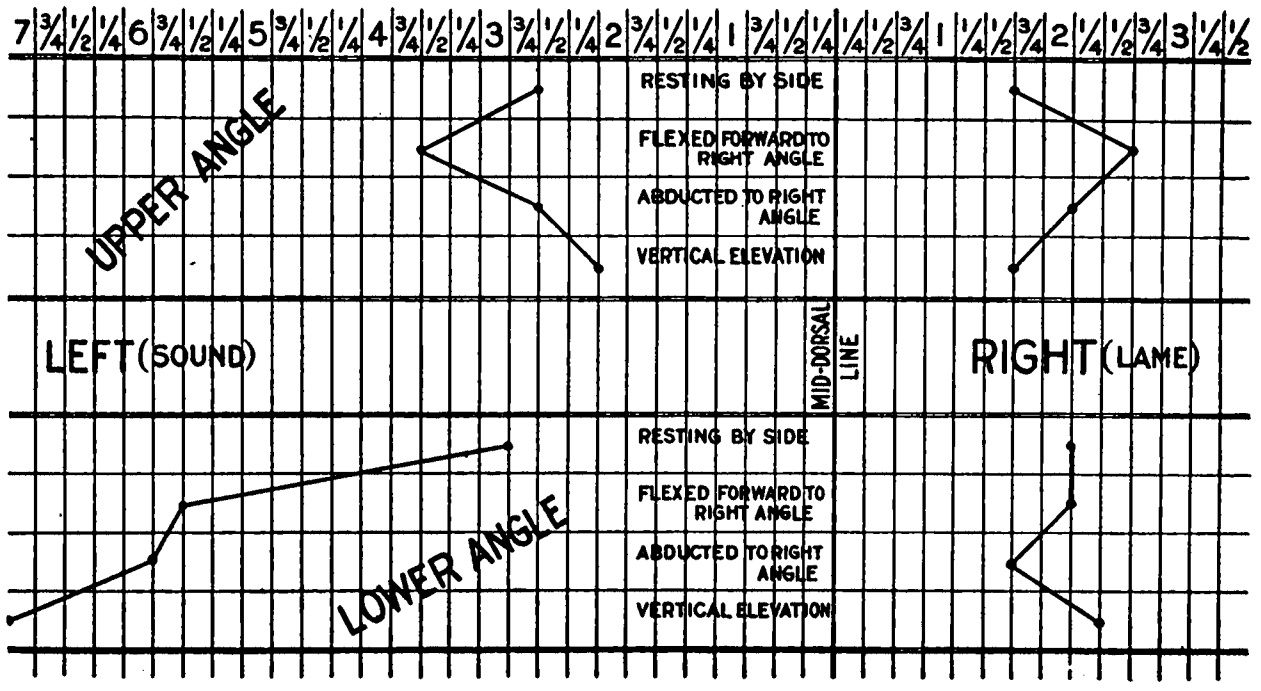
FIG. 6.



Graphic chart based upon the table showing relations of angles of scapulæ to mid-dorsal line in the four positions of the arm. The relations of the vertebral border to the mid-dorsal line may be figured by connecting the respective dots in the various positions. Contrast the wide forward and outward excursion of the inferior angle of the sound scapula with that of the lame.

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By way of exclusion the patient was examined for progressive muscular dystrophy, so commonly localizing in the shoulder region, with absolutely negative findings. To exclude cervical rib, a skiagram was taken by Dr. Henry K. Pancoast, but no supernumerary rib was found. To exclude syphilis, a Wassermann reaction made by Dr. John L. Laird was negative. Dr. Alfred Reginald Allen very kindly made tests of the long thoracic nerve and serratus magnus muscle with both the faradic and galvanic excitors, with in both cases the reaction of degeneration.

Acting upon the diagnosis of isolated paralysis of the right long thoracic nerve of Bell due to traumatism with sequential atrophy of the serratus anticus muscle, the treatment advised was cessation from work, tri-weekly massage with passive movements, active graded gymnastics, and ascending doses of sulphate of strychnia beginning with one-thirtieth of a grain thrice daily after meals.

After over three months of this treatment without benefit, or any sign of improvement except that gained by education of the compensatory elevator fibres of the trapezius, not wishing to discharge the patient—just entering upon his life's work—uncured and permanently crippled, an operation was advised which is believed to be original, but which has not been tried yet, pending the consent of the patient.

As to general considerations of serratus magnus palsy, Dr. Skillern said that it was not germane to the object of his communication to deal with the commoner medical and for the most part better known aspects of this malady. A comprehensive paper by Eshner (Jour. A. M. A., Feb. 1, 1902) covers this ground. The literature is scarce, contributions by Gower and a monograph by Berger (1875), which covers many aspects of the subject, being the most valuable. He desired, however, to emphasize a few points which have to do with completely isolated and independent paralysis of the serratus magnus due to trauma.

In the first instance the long thoracic nerve is exposed to trauma as it traverses the scalenus medius, after emerging from which its superficial position exposes it to the pressure of objects—especially sharp-edged ones—carried upon the shoulder, particularly as is commonly seen among laborers when the object is unloaded by a short quick shrug of the shoulder. Hecker,

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Jobert and Fuehrer have reported cases similar to the one now reported, and in which paralysis followed heavy work that required energetic lifting of the arm in frequent repetition. Wiesner attributes the injury in these cases to violent alterations of the entire supraclavicular fossa in shape and in position.

The incidence of the malady in the present patient was similar to that in other cases in which continuous and severe action of certain scapular muscles was conspicuous in the etiology, in that it began without warning (and but slight pain) with a feeling of stiffness and weakness of the arm and then paralysis. Then the antagonistic trapezius, rhomboids and levator scapulæ, now unopposed and free to act, contracted and produced the above-depicted deviation of the scapula, whilst the serratus magnus, freed from its taskmaster—the long thoracic nerve—lay dormant and slumbering and shrivelling up upon the chest-wall. The seeming elevation of the lame arm higher than the shoulder is more apparent than real, and is very weak and wavering, it being due as aforementioned to compensatory action of the elevator (spino-acromial) portion of the trapezius.

Conservative measures are being thoroughly tried out in this patient because he reported early for treatment, and the earlier a case is treated with electricity the more favorable are the chances for its restoration. Again, experience with similar cases by others has shown that those cases are apt to heal in which an overstretching of the shoulder muscles is at the bottom of the palsy, and also complete restoration has been produced by the faradic current in cases that have existed many years. With these measures he may expect a certain degree of improvement, but in all probability a permanent lameness of the arm with the characteristic deformity.

The prognosis, however, must not be based so much upon the behavior of previous similar cases as upon that of the case that confronts us. It depends upon the severity of the anatomic lesion of the nerve, the nutritional state of the paralyzed muscle, and the extent of secondary changes in its antagonists. Further, complete absence of reaction of the nerve and muscle to both currents makes the prognosis absolutely bad and almost always means the case is incurable.

The crux of this case is the textural condition of the long thoracic nerve, and of the four possibilities,—concussion, com-

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pression, contusion and laceration—the probability, based upon the clinical findings, is laceration with separation and with interposition of scar tissue between the dissevered ends. This being the case, no amount of electricity, massage or other measures will remove that scar tissue. The lesion is on a small scale akin to traumatic rupture of the brachial plexus and should be dealt with accordingly. It is for these reasons—and mainly to restore a useful arm to this man entering upon his wage-earning life—that Dr. Skillern has planned and recommended the execution of the following operation.

Operation.—It is evident that the only operative procedure to be considered here is that of inosculating the proximal end of a healthy nerve to the distal end of the injured long thoracic. In casting about for a nerve that would fulfil the requirements of equal size, identical origin and close proximity, it occurred to him that choice lay between the three subscapulars. Of these the uppermost is the shortest, and, passing down behind the axillary artery, soon sinks into the subscapularis, which it supplies. Its origin from the fifth and sixth cervical nerves is almost identical with that of the long thoracic, which arises additionally from the seventh. Its size is equal to that of the long thoracic and its proximity is close, it being but one-half inch behind and to the outer side (Fig. 7). It usually consists of two branches, an upper and a lower. Thus it is possible for one branch of the upper subscapular to be preserved to dominate the upper portion of the subscapularis, the lower portion receiving its innervation from the lower subscapular which supplies, in addition, the teres major. The middle or long subscapular continues its lengthy course to the latissimus dorsi. The short subscapular nerve, therefore, is the least important of the three, supplies only part of the subscapularis, and fulfils the conditions.

A horseshoe-shaped flap is outlined over the hollow of the axilla with its base corresponding to the anterior fold (lower border of the pectoralis major). The flap, including the underlying axillary fascia, is raised and reflected over the anterior wall. The long thoracic nerve is sought for coursing down the middle of the inner wall of the axilla, beneath the fascia covering the serratus magnus. It is traced up to the apex of the axilla, beneath the great neurovascular bundle, which is retracted

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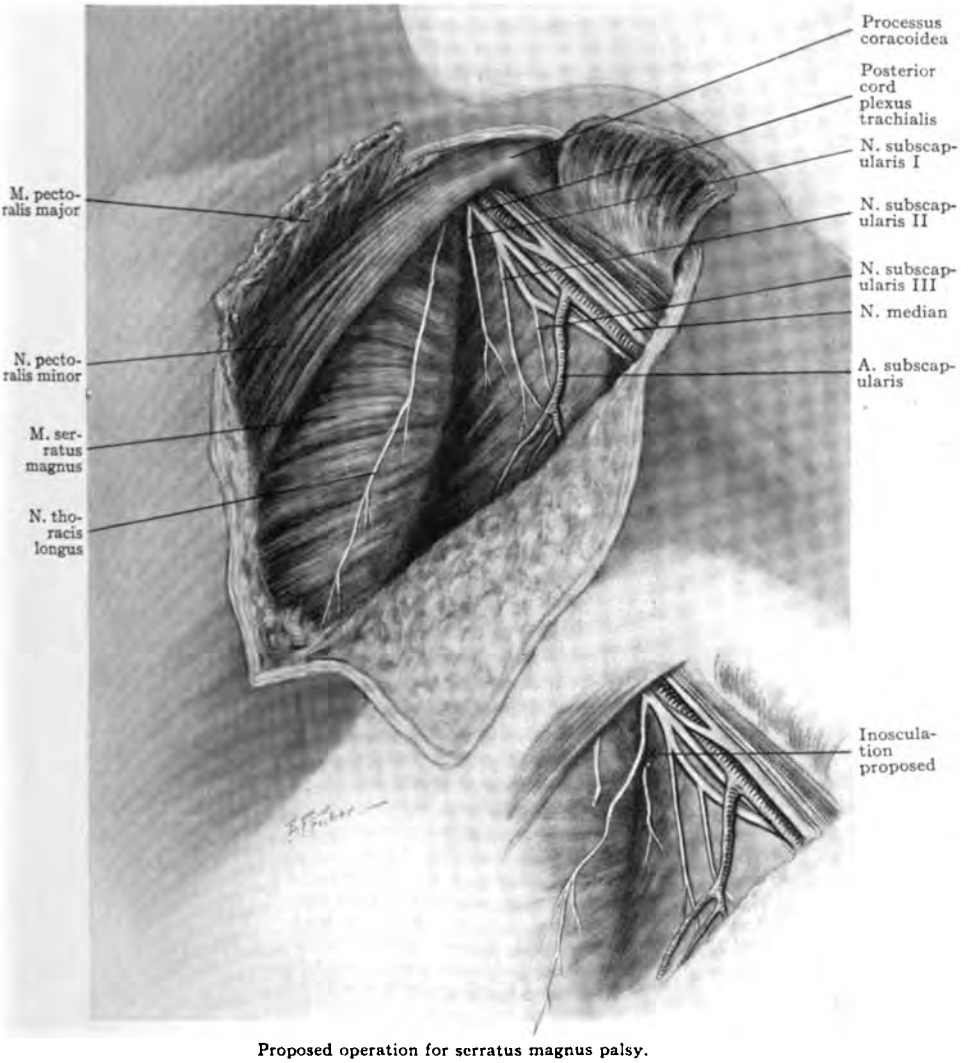
FIG. 7.



Proposed operation for serratus magnus palsy.

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forward against the anterior axillary wall. The posterior cord of the brachial plexus will thus be stumbled upon, it being the lowest constituent of our upturned neurovascular bundle. The three subscapular nerves are readily seen coursing beneath the fascia upon the subscapularis and are traced up to the posterior cord. The uppermost of the three is now found but one-half inch from the long thoracic. It is approximated to the long thoracic, both are severed, and the proximal portion of the short subscapular united in contact end-to-end, with the distal portion of the long thoracic, using very fine catgut suture. The line of union is wrapped about with egg-membrane in order to prevent interference by connective-tissue from without, and to facilitate regeneration of the neurilemma tube.

ULTIMATE OUTCOME OF SUPERFICIAL COLLATERAL CIRCULATION IN A CASE OF POST-TYPHOIDAL THROMBOPHLEBITIS OF THE INFERIOR VENA CAVA.

DR. SKILLERN gave the later history of a case which was first reported in detail in the ANNALS OF SURGERY (1912; lv; 6; p. 919) and the condition of the superficial abdominal veins at that time is reproduced in the accompanying cut (Fig. 8). They have been present ever since an attack of typhoid fever, three years ago. Several months ago, following immediately an attack of acute tonsillitis, the patient noticed that the veins over the right half of the anterior abdominal wall had become reddened and painful. Examination at this time revealed acute thrombophlebitis with its classical picture of a broad streak of dusty redness, swelling, local heat, tenderness, and cord-like tenseness of the superficial veins over the right half of the anterior aspect of the trunk between the right inguinal furrow and the axilla. After a few days of treatment by rest in bed, catharsis, mercury thrice daily, and local applications of lead-water and alcohol, the acute phlebitis subsided, leaving small thrombi here and there along the course of the veins, and shortly afterward these thrombi disappeared and no trace of any dilated veins could be seen (Fig. 9). After this the same process was repeated on the left side, likewise resulting in disappearance of the veins, with the exception of the lower part of the thoraco-epigastric vein just above the middle of left Poupart's ligament.

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This had always been the largest and most tortuous vein, and a hard thrombus remained in it.

The pathology here seems to be clearly explained by metastatic infection of the chronically-congested vasa vasorum by bacterial emboli carried by the blood-current from the primary focus in the tonsil to the *locus minoris resistentiæ*. The minute thrombi arising from its bacterial invasion of the vasa vasorum migrated by continuity into the larger dilated and weakened superficial veins, whose walls they nourished, and gave rise to the macroscopic acute thrombophlebitis, which later extended over to the left side more likely through the superficial than the deep veins, for had the common iliacs been invaded there would have been milk-leg, which did not arise. During the temporary occlusions of these veins by the thrombi the blood current was forced into the deeper para-vertebral channels, which dilated to accommodate the extra volume of blood, and after the subsidence of the superficial phlebitis they remained permanently dilated and kept on returning the extra blood, whilst the superficial veins contracted from the fibrous tissue which organized the thrombi. It seems scarcely necessary to theorize upon a coincident canalization of the thrombus in the vena cava for there were no signs of deep thrombophlebitis. The crural ulcers seemed to be healing.

LUXATION AT MIDTARSAL (CHOPART'S) JOINT.

Dr. Skillern presented skiagrams showing a midtarsal dislocation. This history was as follows: A negro man, aged twenty-three, presented himself at the Surgical Out-patient Department of the University Hospital, service of Dr. B. A. Thomas, on June 20, 1912, complaining of an injury to his right foot received the previous day in the following manner: While standing upon two iron beams with the heel on one, the ball on the other, and the arch spanning the intervening space, a third iron beam fell from a freight car four feet above upon the dorsum of the right foot. Examination revealed great swelling, which obscured bony landmarks upon the dorsum; tenderness over the astragalo-scaphoid joint internally, but more marked over the calcaneo-cuboid joint externally; and loss of rotatory movement but preservation of flexion and extension. There was no ecchymosis. Skiagram, taken by Dr. Henry K. Pancoast (Fig.

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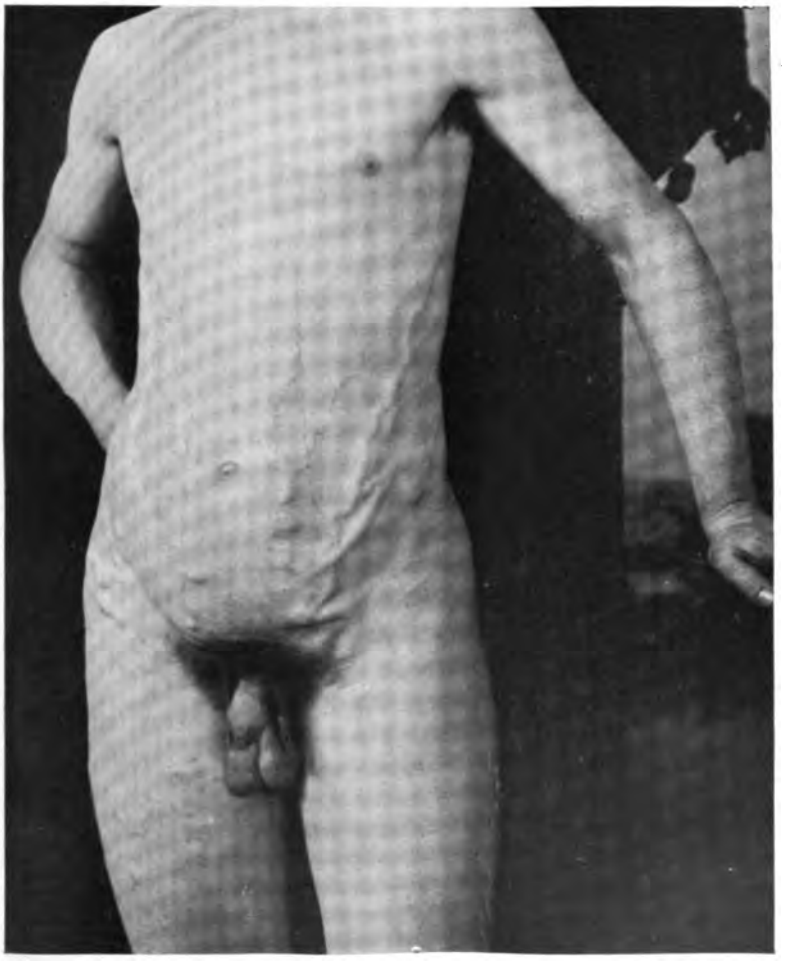
FIG. 8.



Enlargement of superficial veins consequent upon occlusion of the vena cava inferior.

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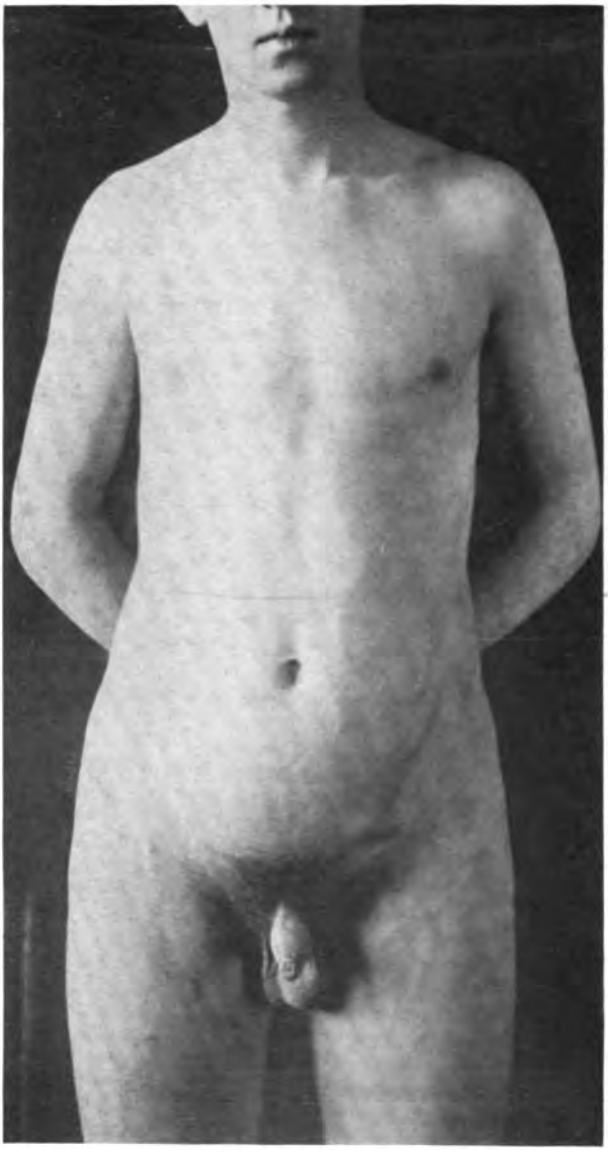
FIG. 9.



Subsidence of enlarged superficial abdominal veins three years after acute metastatic thrombophlebitis occluding inferior vena cava.

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10) showed incomplete total luxation at midtarsal joint with sprain-fracture of antero-external corner of os calcis. The patient, a negro, refused an anæsthetic, but by manipulations somewhat similar to those used in the reduction of Colles' fracture, he restored the articular surfaces by plantar flexion followed by extension and rotation outward, and applied a gypsum case (Fig. 11).

The reporter remarked that Petit (*Oeuvres completes; Bibliothèque Chirurgicale;* 1837; I; p. 98) described the first two cases of this injury, but his as well as Sir Astley Cooper's (Treatise on Dislocations and Fractures; 1823; p. 376) cases were severely criticized by Broca (*Mémoires de la socété de chirurgie;* T. III; 1853; p. 566) as having been based on insufficent evidence. Malgaigne (*Traité des Fractures et des Luxations;* 1855; II; p. 1071) was the first to name the injury midtarsal luxation. In a very extensive monograph Houzel (*Thèse de Paris,* 1911) reviewed the literature up to 1911, and went into the minutest detail concerning the mechanism and other features. He alleged to have found 34 cases. At about the same time, however, Paul Mueller (*Fortschr. a. d. Geb. des Röntgenstrahlen;* 1911–1912; XVIII; p. 187) sifted the literature much more carefully, selecting those cases only which had been confirmed by skiagram or by autopsy. With these provisions just 12 cases, including one of his own, passed muster. Goebel (*Archiv. f. Orthop.;* 1912; XI; p. 9) thought to add one more to this last, but his case must be omitted from classification because it was almost a pure dorsal double luxation of the scaphoid, which carried with it the internal cuneiform alone, instead of the entire forefoot. The present case, therefore, is the thirteenth instance of this rare injury.

Corson (ANN. SURG., 1912; LVI; 6; p. 883) gives a discourse without conclusions about "Mediotarsal Subluxation as Shown by the X-ray," and examination of the skiagrams shows that the first was taken with the foot in plantar flexion,—a position we employ in surgical anatomy to make prominent the head of the astragalus as a bony landmark upon the dorsum of the foot, and also in a Chopart amputation to facilitate entrance of the scalpel into the dorsum of the joint. Corson was deceived by the natural widening of the joint-line under these circumstances, for the next skiagram (after reduction (?))

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shows the foot at right-angle to the leg, in which position the joint-line is reduced to a chink.

The midtarsal or Chopart's joint, more recently well-designated by Fick the "transverse tarsal joint," is formed by the os calcis and astragalus behind articulating, respectively, with the cuboid and scaphoid before. The calcaneo-cuboid joint is firmly bound by the long and short plantar ligaments supported by the tendon of the peroneus longus, so that its mobility is reduced to a minimum. At the astragalo-scaphoid joint a composite socket is formed for the head of the astragalus by the sustentaculum tali behind, the scaphoid before, and in between by the upper cartilaginous surface of the inferior calcaneo-scaphoid ligament, which is short and very thick and one of the strongest in the body. This ligament as well as the joint is stoutly supported by the inserting tendon of the tibialis posticus. The astragalo-scaphoid joint is higher and more exposed than the calcaneo-cuboid, and its range of motion greater. It is the opposition joint of quadrupeds but has lost this significance in man, its most important function being to supplement or accompany movements of the ankle-joint. The combined units of the transverse tarsal joint furnish motions of slight plantar flexion and slight rotation about the longitudinal axis of the foot. Otherwise the tarsus has practically no mobility. The part of the foot in front of this joint-line may be referred to as the antetarsus, and that behind, the posterior tarsus.

Luxation here may be classified according to the involvement of one or both joints as partial or total; according to the extent as complete or incomplete; and according to the direction as plantar or dorsal. The present case, therefore, classifies as a total, incomplete luxation of the plantar type. It is total because both joints are involved; it is incomplete because the articular surfaces are still in contact inferiorly; it is of the plantar type because the antetarsus is lowered into the sole of the foot. Isolated luxation of the calcaneo-cuboid joint never occurs, but is precipitated by the astragalo-scaphoid joint taking the initiative, just as one mountain-climber is dragged down by another who has lost his foothold. There is usually a lateral displacement, in addition.

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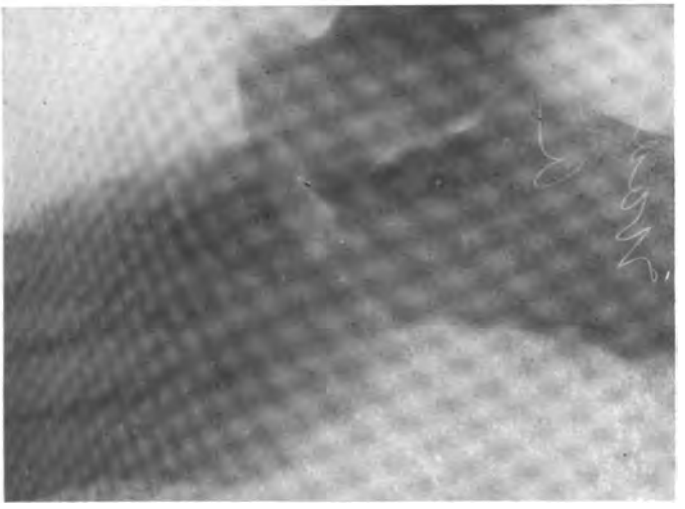
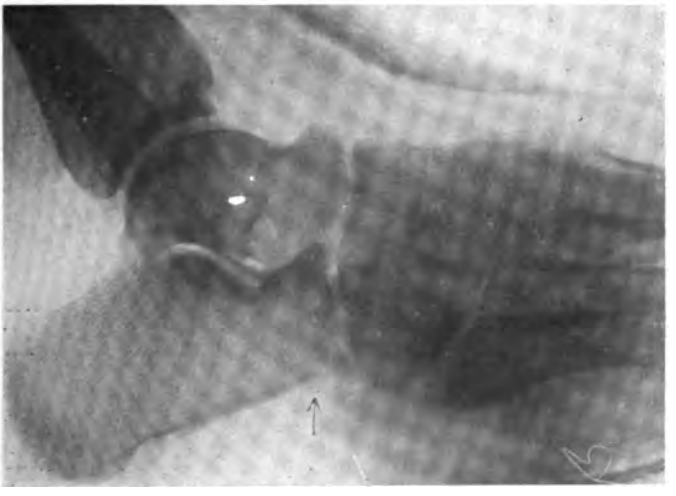
FIG. 10.



Luxation at mid-tarsal joint, before reduction. *Type*—total incomplete plantar. Note prominence of head of astragalus on dorsum.

FIG. 11.



Luxation at mid-tarsa joint after reduction. Gypsum case applied so as to support ante-tarsus but permit posterior tarsus to sink. Note sprain-fracture of os calcis.

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Predisposing causes are repeated sprains which relax ligaments, and pathological states, notably flat-foot and pigeon-toe. Determining causes are direct violence (as in this case) but more commonly indirect, usually when the foot is in hyperextension (plantar flexion) at the time of trauma.

The subjective symptoms are pain and loss of function; the objective signs, much swelling, alteration in bony landmarks, and shortening between tibial malleolus and hallux. In the dorsal type the scaphoid (if partial) and, in addition, the cuboid (if total) are shoved up to project onto the dorsum to an extent varying with the completeness of the luxation, whilst in the sole the anterior extremity of the os calcis as well as the head of the astragalus form prominences. In the plantar type which is more frequent, this state is reversed, the cuboid and scaphoid projecting into the sole, obliterating the arch and giving rise to a prominence in the centre, which is readily seen in a plantar imprint, whilst on the dorsum the head of the astragalus and anterior extremity of the os calcis form prominences over which the extensor tendons course just as the bridge of a violin raises its springs.

The diagnosis is based upon the clinical findings in conjunction with the skiagram. If great swelling interferes with a satisfactory examination, the lesion may ' ; *suspected* and diagnosis made by skiagram.

As associated lesions there may be sprain fracture of adjacent tarsal bones; compression-fracture of the os calcis; compounding through the skin; and from the great swelling and hemmed-in extravasation thrombosis followed by gangrene of the foot and leg. Late lesions, especially if unreduced, are tarsitis with osteophyte formation, retraction of tendons and muscular atrophy. The prognosis is good after proper reduction.

Treatment consists in immediate reposition, preferably under anæsthesia. The posterior tarsus is immobilized and the antetarsus manipulated according to the variety of the luxation so as to retrace its emergent path. It is a matter of judgment and patience. Vanverts thus succeeded in reducing a luxation of two weeks' standing.

Some cases are irreducible at the outset. For these and for poorly-functionating old cases operation is indicated. Even at operation there may be considerable difficulty in locating the

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obstacle to reduction. In old unreduced cases with poor functional result the operation of partial anterior tarsectomy, in which the scaphoid alone is removed, reduces the luxation and re-establishes the arch.

After reduction by either bloodless or operative measures regard must be had for the weakened plantar arch. In the present case a gypsum case was applied immediately after reduction and three weeks later a flat-foot shoe. He was a poor risk against flat-foot both because of his race and because of weakening of the calcaneo-cuboid joint from sprain fracture of the inferior articular edge of the os calcis from the pull of the important plantar ligament.

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