ness of the cure does not depend entirely upon the successful removal of the gland. Two other factors must be considered: first, the care of the patients after the operation which should, whenever possible, free the patient from physical and nervous strain for periods varying from several months to two years. Unfortunately, the social status of the patient may make it impossible to provide these conditions sometimes. This must be borne in mind by the practitioner into whose hands the patient falls after operation, and the completeness of the recovery will depend upon his appreciation of the need of this after-treatment and whether the circumstances permit of its enforcement. Second, the existence of chronic visceral disease at the time of the operation must be taken into account. Some of these patients are physical wrecks with organic lesions of heart, kidney, and other organs, from which complete recovery is impossible. As Kocher (*Brit. Med. Jour.*, February 17, 1912) has said, if all cases were operated upon within a short time after the outbreak of the disease, they would probably all be cured and to this might be added that the mortality, low as it now is in all cases, would be reduced to that of as common a procedure as herniorrhaphy.

The general practitioner has every right, if he so chooses, to try nonsurgical means in the early stages of the disease before the myocardium or kidney or nervous system is permanently damaged. But if he fails to arrest the disease and does not advise operation in the curable stage, he should be just as severely censured as the practitioner who fails to call for surgical aid until his patient with acute appendicitis has developed peritonitis, or one with a callous ulcer of the stomach, carcinoma. The conditions are quite parallel. The extraordinary recuperative power of patients with Graves's disease is amazing, and in most cases, sick as they are at the time of operation, they will almost uniformly be restored to perfect or reasonably good health.

Dr. George P. Müller believed that too much emphasis is laid upon the preliminary medical treatment of exophthalmic goitre by most of the writers and text-books on the subject. It seemed to him that those cases seen early, before the so-called four cardinal symptoms are present, when mental irritability, general nervousness, loss of weight and strength and tachycardia may be the chief evidences of hyperthyroidism, may be completely cured by non-operative measures, of which rest is the key-note of treatment. In cases in which the diagnosis is established, it is an absolute waste of time in trying the so-called medical treatment for the three or four months advised by most writers.

STATED MEETING, HELD MAY 4, 1914.

Dr. G. G. Ross in the Chair

UNUNITED FRACTURE OF THE NECK OF THE FEMUR, TREATED BY BONE-TRANSPLANT

Dr. Astley P. C. Ashhurst presented a man, thirty years old, who in August, 1913 (seven months after injury), came under his care at the Orthopædic Hospital, in Dr. Harte's service, and was found to have an ununited fracture of the neck of the right femur. He was unable to walk without crutches, on account of pain and weakness; he could stand alone, and even bear momentarily all his weight on the injured limb, but the hip grated, and the trochanter slid up and down on the pelvis. There was shortening of an inch and three-quarters. A skiagraph showed an ununited fracture at the base of the neck, oblique, and the longer fragment belonging to the head of the bone and the front of the neck (Fig. 1).

The patient was referred to the Episcopal Hospital (there being no vacant bed at the Orthopædic Hospital), and admitted to Dr. Frazier's service. Operation was done by Dr. Ashhurst on August 22, 1913.

1. An incision was made downward for 3½ inches from the anterior superior spine of the ilium, passing between the sartorius and tensor fasciæ femoris, and then between the ilio-psoas and rectus muscles. The capsule of the hip joint was then opened and detached widely from the anterior intertrochanteric line, exposing the line of fracture, which was bevelled at the expense of the posterior surface of the neck, and extended anteriorly to the extracapsular region of the great trochanter. Only fibrous union was present, and the fragments were easily pried apart with a bone elevator. The fractured surfaces were then freshened. It was now found that by outward rotation, followed by longitudinal traction and finally by inward rotation, the fragments were jammed together in good position. The wound was then temporarily packed with gauze.

2. A bone peg (Fig. 2) was removed from the crest of the left tibia by means of the speaker's circular saw (Fig. 3); the dimensions of this peg were four and a half inches long, and one-half by three-eighths by three-eighths of an inch thick (11.5 cm. long, and 1.5 cm. by

1 cm. by 1 cm. thick); it tapered slightly at its lower end. This bone peg was temporarily put in hot salt solution, and the leg wound closed.

3. The fracture of the cervix femoris was set under control of direct vision, by outward rotation, longitudinal traction, and finally inward rotation. While the limb was securely held in this position, an incision one and a half inches long was made over the great trochanter, and by means of a steel drill in a hand-driven brace (Fig. 3) a hole was bored through the trochanter and neck into the head. First a drill three-eighths of an inch in diameter was used, then one fifteen-thirty-seconds of an inch in diameter; and as the peg proved too large to be driven in through this hole, a drill half an inch in diameter was finally used. The peg fitted this hole very snugly, and it was necessary to drive it home with very vigorous blows from the mallet (Fig. 4). Some of the projecting end of the peg was then cut off. The two wounds in the hip were then closed, and the limb dressed in plaster of Paris from toes to axilla, in an abducted position. The time of the entire operation, including plaster of Paris, was two hours.

September 22, 1913: One month after operation, the plaster case was removed below the knee.

October 12, 1913: Seven weeks after operation the remainder of the plaster case was removed. There was no stiffness or thickening around the hip joint, and the incisions were healed. The end of the bone peg was palpable beneath the skin over the great trochanter. There was no shortening of the limb and no movement between the fractured surfaces. Rotation at the hip was normal. Flexion to 150 degrees was easy and painless. The patient was to stay in bed two weeks longer.

October 20, 1913: Allowed to be up in wheel-chair.

October 25, 1913: Walking with crutches and a high shoe on the left foot, preventing any weight-bearing on the fractured limb.

November 27, 1913: Discharged from the ward, with directions to bear no weight on the right foot until six months after operation. A skiagraph made about this date showed the same conditions as Fig. 4. Figs. 5 and 6 are from photographs made December 1, 1913, four months and a half after operation.

Soon after this time the patient returned to his home in Ohio. About the first of the year (over four months after operation) he was permitted to abandon the use of the high shoe, but was directed to continue the use of crutches. This, however, he did not do. He felt so well and strong, he wrote, that as soon as he gave up using the high shoe he threw away his crutches. The effect of this was apparent when

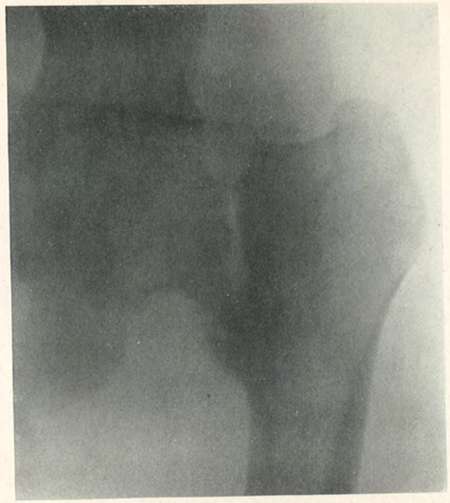


FIG. 1.—Ununited fracture of cervix femoris, seven months after injury. Unable to walk without crutches.

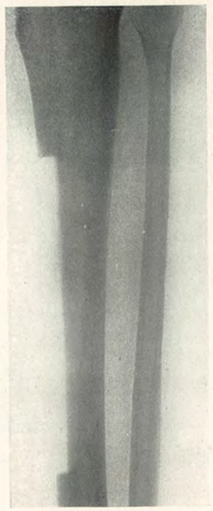


FIG. 2.—Showing defect in tibia after removal of bone peg.

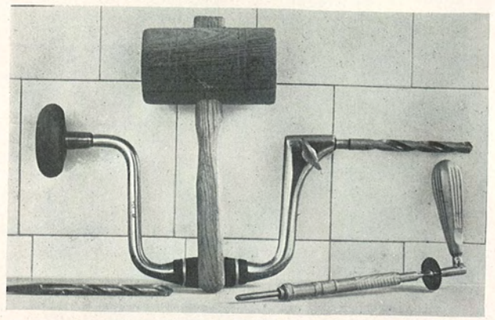


FIG. 3.—Circular saw, brace, drills and mallet used in transplanting a bone peg for ununited fracture of neck of femur.

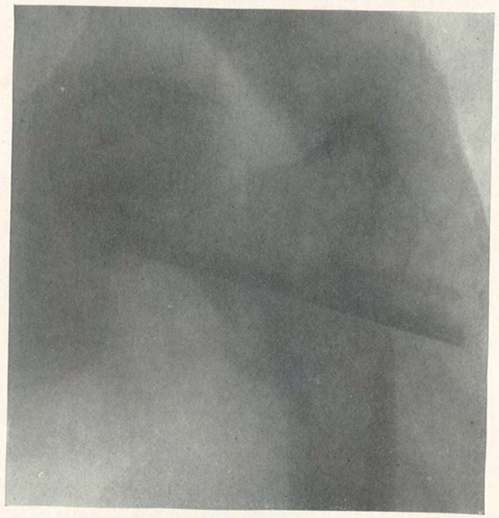


FIG. 4.—Bone peg in ununited fracture of cervix femoris (skiagraph made through plaster-of-Paris dressing 10 days after operation).

FIG. 5.

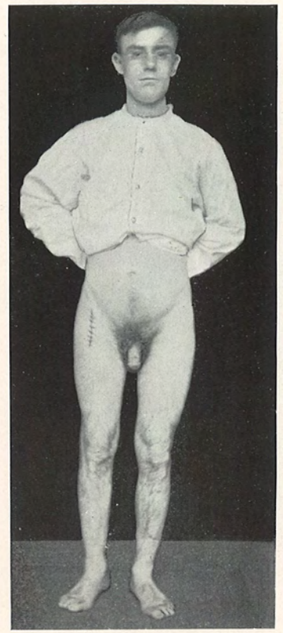
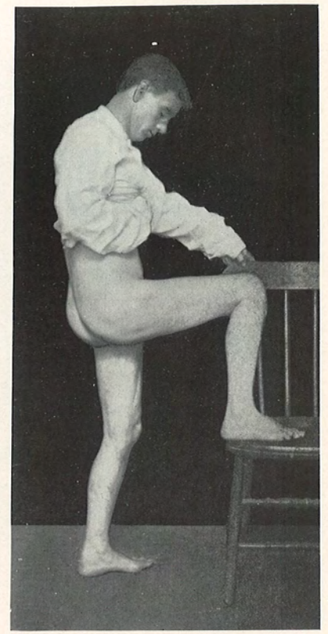


FIG. 6.



FIGS. 5 and 6.—Bone peg implanted in neck of femur for ununited fracture. No shortening, free motions, four months and a half after operation.

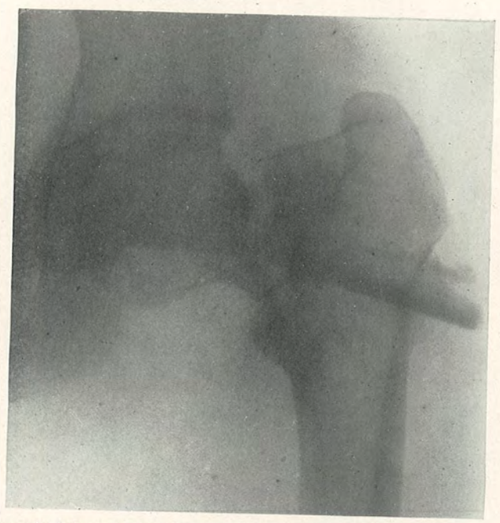


FIG. 7.—Skiagraph eight months after insertion of bone transplant, showing incomplete fracture of the transplant and secondary coxa vara.

he next presented himself for observation on April 20, 1914. He was now wearing a lift in his right heel, as he felt the limb was shorter than the left. Measurements showed a shortening of half an inch; in December, 1913, there had been no shortening. Otherwise the hip was in good shape: there was flexion to about 70 degrees, free rotation, abduction through about 10 degrees, and all these motions were painless. Walking was easy without any support, but there was a noticeable limp; the man had not been able to return to his usual occupation in the pottery, as this involved heavy lifting, and his employers were unwilling to risk an accident though the man himself said he was sure he could do the work. Meanwhile he had been doing odd jobs, but he had no steady employment. His chief complaint was of pain above the knee, worse after resting. When his knee gets limbered up he walks with very little limp.

A skiagraph was taken (Fig. 7), and this promptly revealed the cause of the shortening; the transplant had fractured, and the resulting coxa vara prevented as free abduction as had been present before the patient resumed weight-bearing on the limb. In spite of the fracture of the transplant, the fragments seemed to be firmly united, though little callus is visible in the skiagraph. It is interesting to see that the end of the bone peg projecting beyond the trochanter is gradually being absorbed. In Albee's similar case, of which an illustration is given in Murphy's Clinics (June, 1913, Fig. 98), it is stated that the skiagraph (five weeks after operation) shows proliferation of bone from the protruding end of the bone peg. In the skiagraph of the present patient there is apparent quite a growth of bone on the surface of the femur around the drill hole, but this, I believe, is due to extension from the femoral shaft and not due to growth in the transplant. Dr. Albee always preserves the periosteum in his transplants, and Dr. Murphy does likewise, but in Dr. Ashhurst's operations he has always removed the transplant subperiosteally, regarding the periosteum simply as a limiting membrane. McWilliams, however (*Jour. Amer. Med. Assoc.*, 1914, i, 346), has reported very careful experiments, in which he comes to the conclusion that it is very important to preserve the periosteum because it renders the transplant more easily permeable by surrounding capillaries, thus ensuring the early establishment of an adequate circulation through it. His experiments certainly show the value of preserving the periosteum, since in a number of instances he secured reproduction of bone from periosteum alone; but there may be another reason than that given by Dr. McWilliams for the greater liability of the bone graft to be absorbed when it is uncovered by peri-

osteum. This may very well be that the periosteum really acts only as a limiting membrane, and *protects the transplant from solution by the cells of the surrounding tissues.* When the transplant is *embedded within osseous tissue,* as is the case in the transplant figured in the accompanying illustrations, and in the transplants used for splinting the tuberculous spine, there is apparently little fear of its absorption; when, on the other hand, it is embedded, not in osseous tissue but in the soft tissues, it is very likely to be absorbed unless protected from solution by an envelope of periosteum, its *normal limiting membrane.* Thus it is not surprising to see in Fig. 7 that the end of the bone peg projecting beyond the femur is being absorbed, while that embedded within bone, or in immediate contact with living bone, preserves its form unaltered. It will be interesting to know what became of the end of Albee's transplant eight months or more after operation. J. B. Murphy has reported one case (Murphy's Clinics, October, 1913, vol. ii, p. 797) in which he thought the preservation of the periosteum was detrimental to the production of new bone, but unfortunately the stenographic report of his remarks is so inaccurate that it is imposible to know just what was done: the skiagraphs he presents indicate that a subperiosteal resection of the upper end of the humerus was done for cystic osteitis, and that in the place of the diseased humerus (removed subperiosteally) a transplant was inserted which had its own periosteum still in place. The subsequent skiagraphs (Figs. 200–204) indicate that the transplant with its periosteum was then surrounded by new bone formed between the transplant and the ensheathing periosteum which belonged to the excised humerus, and Dr. Murphy states that the periosteum which belonged to the transplant acted detrimentally in that even as long as seven months after operation it remained as a white line (visible in the skiagraph) between the transplant and the surrounding new-formed bone. But though all the skiagraphs clearly indicate that this new-formed surrounding bone developed beneath the original periosteum of the (subperiosteally) excised humerus, it is stated in the text of Murphy's Clinics (p. 788) that the periosteum was excised along with the diseased humerus.

Although the patient presented has been walking on his leg without any support from crutch or cane for a period of four months, it is scarcely possible to reckon his present condition as an end-result. He has not returned yet to his ordinary work, but there seems every likelihood of his being able to do so within a short time.

Finally, Dr. Ashhurst suggested that bone transplantation is a better method of treating ununited fractures of the hip than the use of nails,

screws, etc. But, as the present case demonstrated, it is not safe for the patient to bear weight on the limb as soon as four and a half months after operation. This patient did so contrary to advice, and as a consequence he fractured the transplant.

In an interesting paper on the subject of intracapsular fractures of the hip, read before this Academy two years ago by Dr. G. G. Davis (*Trans. Phila. Acad. of Surg.,* 1913, xv, 112), the following were among the conclusions reached:

"The surest way of remedying cases of ununited fracture of the neck of the femur is to cut down, freshen the edges of the fragments, pin them together with screws, nails, or other means, and put them up in the abducted position. When foreign bodies are inserted to pin the fragments together they are likely to cause discomfort sufficient to necessitate their removal. Considerable discomfort follows the operation and the patient is inclined to attribute this to the nail or screw and demand its removal. Firm union can be obtained by freshening the surfaces of the fragments and then jamming them together by widely abducting the limb and fixing it in plaster of Paris without the use of any nails, screws, or other fixation appliances."

These conclusions of Dr. Davis, who has had more experience than any other Fellow of the Academy with operations for ununited fractures of the hip, were reached before the operation of bone transplantation came into general use; and it seems that this is a better method of fixation than the use of foreign material such as nails, screws, or even ivory pegs; and that some form of direct fixation of the fragments is extremely desirable, though it had been shown by Dr. Davis that in some cases it was possible to secure firm bony union without direct fixation.

Dr. J. T. Rugh said that last fall he made bone-grafting for ununited fracture of the neck of the femur in the case of a woman forty-three years of age, who had suffered a fracture two years before. Two years ago, he put in a silver wire nail, which remained in place until the second operation. At the time that he put in the nail, after freshening the edges, he was surprised at the softness of the bone in the upper end of the femur. The nail was driven in with the greatest possible ease, so that the bone was evidently partially degenerated, and at the end of two years while the nail was in place, there was no attempt at union. She could walk slightly on the part, but a slight upward dislocation had taken place. Last October he again operated, took out the nail and enlarged the hole the nail had made, but even the bone structure in her tibia was so soft that when he attempted to drive the graft into the hole in the neck of the femur, the graft itself broke down like very soft

wood, so that her bone structures all over her body were decidedly poor. This taught him that not all cases of ununited fracture are amenable to treatment by this method, because of the condition of the bone in the individual.

Dr. Gwilym G. Davis said that if the patient has good enough bone to make a transplant the question of using the transplant as a peg promises to solve the question as to what means shall be used to fix the fragments. He remembered the trouble experienced in using pegs or pins of steel and screws—for instance, one of his cases simply complained of pain although the wound was long healed, tightly and apparently satisfactorily. The patient knew the steel was in there and he could not get the idea out of his head that it should come out. At last he found a doctor who tried to take it out but he could not find it, and simply left a nasty sinus through which later Dr. Davis had to take out the screw—no matter what foreign body is put in, the surgeon is liable to hear from the patient sooner or later. This case just cited occurred before the suggestion was made by Albee of using a bone pin.

Dr. Duncan L. Despard inquired whether Dr. Ashhurst felt that a bone peg is a distinct advance over the silver nail in fracture of the neck of the femur? In the last three years he had attempted this operation in 3 cases, all patients older than his, the youngest being fifty-four years of age. In each of these cases at the time of operation there had been a tremendous amount of absorption of the head of the bone, and he practically had no hope of bony union and only tried for an ankylosis. He did not think any results in his cases had been very much of an improvement. They walk with decided limps. It is a question whether the bone peg offers very much more than the silver nail. It does not stand as much strain as the nail, and the difficulty of keeping the patient quiet for the long period of time required is not to be overlooked.

Dr. Ashhurst, in response to Dr. Despard's query, called attention to the remark of Dr. Davis that bone pegs should be an advantage over foreign bodies because the patient is not satisfied to allow foreign substances to remain. If the patient has only his own bone it is reasonable to suppose his mind will be relieved. This bone is either an absorbable foreign body or else remains as bone. It will promote osteogenesis and so procure firm union.

CINEMATOPLASTIC AMPUTATIONS

By Astley Paston Cooper Ashhurst, M.D.
of Philadelphia
associate surgeon to the episcopal hospital; instructor in surgery in the university of pennsylvania

It does not appear that amputation for cinematic prosthesis, according to the method of Vanghetti,[1] has received adequate attention in this country. This emboldens me to report two cases in which I have resorted to this procedure, though the report is necessarily incomplete as it has not yet been possible to secure a satisfactory prosthesis, though the patients have good motion in their stumps.

The design of the operation, briefly, is to construct one or more muscular or tendinous loops at the end of the patient's stump, so that the voluntary movements of these loops may be transmitted to the artificial hand. Many artificial arms are already on the market for use with ordinary stumps. In the case of one of those in most general use, the hand is opened by touching a spring with the other hand, and snaps shut again, into a fist, when the spring is released. Such a hand as this, as the manufacturers themselves are forced to admit, is useful for nothing more than "Sunday wear," as there is no voluntary grasp in the hand. A better type of artificial hand is one that secures its motion chiefly by means of straps passed around the patient's body, especially over the opposite shoulder. With one type of arm constructed on this principle, the patient is enabled, presumably only after long and constant practice, to perform almost any motion; and a patient with both arms amputated can dress himself, feed himself, and can make many graceful gyratory motions of little practical use. At the recent meeting of the International Surgical Society in New York City, opportunity was afforded to see a number of patients equipped with arms of this type; but on closer examination I found that while almost any motion was possible, with fingers, thumb, wrist and elbow, yet the grip was very weak (unless the hand was locked by a spring), so that no manual work was attempted. These men make their living advertising this particular make of artificial arm, as travelling salesmen; and probably could make as good a living with-

[1] G. Vanghetti: Plastica e Protesi Cinematiche; Nuova Teoria sulle Amputazione e sulla Protesi. Empoli, 1906. Previous works by this author, on the same subject, had been published in 1898, 1899, and 1900.

out any artificial arm if they advertised some other article of merchandise.

But there are very many patients in the laboring classes who are unable to live by their brains, and are utterly incapacitated by the loss of an arm; the most they can do is to act as watchmen, gate-keepers, elevator men, etc. If, however, they could be provided with a hand movable at will and possessing at the same time a grip strong enough to wield

"a shovel, a rake, or a hoe,
a pickaxe or a bill"

or do other laboring, carpentering, masonry or painting work, their earning capacity would be considerably increased, even if it still fell short of the normal.

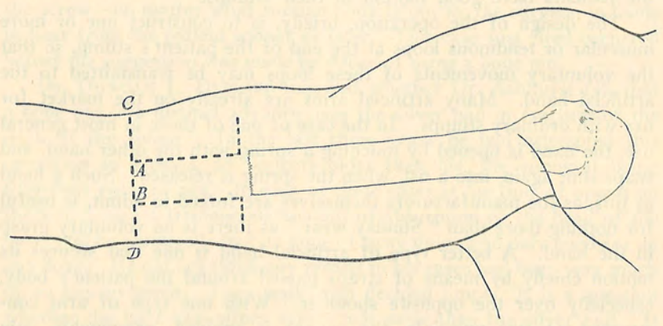


FIG. 1.—Cinematoplastic amputation. Inner surface of arm; the flap, *AB*, is to be used to cover the end of the bone; circular amputation at *CD*.

The amputation for cinematic prosthesis is a tedious operation and is not designed as a primary procedure in traumatic cases or in other patients acutely ill. The primary amputation in such cases should be given ample time to heal before the cinematoplastic amputation is undertaken. The level of bone section is determined by the length of the soft parts available for making the muscular loops; the latter should be amply long, so as to allow for subsequent retraction and nevertheless provide for plenty of play beyond the bone end.

In both the cases in which I have adopted this method, the amputation was done through the humerus, by the following technic (Figs. 1–4), which differs somewhat from that described by Vanghetti: a small skin flap is outlined over the brachial vessels, as long as the diameter of the limb and nearly an inch wide, with its base at the level proposed for section of the bone (Fig. 1, *AB*); this flap is raised with the subcutaneous tissues, and the brachial artery and vein are ligated and divided just above the level at which the bone is to be sawed. The nerves are divided at the same level or higher, but great care is exercised throughout the operation not to interfere with the nerve supply of the muscles which it is proposed to utilize in the stump. A longitudinal incision is then made on the outer side of the arm (Fig. 2), between the flexor and extensor muscles, and these with the overlying skin are then raised from the bone, from the level of proposed bone section down as far as possible. In the arm the musculospiral nerve is now divided, unless it was accessible from the first incision. The soft parts are then divided circularly down to the bone

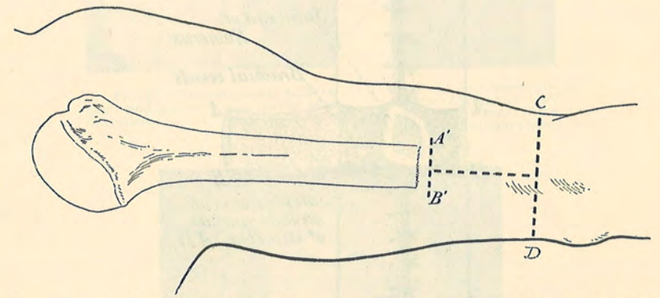


FIG. 2.—Cinematoplastic amputation. Outer surface of arm; the flap, *AB*, is sutured to the line *A'B'*.

at the distal limit of healthy tissues, and the musculo-cutaneous flaps are raised; the anterior flap contains the biceps (perhaps also some of the deltoid, brachialis anticus, or coracobrachialis, according to the level), and the posterior flap contains the triceps. The bone is then sawed at the desired level. A small transverse incision is then made towards the centre of the flexor and extensor flaps through the skin only, at their bases (Fig. 1), so as to permit of wrapping the skin around the biceps and triceps respectively, in the form of a cylinder. This little procedure when repeated on the outer side of the stump also leaves a free skin margin (Fig. 2, *A'B'*) to which may be sutured the end of the skin flap designed to cover the bone. This flap is next adjusted across the end of the bone, and is sutured in place with chromic catgut (Fig. 3, *AB* is sutured to *A'B'*). Absolute hæmostasis is important. Then the skin overlying the muscular flaps is wrapped around them in a cylinder, so

far as is possible (the skin usually is too scanty, and I had to sacrifice some of the muscle in both cases), and is sutured. Next, the free ends of the biceps and triceps are sutured to each other, end on, with buried sutures of chromic gut, and the remainder of the skin is finally closed as accurately as possible. A large rubber tube is passed through the loop thus constructed (Fig. 4), and the stump is lightly dressed.

CASE I.—Man aged thirty-five, a steam-fitter by occupation, was in Dr. Frazier's service at the Episcopal Hospital. Amputation was done, August 14, 1911, at the middle of the humerus

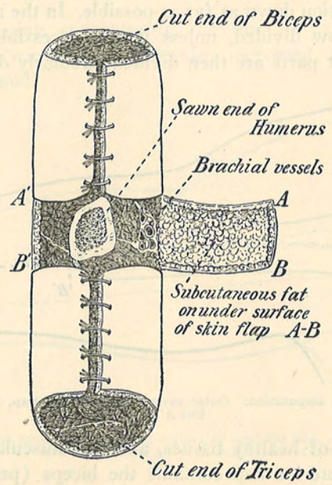


FIG. 3.—Cinematoplastic amputation. Diagrammatic view of the end of the stump. The flap, *AB* is sutured to *A'B'*, and the skin overlying the muscular flaps is sutured around them as a cylinder.

for incurable infection of the hand and forearm, of nearly four months' duration. In this case the cinematoplastic amputation was done as the primary procedure. There was prolonged but not very active suppuration, due chiefly to an intractable dermatitis of the stump, which did not heal permanently until four months after operation. Fig. 5 shows his condition four weeks after operation.

As soon as healing was complete he left the city, and I did not see him for almost two years. In November, 1913, he returned to Philadelphia and I found his stump in very good condition. The flaps had retracted considerably, and the loop is now

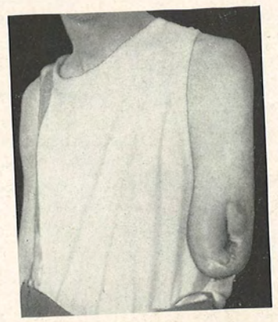


FIG. 5.—Cinematoplastic amputation: first patient; four weeks after operation.

FIG. 6.—Cinematoplastic amputation; second patient; five months after operation.

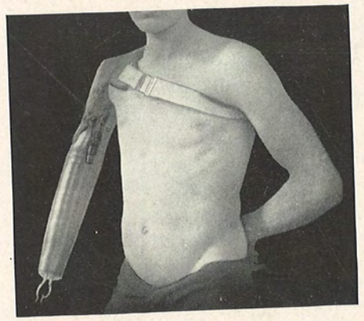


FIG. 7.—Cinematoplastic amputation; second patient; temporary prosthesis.

about one-third smaller than shown in the photograph taken four weeks after operation. His stump is strong and freely movable voluntarily over the end of the humerus, and there is a direct pull of at least half an inch (1.25 cm.). He has surprising strength in the muscular loop, and if fitted with a proper prosthesis should have a strong grip in the artificial hand.

CASE II.—Young man of twenty-one years, a painter by trade, whose arm had been amputated first for a crush at the age of fourteen years, at about the middle of the humerus. When nineteen years of age (in 1910) re-amputation had been done for a conical stump, the bone being divided this time through the insertion of the deltoid. Though this left a very short stump, it seemed that a cinematoplastic amputation should increase its

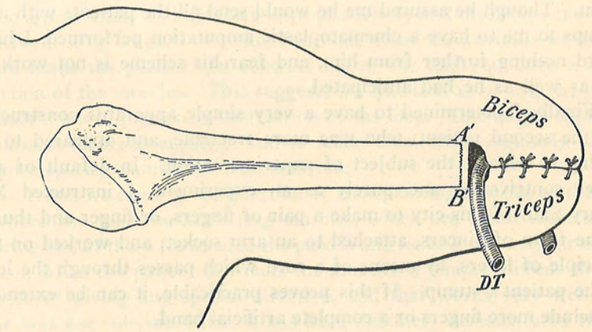


FIG. 4.—Cinematoplastic amputation. The biceps has been sutured to the triceps, and a rubber tube is passed through the loop before dressing the stump.

usefulness. The operation was done in Dr. Frazier's service at the Episcopal Hospital, on October 18, 1912. Healing was prompt and good power was secured in the stump, with nearly one inch of direct pull. The patient himself claims at least an inch and a quarter (3 cm.,) but I think this is an exaggeration. Fig. 6 is from a photograph made five months after operation.

This patient also was lost sight of for a long time, and only recently has he returned for observation. He has spent some time in jail, has neglected his stump, and thought the loop had closed up; but a strip of gauze was easily drawn through, though it caused a little bleeding, and a very slight discharge persisted as long as the gauze was kept in place. The stump is very strong, however, and the loop can be both flexed and extended very actively.

I myself and the patients themselves have consulted several manufacturers of artificial arms, with the object of having a cinematic prosthesis applied. The manufacturers invariably recommend and prefer artificial arms of their own manufacture and decline to manifest any enthusiasm about making artificial arms with a different mechanism. Finally I induced one manufacturer to make the attempt, but the patient then in question declined to pay for any "experimental" arm unless it proved absolutely satisfactory. This guarantee the maker declined to give, and the proposed deal fell through. This patient (Case I) then conceived the idea of making his fortune by inventing an artificial hand for himself, having it patented, then inducing some manufacturer to put it on the market and pay the royalties to him, while he himself would enjoy life travelling over the world as a sales-agent. Though he assured me he would send all the patients with arm stumps to me to have a cinematoplastic amputation performed, I have heard nothing further from him, and fear his scheme is not working out as well as he had anticipated.

Finally I determined to have a very simple apparatus constructed for the second patient, who was more tractable, and appeared to be willing to become the subject of experimentation. In default of any better contrivance, and purely as an experiment, I instructed Mr. Henry Saur of this city to make a pair of fingers, or finger and thumb in the form of pincers, attached to an arm socket, and worked on the principle of levers, by means of a cord which passes through the loop in the patient's stump. If this proves practicable, it can be extended to include more fingers or a complete artificial hand.

I may add that Vanghetti himself experienced very great difficulty in having a suitable prosthesis constructed, and the fact that he succeeded at last probably is due to his having as great a genius for mechanics as for surgery. However this may be, the various designs of apparatus which he gives in his book have not served to inspire any useful ideas in the mechanicians to whom I have submitted them. Hence I make this report of these amputations for cinematic prosthesis merely to show that the construction of the cinematoplastic stump is quite possible, and in the hope that someone with more mechanical ability than I myself possess will undertake the further problem of designing the prosthesis.

Dr. Gwilym G. Davis remarked that it seemed to him that there was a field for this type of amputation and he thought that surgeons would be more careful in the way that they do amputations and operate

more from the utilitarian standpoint. For instance, in the lower extremity the adaptation of an artificial limb is often interfered with by the lateral protrusion of the bones in the knee-joint and ankle-joint. If such a person wishes an artificial appliance around the foot, anything placed over this protrusion increases the width of the ankle so much that it gives the impression of a marked deformity, which is of course very objectionable. That can be obviated by making the section above the ankle and getting rid of the swell of the ankle, so that when one adds the apparatus in addition to the natural stump it makes a diameter equal to the normal ankle. The operation suggested by Dr. Ashhurst is along the same lines. It is interesting that in these particular cases the biceps was united to the triceps. The biceps flexes and the triceps extends. Look at the field this opens. All we have to do is to divide the arm laterally and lift the triceps posteriorly and the biceps anteriorly, make a sling on each of them, and then when the attempts to contract are made the patient can contract either one and you have a double action of the muscles. This suggests the question as to how the patient must think to produce a contraction of the loop. One might expect the muscles to act irregularly, and to make them work regularly will require special training of the cerebrum.

When we come to the question of transplanting muscles of the knee, where you take the hamstring muscles, which are flexor muscles, and bring one of these forward to the patella and make it an extensor muscle, then when the patient contracts the muscles it simply stiffens the limb without giving any special direction, and that works very well. But he was not convinced that it has been definitely demonstrated that we can, within a reasonable time, take a flexor muscle and deliberately sandwich it in among the extensor muscles and expect it to act contrary to its original method.

RETENTION CYSTS OF THE PANCREAS

By John Speese, M.D.
of Philadelphia, Pa.

The patient, a male aged fifty-nine, was admitted to the University Hospital complaining of pain in the upper abdominal region. He states that he noted a feeling of discomfort in the epigastrium six years ago, and at times suffered from pain which radiated from the epigastrium to the lower dorsal region. Coincident with the discomfort, he experienced a sensation of pulsation in the upper portion of the abdomen, and several months ago was able to palpate a mass in the midline above the umbilicus, in the situation where the pulsation was present. The mass would disappear for a time, then reappear, and of late has been present only in the standing posture. He has lost about six pounds in weight and has had several attacks of jaundice.

The patient is married, a laborer by occupation, does not use alcohol or tobacco, his appetite has always been good, there has been no discomfort after eating.

The physical examination shows in the epigastrium a pulsating mass which seems to blend with the abdominal aorta. There is no tenderness or rigidity.

Gastric analysis: Free HCl, 0; total acidity, 20; trace of lactic acid; occult blood, 0. The microscopic examination shows much mucus, starch granules and a few Oppler-Boas bacilli.

Urine examination was negative.

Blood: Hæmoglobin, 60; red blood-cells, 3,800,000; white blood-cells, 9900.

Operation (by Dr. Frazier).—A right rectus incision was made and on examination the stomach, duodenum and gall-bladder were found to be normal. In the folds of the gastrohepatic omentum a cystic tumor was found, the contour was irregular and the mass was about the size of a large peach. On the posterior aspect it seemed to be in relation with the vena cava and adherent to the head of the pancreas, so that in removing it a thin layer of pancreatic tissue was carried away with the tumor. The rent left in the gastrohepatic omentum was closed with a purse-string suture, leaving a small opening for a drainage tube.

The patient made an uninterrupted recovery and was discharged cured.

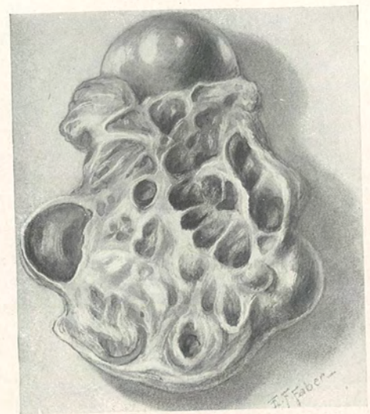


Fig. 1.—Retention cysts of the pancreas.

Fig. 1.—Retention cysts of the pancreas.

Pathological Examination.—Specimen consists of an irregular nodular mass which measures 4.5 x 6 x 4 cm. and weighs 85 gms. The external surface contains numerous cysts and has adherent to it portions of a thin, fatty membrane resembling omentum. Between the cystic areas the tissue is dense and contains numerous points resembling cartilage. On cross-section the specimen is seen to be riddled with cysts, the largest of which measures 2 cm. in diameter, the lining is smooth, and the contents consist of a cloudy fluid. In the centre of the tumor, and surrounded by the multiple cysts, is a dense mass of whitish tissue which has the consistency of cartilage and contains several points of calcification.

Microscopic examination of sections removed from the wall of the larger cysts shows a pronounced fibrous overgrowth which surrounds and distorts the pancreatic tissues present. In some instances the acini are well preserved, but for the most part the fibrous stroma has altered the outline of the lobules to a marked extent. The individual acini and ducts are surrounded and separated by the fibrous overgrowth which has isolated small groups of acini. Islands of Langerhans are present, many of them appear normal and others are infiltrated with red blood-cells. The stroma for the most part is rich in cells but in some places it has undergone hyaline degeneration and contains few cells. With the exception of these areas it is well vascularized, the vessels having been recently formed and most of them are congested. In the centre of the specimen the glandular tissue practically disappears, the tissue has a hyaline-like appearance and contains many points of calcification. In the areas in which the fibrous overgrowth is most intense, many of the acini show slight degrees of dilatation. The cysts are lined with epithelium which is cuboidal in shape in the small cysts and flat in the larger ones. The epithelial lining is composed of a single layer in many cysts, in others it is heaped up and in many of the larger ones the lining is entirely absent. The contents of the smaller cysts is composed of blood, and traces of blood-pigment are found in the fibrous stroma.

The fluid in the cysts is slightly acid, and microscopically contains debris, many erythrocytes and a few epithelial cells. The examination for ferments was not made, as the specimen was fixed in formalin soon after removal.

The gross features and the microscopic study of the specimen indicate that the cysts belong to the retention variety, and that the chronic pancreatitis is to be held responsible for the process. The history of repeated attacks of jaundice indicates that the pancreatitis may have originated in infection from the biliary passages. The presence of calcification in the cyst wall has been mentioned in the reports of other cases but is usually associated with the pseudocysts of traumatic origin.

Pancreatic cysts may be divided into four main groups: The proliferation cysts (adenocystoma), degeneration cysts, pseudocysts, and retention cysts.

The proliferation cysts are to be regarded as new formations, and are not common, as Kleinschmidt in 1907 collected 21 cases from the

literature. Lazarus states that the adenocystoma is the most common form of cyst, and believes that many cases are not recognized because, in the surgical treatment, the cyst is merely drained, and its true nature not appreciated. This statement is disputed by other writers, the majority of whom regard the traumatic pseudocyst as the most common form.

The epithelial and connective-tissue proliferation in the adenocystoma results in the formation of papillary projections into the cyst, the condition resembling greatly the cystoma of the ovary. When epithelial proliferation is demonstrable, the differentiation between the adenocystoma and other cysts is not difficult; but when the epithelial lining disappears, the differentiation becomes impossible in some cases. As a rule, however, the epithelium persists in the smaller and more recently formed cysts, although it has totally disappeared in the larger ones. The destruction of epithelium is probably due to pressure atrophy, as it seems unlikely that the pancreatic secretion would destroy epithelium and have no action on the surrounding connective tissue (Korte). Trypsin has never been found in the cyst contents, although in a few instances ferments reducing sugar and fat have been isolated.

The adenocystoma are most commonly found in the tail of the pancreas. In Kleinschmidt's 21 cases, 2 arose in the mid portion; in 4 the cyst involved the entire gland, and in the remaining the tail was the seat of the growth. The tumor is attached to the pancreas by a broad base, is rarely pedunculated, and is always surrounded by a firm, fibrous capsule which separates it from the pancreas.

The pancreas in a small number of cases is the seat of chronic inflammation; this is regarded by Lazarus as an important etiological factor, for conditions favoring stasis of secretion play a rôle in the origin of adenocystoma. It should be mentioned that stasis is more prone to occur in the tail of the pancreas where the proliferating tumors have their site of predilection. Chronic inflammation is rarely general and is limited to the parenchyma about the tumor. As the tumor is located in the tail of the pancreas almost exclusively, the remaining portion of the gland usually is free from disease and its function is undisturbed. The chronic pancreatitis associated with retention cysts, on the other hand, is diffuse in nature, involves much pancreatic tissue, interferes greatly with its function, and leads ultimately to severe disturbances in secretion and metabolism. We find, therefore, that adenocystoma is rarely accompanied by evidence of wasting or weakness, and that retention and other forms of cyst are prone to produce such symptoms.

In the differential diagnosis between adenocystoma and other forms of pancreatic cysts, Kleinschmidt calls attention to the following points:

The majority of adenocystoma occur in females, whereas both sexes are equally affected by the other cysts. The cystomata develop slowly, are progressive, produce no symptoms, there is no history of traumatism. A history of traumatism is elicited in 30 per cent. of the other cases. In these digestive disturbances are common, the course is rapid, there may be intermittent enlargement or actual temporary disappearance of the tumor. The subjective symptoms differ greatly, being absent or slight in the cystoma, they are characterized by severe pain, loss of appetite, vertigo, constipation or diarrhœa in other forms. The general condition of the patient depends on the amount of pancreatic tissue involved by the cyst. There is little or no systemic disturbance in the cystomata, as the growth generally is confined to the tail of the gland. The traumatic and other cysts, however, usually are accompanied by loss of weight, strength and severe anæmia.

The prognosis is always grave. The development in some cases has been so slow that the tumor produced no symptoms, and was only discovered by accident. When the tumor begins to grow rapidly the danger of pressure on important surrounding structures and organs is great. When of large size and the pancreas is involved to a marked extent, alterations in nutrition arise and hasten a fatal outcome. Malignant degeneration is always to be feared.

The degeneration cysts are secondary to various inflammatory and neoplastic processes in the pancreas. Lazarus has found that toxic processes and various infectious diseases, as well as the softening of malignant tumors, are instrumental in producing this form of cyst. Autodigestion of effusions, especially when followed by indurative lesions about the hemorrhage, are responsible for the production of degeneration cysts of traumatic origin.

Injuries to the pancreas followed by hemorrhage can cause four different lesions according to Lazarus:

(1) Indurative pancreatitis, which possibly can lead to formation of true retention cysts.

(2) "Endopancreatic pseudocyst," the formation of which is the result of autopeptic and inflammatory processes.

(3) Degenerative cysts following fat necrosis.

(4) Hæmatoma of the pancreas and omental bursa (peripancreatic pseudocyst).

Pseudocysts are formed from hemorrhagic effusions into the tissues surrounding the pancreas, and almost always follow traumatism and inflammation of the gland. In rare instances autodigestion of encapsulated hæmatomas in the substance of the pancreas may be followed by

cyst formation. Rupture of the peritoneal covering of the pancreas permits both blood and pancreatic ferments to escape into the omental bursa. The reactive inflammation causes connective-tissue proliferation and condensation, a cyst wall is thus formed. When the pancreas is torn, the cyst may connect directly with the necrotic and degenerated gland tissue. The cyst does not contain an epithelial lining, a fact of importance in differentiating pseudocysts from adenocystoma and retention cysts. It should always be borne in mind, however, that the epithelium may have been destroyed by the action of pancreatic ferments. The cyst contents is variable, although traces of blood can generally be found, either in the cyst contents or in the wall. In many cases the fluid is clear, due to absorption of the blood, although cysts of long standing may have bloody contents due to erosion of the vessels, and consequent fresh hemorrhage. There is little doubt that repeated hemorrhages into the cyst are responsible for its enlargement.

A history of traumatism has been elicited in about 25 to 30 per cent. of the cases. Gobell, in 230 cysts which were operated upon, found that a history of traumatism was present 76 times. The symptoms appear in the majority of cases soon after the injury and are accompanied by severe pain and other symptoms indicating disturbance of digestion.

Retention cysts arise either from the duct of Wirsung or from the smaller ducts and acini. The obstruction of the duct is due to pressure, pancreatic calculi, stricture, etc., and is followed by stasis and dilatation, the cystic condition gradually extending to the main branches of the duct. When the process begins in the small ducts or acini, obstruction to the outflow of secretion results in stasis and dilatation. The cause of the obstruction, according to the histologic researches of Tilger, Dieckhoff and others, lies in a preceding chronic pancreatitis. The connective-tissue proliferation accompanying this process surrounds and compresses the pancreatic glands and ducts. The stagnant secretion causes fatty degeneration of the gland cells, the ferments next act upon the pathologically changed wall, the membrana propria disappears by autodigestion, the interstitial tissues undergo necrosis, and by confluence of many acini a small cyst is formed.

The importance of chronic pancreatitis as an etiological factor in the production of retention cysts is recognized by most writers, the majority of whom regard the process as primary. Lazarus endeavored to prove experimentally whether mechanical injuries by inducing interstitial inflammation caused cyst formation. The pancreas was injured by direct trauma, vessel ligation or by the injection of irritating fluids. The resulting connective-tissue proliferation, especially involving the interstitial tissues, caused compression of, and injury to, the acini, adhesions between the capsule and parenchyma, hyperplasia of the periductal tissues, and an active increase in the number of ducts. As a result of this cirrhotic process, the ducts were cut off and dilatation resulted. By producing subcapsular hemorrhage from trauma, and the injection of small amounts of iodine into the exudate, a reactive pancreatitis was induced and a cyst without lining, the size of a goose-egg, resulted. When a pancreatitis was not induced by iodine injection, the hæmatoma was absorbed and a scar resulted.

The formation of such pseudocysts is aided by the artificial production of pancreatic cirrhosis which favors stasis of secretion in the surrounding tissues. Following traumatism, therefore, pancreatic secretion escapes from the acini; the hæmatoma, the surrounding parenchyma and tissue shreds are digested. In the periphery a reactive inflammation leads to the formation of a capsule and further absorption is retarded by the chronic induration.

Lazarus gives the name of "intrapancreatic pseudocyst" to formations of this kind, the traumatism and cirrhosis being the important factors. Tilger and Dieckhoff believe, however, that hemorrhage into the parenchyma never causes cyst formation, and that when traces of blood can be demonstrated, the hemorrhage is to be regarded as secondary.

Honigmann states that endopancreatic cysts can arise in two ways: through cystic transformation of hæmatoma arising in the gland parenchyma, or upon the basis of a chronic interstitial pancreatitis. In the first case the pancreatic ferments induce degeneration of the blood and tissues, and the cyst may reach great size if the normal resorptive ability of the pancreas is retarded. The experiments of Lazarus show that the reactive inflammatory processes in the surrounding tissues have a marked tendency to retard absorption. This form of cyst, as in the more common peripancreatic pseudocysts, occurs a short time after the injury is inflicted, and differs greatly from the chronic course pursued by the cysts secondary to chronic indurating lesions.

The chronic pancreatitis present in many of the cases reported has been secondary to systemic infections, such as syphilis, toxæmias, etc., or to local infection most commonly arising from the biliary passages. Honigmann points to the possibility of traumatism as a factor in producing chronic pancreatitis. The healing of many small foci of hemorrhage, with scar formation, and connective-tissue proliferation may directly cause sufficient contraction of tissues to cause stasis of secretion and dilatation, and thus produce retention cysts.

It seems feasible from these views to conclude that true retention

cysts in the majority of cases are due to a preëxisting chronic pancreatitis. In most of the cases the pancreatitis follows some general infection, but, in rare instances, traumatism may invoke a local reaction which in turn leads on to the cyst formation.

The author desires to thank Dr. C. H. Frazier for permission to record this case.

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SUBLUXATION OF ULNA

Dr. John H. Jopson showed a case of subluxation of the lower end of the ulna in a girl aged fifteen with the following history: Eighteen months before he first saw her she had fallen and fractured her right wrist and was told, after an X-ray examination, that the wrist was broken in two places. She wore splints for six weeks. She has had more or less trouble with the wrist since that time, and more especially since she went to work in a cigar factory two months ago. Since that time there has been noted considerable pain and deformity. Examination of the wrist showed a deviation of the hand towards the radial side. There was no silver fork deformity. In pronation the normal prominence of the head of the ulna was present and even somewhat exaggerated on the back of the wrist (Fig. 8). On supination a well-marked subluxation of the lower end of the ulna forward was noted, and the articular surface could be readily palpated on the front of the wrist (Fig. 9). In this position of the hand there was a marked groove between the dorsal surfaces of the bones, and the sigmoid cavity of the radius could be palpated on the back of the wrist. Reduction and re-dislocation occurred with each motion of pronation and supination respectively, and these movements were painful. The X-ray showed an old Colles fracture of the wrist in good position, about half an inch above the end of the bone. There was an unhealed fracture of the styloid process of the ulna. The fracture of the radius had apparently resulted in shortening due to impaction. The ulna seemed longer than its neighboring bone, although this did not show prominently in the X-ray.

The operative problem seemed to be to shorten the ulna, to fix the bones in their normal relation by re-attaching the styloid process and

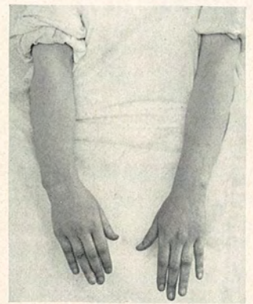

Fig. 8.—Subluxation of the ulna.

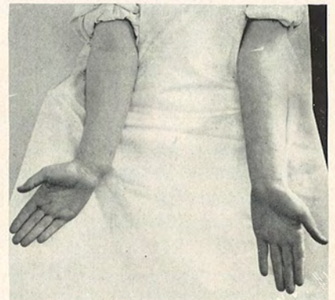

Fig. 9.—Subluxation of the ulna.

with it the triangular cartilage in their normal positions, and to secure additional fixation by suture of the ends of the radius and ulna to each other. The following operation was performed: An incision about three inches long was made on the dorsal surface of the ulna, parallel with, and near its radial border. The posterior ligament of the wrist was severed and retracted, exposing the head of the ulna; the periosteum was elevated, and the end of the bone with its articular surface resected for about 1 cm. The edges of the sawed surface were rounded and a small hole drilled through the outer border. The periosteal covering of the adjacent borders of the radius and ulna was exposed and several sutures were passed, fastening the two bones together where they were in contact. Another suture was passed through the triangular cartilage and around the fractured styloid process, and through the hole which had been drilled in the head of the ulna. When this was tied the styloid process was brought in contact with the resected end of the bone. The posterior ligament was reunited and the wound closed. Both silk and chromic catgut sutures were used. The arm was dressed in pronation on a palmar splint. The wound healed by primary union, but a small aseptic abscess developed as the result of irritation from one of the silk sutures, and a sinus remained for several months until the silk suture had separated and could be removed, when it promptly closed.

The result has been most gratifying. The patient shows perfect restoration of the movements of the wrist, supination and pronation being practically complete, with no tendency to a return of the luxation, and she is again working at her trade of cigar maker. She says that the wrist hurts her sometimes, especially in damp weather. The hand and forearm seem nearly as strong as normal.

Dr. Jopson further remarked that in the Transactions of the New York Surgical Society (ANNALS OF SURGERY, June, 1913) is the report of a case presented by Dr. William Darrach under the title of "Habitual Forward Dislocation of the Head of the Ulna," in which the symptoms were almost precisely the same as those which this patient exhibited. In Darrach's case the condition followed a series of injuries to a chauffeur, the radius being twice fractured by the back kick of an automobile, and fracture of the styloid process of the ulna being associated with it. The third injury, in which the wrist had been injured but not fractured, had resulted in this type of subluxation. The head of the ulna slipped out on supination and returned to its normal position on pronation. There was increased antero-posterior mobility at all times, and an X-ray showed the ulnar styloid to be still ununited, and a back-

ward curve of the radius was present due to imperfect reduction of the fracture.

As Darrach remarked, luxations of the lower end of the ulna which are not associated with fracture of the radius are rare, there being 33 reported cases. With fracture of the radius the condition is much more common. He points out that even when the accident of dislocation has been recognized and reduction completed, a weakness at this joint may remain due to imperfect repair of the structures on which the strength of the joint depends, namely, the triangular ligament and the joint capsule. This is especially prone to be the case if the ulnar styloid is broken, as the attachment of the triangular cartilage to its base favors tearing loose of this important structure, which holds the ends of the radius and ulna together. Darrach could find only six cases of habitual dislocation of this joint: 3 reported by Hoffa and 3 by Courtin. He did not find the impairment of function in this case sufficient to call for operation at the time, but stated that if sufficient disability should result he would resect the lower inch of the ulna. In order to repair the damage completely he stated it would be necessary to obtain union between the ulnar head and styloid, and to reef the capsule, and also to overcome the backward bending of the radius with the resulting strain on the anterior portion of the joint capsule.

It is a well-recognized fact that dislocations, partial and complete, of the lower end of the ulna are frequent complications of Colles fracture, especially when associated with fracture of the styloid process of the ulna, and numerous clinical and experimental observations by Pilcher, Moore and others have made clear the anatomical reasons for this association. A persistent recurring subluxation of the type described by Courtin, Hoffa and Darrach, and a typical example of which is that here reported, is due to imperfect repair of the injured parts, especially of the fractured styloid, or to persistent strain on the joint due to imperfect reduction of the fractured radius, or to permanent shortening of that bone as a result of crushing and impaction. It may also accompany fracture of the forearm in its upper portion as in a case of Hamilton's referred to by Courtin, or fracture of the middle third of the radius, as in one of Hoffa's cases, or even certain forms of violence unaccompanied by fracture, or at least in which no fracture has been demonstrated, as from the lifting of a heavy weight, or where a child is violently lifted by pulling on its hand. The last-mentioned cause is emphasized by Tillmanns as one of the commonest etiological factors in subluxations, and while repair in these cases is usually complete and permanent, recurring subluxation may follow, as in one of Courtin's

cases. Tillmanns also emphasizes the difficulty of retaining in place the end of the ulna in those complete dislocations in which fracture of the radius is an associated injury. That recurring subluxations and luxations of the radio-ulnar joint are not more frequently noted is probably because they are not looked for, and also because they do not necessarily impair the strength and usefulness of the joint. We have seen another typical example of subluxation of the ulna only recently in an elderly woman, who had sustained three fractures of the left forearm at various periods of her life, one of the fractures being a typical Colles for which we had treated her; and, aside from the deformity, the patient presented no symptoms. There was an associated fracture of the styloid of the ulna. On the other hand, some of the weak and painful wrists observed after Colles fracture are probably due to this condition, and it is an interesting fact that so many of the systematic works on fractures omit any mention of it, as Darrach has pointed out.

In one case a good result was obtained by following out to a certain extent the indications for operative correction which Darrach enumerated as indicated for restoration of normal relations in the wrist joint in cases such as his, with the exception of straightening of the radius, which was not necessary in our case, as the shortening of that bone was due to impaction and not overriding of a displaced fragment. A limited resection of the lower end of the ulna to shorten that bone was done without fear of compromising the motions of pronation and supination, as experience in cases of compound dislocation and other types of injury and deformity has shown such fears to be groundless. Hoffa operated upon two of his three cases; one a recurring backward dislocation without fracture, and the other a recurring forward dislocation following a fracture of the radius in its middle third. The procedure which he recommended is the opening of the joint capsule by a dorsal incision and the uniting of the periosteum covering the adjacent ends of the radius and ulna by two or three sutures, a simple operation which he found satisfactory in his cases and which he considers superior to the use of retention apparatus as advised by Mayer and others. While Hoffa's operation would be suited to some types of recurring luxation, it would not accomplish its purpose in those the result of Colles fracture with marked radial shortening, and in such we would practise the operation we have described, which combines the essential features of Hoffa's operation and that suggested by Darrach.

Three points might be emphasized: First, the advisability of more prolonged fixation of those fractures of the radius accompanied by

separation of the styloid process of the ulna, which the X-rays have shown to be so common, in order that healing of the triangular ligament and those fasciculi inserting into its side and base may be obtained. Secondly, the more careful investigation of cases of weak and painful wrists following fractures to determine the causes of the impairment of function. Lastly, the consideration of an attempt to relieve by operative measures those cases in which such pain and impairment of function can be traced to imperfect repair of the structures mentioned.

TUMOR OF CAROTID BODY

Drs. John H. Jopson and John A. Kolmer reported the history of a case of tumor of the carotid body as follows:

A woman, twenty-seven years of age, was admitted March 18, 1913, to the Polyclinic Hospital, discharged March 30, 1913. Married three years ago; one child eighteen months old; now in the fifth month of her second pregnancy. In July, 1911, one month before her child was born, she first noticed a small swelling below the angle of the jaw on the right side of the neck. This gave her practically no pain and has increased slowly in size. At the present time the patient presents herself with a hard, painless, movable ovoid swelling about the size of a pigeon's egg in the right upper cervical region, which resembles a tuberculous lymph gland. There is a small white scar below it near the anterior border of the sterno-cleido-mastoid muscle which has been present since childhood, and probably represents the scar of an old abscess. The diagnosis was tuberculous lymph adenitis.

Operation, March 19, 1913: Oblique incision in crease of neck over tumor. Removal by dissection of the solid tumor was accomplished without great difficulty, except at its anterior inferior border, where it was densely adherent, and could not be separated from the external carotid artery until that vessel had been doubly ligated and divided. The gland lay in the bifurcation of the common carotid artery adherent to, and apparently compressing, the external carotid which was smaller than usual, probably as the result of pressure, and was not identified as the external carotid until it had been ligated. The wound was closed and primary healing occurred, the patient being discharged cured at the expiration of eleven days. The tumor was sent to the laboratory of the Polyclinic Hospital for examination, and the following report was returned:

> Specimen was received in the laboratory in 4 per cent. formalin. The mass is roughly ovoid in shape; well encapsulated; quite firm and somewhat

Fig. 10.—Tumor of the carotid body.

elastic; roughly nodular and greyish-white in color. The cut surface is smooth, white, homogeneous and even in texture.

Microscopical Examination.—Sections present a well-defined capsule with irregular bands of connective tissue extending into the depth of the tumor (see Fig. 10). These bands divide and subdivide, forming an alveolar structure. The connective-tissue cells of these septa are, as a rule, long spindle-shaped cells, well defined and with mature oval nuclei. Scattered about are groups of younger connective-tissue cells with oval and slightly vesicular nuclei. Portions of the tumor show well-defined alveolar arrangement, but in most areas the structure is more diffuse. In the alveolar portions the cells are irregularly grouped, well defined, polyhedric or round, with round or oval, sharply defined nuclei. The protoplasm of these cells is quite homogeneous with poorly defined partitions between individual cells. The size of these cells varies, and evidences of mitoses are present. In a few places the alveoli appeared to be grouped about or are intimately related to blood spaces with several layers of polyhedral cells grouped about the layer of intimal cells. The vascular supply of the tumor is not especially abundant. The blood-vessels are not well defined, and the walls are thin and often present only the endothelial lining. In many areas the typical chromaffin cells of the carotid gland are to be seen, and, since the normal structure of the gland is so disturbed by the new tumor tissue, these have aided in establishing the relation of the tumor to this gland.

Diagnosis.—Endothelioma or perithelioma of the carotid gland.

It will be seen that this case resembled, in its clinical course and operative finding, a number of the reported cases of tumor of the intercarotid gland, or carotid body. The number of cases on record is rapidly increasing as the attention of surgeons and pathologists is directed to the subject. Keen and Funke in 1906 published the first careful study of the subject in America, collecting 29 cases. The recent articles by Callison and Mackenty (ANNALS OF SURGERY, December, 1913) and Balfour and Wildner (*Surgery, Gynæcology and Obstetrics,* February, 1914) are quite exhaustive studies of the subject from the clinical and pathological standpoints. Callison and Mackenty brought the statistics up to date by collecting 31 cases in addition to Keen and Funke's series of 29, making 60 in all, and to these may be added the case reported in Balfour and Wildner's study of the anatomical and histo-pathological side of the subject, and our own case. Other cases are probably also already on record.

To reiterate the salient points of this case it will be noted that, as in the large majority of cases of this affection, the diagnosis of carotid tumor was not made before operation, nor, indeed, until the pathological report had been returned. This has been the common history in these cases. The tumor was, of course, solitary, of slow growth, of moderate size, and gave rise to no symptoms except a slight disfigurement. This is

also the usual clinical history until the tumor reaches a stage where it takes on rapid growth and assumes a more or less malignant nature, when recurrences, metastases and involvement of the neighboring cranial and sympathetic nerves may be excited. At operation the tumor was so closely adherent to the external carotid that that vessel was doubly ligated and divided before it could be removed. Fortunately, the tumor had not advanced to the left, where it surrounds the vessels and renders ligation of the three carotids necessary to its removal. Of 54 operated cases the external carotid was ligated singly in 7 instances, and the three carotids in 32 cases. With the necessity of triple ligation, the mortality and complications from embolichal softening, secondary hemorrhage and injury to neighboring nerves increases very rapidly, and the death-rate reaches the proportions in all operated cases of 22 per cent. (12 deaths in 54, according to Callison and Mackenty's statistics).

The pathological report in this case was endothelioma or perithelioma. These are the usual pathological findings. One case was reported as carcinoma. The demonstration of chromaffin cells by Kolmer clinched the pathological diagnosis of carotid tumor in our case.

PARTIAL COLECTOMY FOR INTESTINAL STASIS

Dr. John H. Jopson reported the case of a woman, aged thirty-four, who had been ill since November, 1911. Her symptoms were those of intestinal stasis, obstinate constipation, abdominal pain aggravated by eating; eructations, great loss of weight and quite marked neurasthenic symptoms. When first seen she was of a tall, thin, gastroptotic type of female, but this was largely due to the fact that she had lost 30 or 40 pounds within a few months. She had a marked secondary anæmia. In May, 1912, Dr. Jopson had removed her appendix which showed chronic interstitial changes, and separated numerous broad, thin adhesions between the first portion of the duodenum and the transverse colon which were causing a moderate obstruction of the first-mentioned portion of the bowel. The stomach showed no disease. She was not in the least improved by this operation, but continued with the attacks of gastric pain, gas, inability to take anything in the line of solid diet, and with some hyperacidity. The constipation became much more obstinate. Inflation of the stomach showed a very moderate ptosis.

The patient was placed on a modified rest cure in the hospital, but vomiting, abdominal pain and distress, and eructations continued.

In August, 1913, the abdomen was reopened. Careful examination showed that adhesions which were divided fifteen months previously had not reformed, the large bowel being remarkably free, except at the

hepatic flexure of the transverse colon. At this point the bowel was acutely kinked; the ascending colon and transverse colon were bound together by adhesions of the same avascular nature as those discerned at the first operation. The ascending colon was much distended. The distal portion of the transverse colon and the descending colon were moderately collapsed, and there were a very few adhesions at the splenic flexure, which were divided.

The terminal portion of the ileum was divided and the cæcum and ascending colon and hepatic flexure and the first portion of the transverse colon were excised. A lateral anastomosis was performed between the terminal portion of the ileum and the transverse colon beyond the point of its division.

The patient made a good operative recovery, and when seen four months after operation she was greatly improved. She had gained about 16 pounds in weight. Her constipation was entirely relieved. The stomach symptoms, indigestion, eructations, etc., were very much less and improvement was still progressing. She could eat a normal meal, at least once a day; and, while she still complained of some lumbar pain, especially marked on the right side, which she had had for several years and which was associated with a very movable kidney on this side, she was, comparatively speaking, a well woman in contrast to her condition before the first and second operations. Since then she has not been ill enough to consult her physician, although he recently heard from her to the effect that she was again having some gastric indigestion, mucus in the stools, and some of her old symptoms, so that the final result of the operation cannot yet be stated.

CYSTIC LYMPHANGIOMA OF THE GREAT OMENTUM

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The question of cyst formation in the great omentum has been discussed to a certain extent in the literature, some 50 or more individual case reports, so far as I have been able to ascertain, having appeared to date, notwithstanding which the subject seems to be but very imperfectly understood; there are great differences of opinion with regard to the origin and significance of such cysts, and indeed comparatively few of the reported cases have been studied with sufficient care to permit of a definite determination of their point of origin and mode of formation. That the condition must be a distinct rarity is shown by the fact that only this half hundred so-called cases of omental cysts are available for study—and a number of these must on careful analysis be discarded—but it presents, nevertheless, several points of interest from both the pathological and clinical aspect.

My interest in the subject has been aroused by a case which came under my observation some months ago. The patient was a colored woman, thirty-four years of age, who was admitted May 5, 1913, to the Gynecean Hospital, service of Dr. H. D. Beyea, for the removal of a large tumor, which had been causing a noticeable increase in the size of her abdomen for about eight years. On examination, a hard nodular mass could be felt, extending well above the umbilicus; a diagnosis of uterine myoma was made, and was found upon opening the abdomen to be correct, the uterus itself being somewhat enlarged and multinodular, and having attached to its fundus an almost pedunculated tumor about the size of a man's head. There were numerous intestinal adhesions, and closely attached to the upper portion of the large tumor was the great omentum, which presented the remarkable cystic condition described below. The uterus, both tubes, and right ovary were removed, as was the great omentum, after ligation of the vessels close to the transverse colon. The left ovary and appendix appeared normal, and were not removed. The patient made an uneventful recovery.

Specimen.—The uterus proper measures 9.5 x 8 x 8 cm.; its surface is covered by extensive fibrous adhesions, and on section its walls are seen to contain numerous intramural nodules, varying in size up to 3 cm. in diameter. The large tumor is roughly kidney-shaped; it measures 22 x 16 x 16 cm. Its surface is likewise covered in places by adhesions, and at one point it shows a roughened area about 4 cm. in diameter where it was attached to the fundus of the uterus. Microscopically, all the tumors show the characteristic appearance of myomata. Each tube has been transformed into a small hydrosalpinx; the right ovary

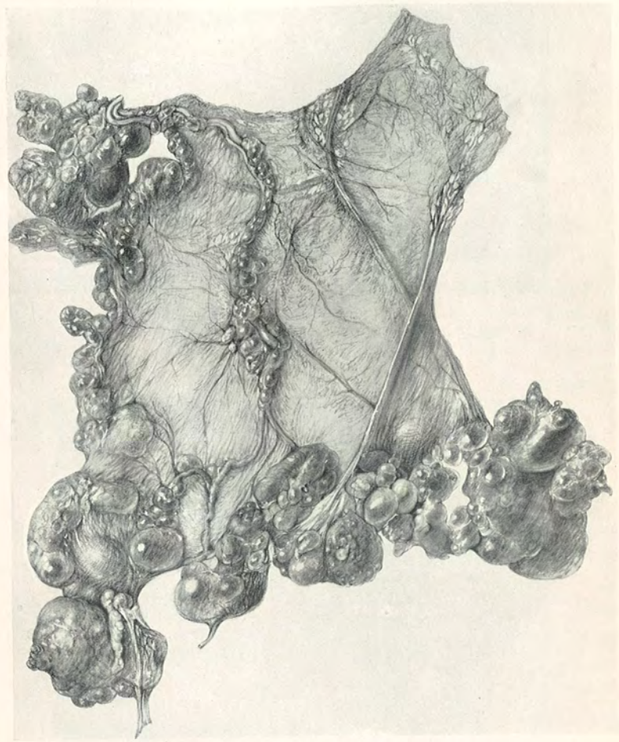

Fig. 1.—Macroscopic drawing of omentum with cysts.

FIG. 2.—Section through wall of one of the larger cysts.

FIG. 3.—Wall of one of the larger cysts, showing numerous lymph spaces of various sizes, lined with endothelial cells.

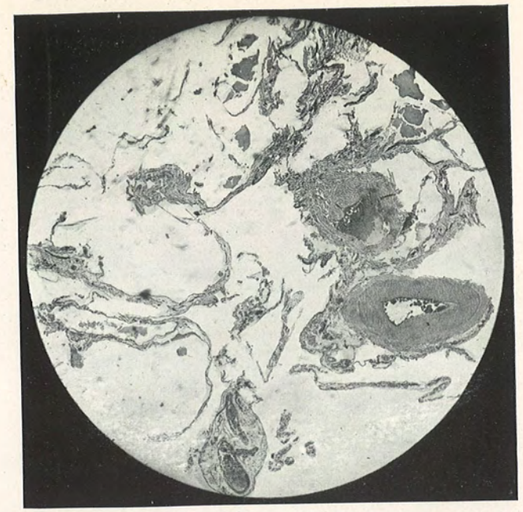

FIG. 4.—Section through the blood-vessels seen traversing the central portion of the omentum in Fig. 1, showing a cross-section of the artery and vein, surrounded by numerous thin-walled, cystic cavities. Very low magnification.

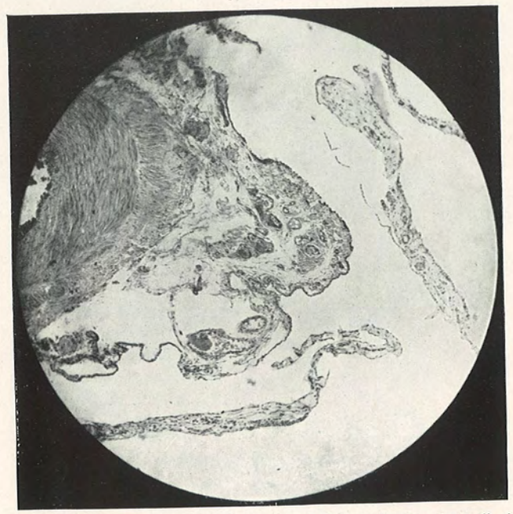

FIG. 5.—Higher power photograph of a portion of Fig. 4, showing the wall of the artery, and surrounding cystic cavities. These are lined by a distinct layer of flat cells with deeply staining nuclei.

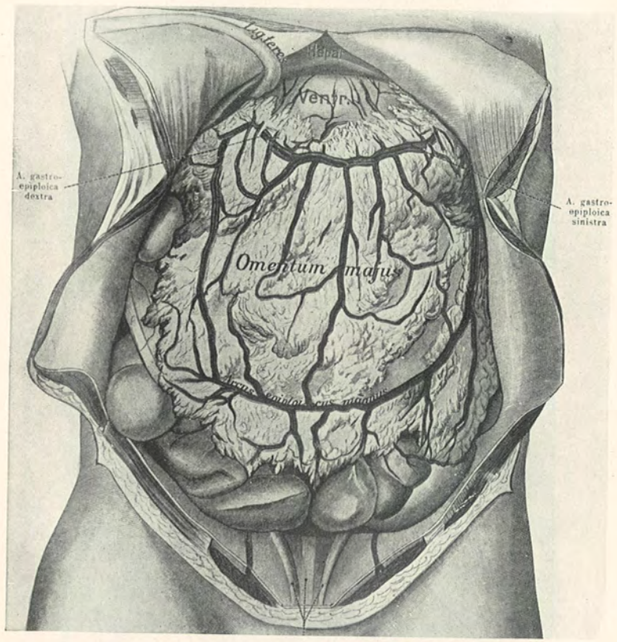

FIG. 6.—Blood-vessels of the great omentum (after Broesike).

contains a small corpus luteum cyst, but is otherwise normal, save for numerous adhesions on the surface.

By far the chief interest of the specimen centres in the *great omentum* (Fig. 1). This is a roughly quadrilateral sheet, measuring 20 x 18 cm. The central portion is thin and delicate, presenting the appearance of normal omental tissue, with very little fat. Around the entire circumference, however, are closely grouped masses of thin-walled cysts, which, when they first presented in the abdominal wound, resembled nothing so much as clusters of grapes. When the omentum had been fully exposed, however, it almost appeared as though a somewhat atypical segment of colon were attached completely around its free border, this appearance being furnished by the continuous masses of cystic bodies on the periphery. The cysts vary in size up to several centimetres in diameter, but on account of their extensive confluence it is not always easy to determine the exact size of any particular individual or group. The external surface of the cysts is for the most part smooth and glistening, the walls are thin and delicate, the contents clear, watery fluid. In addition to the larger cyst masses, which are limited exclusively to the periphery of the omentum, strings of much smaller ones are seen closely hugging one or two of the larger blood-vessels as they cross the central portion.

Microscopic sections through the cyst walls show these to be composed of rather loose connective tissue, containing numerous much engorged capillary blood-vessels, and a fairly intense and widely disseminated infiltration of small round cells. No fat is to be seen. Separating this connective tissue stroma from the cyst cavities is seen in every instance a single layer of flat cells, with distinctly staining nuclei, very strongly suggestive of the endothelium lining lymphatic channels (Figs. 2 and 3). These are present in the largest as well as in the smallest, and in all intermediate-sized cysts; in many places the thicker septa between the larger cavities contain numerous small, endothelial-lined spaces which almost certainly represent merely somewhat dilated lymph capillaries (Fig. 3), and since there is a continuous gradation between these and the largest of the cysts, the assumption seems strongly justified that the entire process has had its origin in a cystic dilatation of the lymphatic channels of the omentum, due to causes which will be discussed later. Still further evidence in favor of this etiology is furnished by examination of a cross-section through the blood-vessels with small surrounding cysts seen traversing the central portion of the specimen (Figs. 4 and 5). In this section we see an artery and vein, surrounded by a very small amount of loose areolar tissue, and then by a conglomerate of delicate-walled cystic cavities, each lined by the type of cells described above. From their structure and arrangement there can be practically no other interpretation of these spaces than that they represent much dilated perivascular lymph-channels. In most of the larger cyst cavities is seen a small amount of homogeneous material, which in eosin-hæmatoxylon preparations takes a diffuse pinkish stain.

The question naturally arises, as to whether the occurrence of this marked degree of cyst formation about the periphery of the omentum, the remainder of the organ being but slightly involved, and then only along the course of a main blood-vessel, can be in any way ex-

plained by the anatomical arrangement of the lymphatics. A careful search through more than a dozen of the more important works on anatomy [1] has failed, however, to bring to light a single description of the arrangement of the lymphatic vessels of the great omentum, nor does its blood-vascular system receive, in many instances, much better treatment. Many of the authors dismiss it with the bare statement that the gastro-epiploics give off descending branches which pass down into the omentum, what happens to them after they get there being left to the reader's imagination; in some instances, however, the statement is made that the descending branches pass down through the anterior layer of the omentum to the free border, and then turn upward in the posterior layer, to anastomose with vessels coming from the transverse colon. Likewise, in most of the drawings illustrating the vascular supply of this region of the body, the lower portion of the omentum is left out entirely, or if it is included, its vessels are represented merely as a few trunks, running straight downward, and after a few subdivisions, ending as terminal branches near the free border.

Norris, however, who has made a careful study of the finer structure of the omentum, goes into the matter somewhat more in detail. He says, "In some cases there are four main arteries which come down laterally on the sides of the omentum, two on the anterior and two on the posterior surface. More frequently, however, the organ is supplied by a central artery in the anterior, and a corresponding artery in the posterior leaflet. As a general rule, three distinct branches are given off from these vessels, which run transversely across the surface of the omentum. They are about an equal distance apart, the lowermost branch corresponding to nearly the lowermost portion of the omentum. . . . The arteries are accompanied by veins." The only drawing I have been able to find that brings out in any way this formation of a transverse vascular arc near the free border is one in Broesike's Anatomic Atlas, showing a distinct arcuate anastomosis between the vertically coursing blood-vessels just within the free border of the omentum (Fig. 6). Although this vascular arrangement is undoubtedly of very irregular, and probably infrequent occurrence, it is of much interest in connection with the subject under discussion, for if we may assume, as seems reasonable, and as Norris specifically states, that in the omentum "in a general way, the chief lymph-channels follow the larger

[1] Including Gray, Holden, Piersol, Cunningham, Morris, Gerrish, Quain, Deaver, Sobotta-McMurrich, Toldt, Rauber-Kopsch, Spalteholtz, Testut, Poirier-Charpey, and Sappey.

blood-vessels"—a condition which certainly holds in the remainder of the gastro-intestinal tract, and in many other portions of the body—may not this anatomical condition explain the production of the more or less continuous chain of cystic structures, evidently of lympho-vascular origin, around the entire edge of the great omentum? If a considerable lymphatic trunk accompanies a vertical artery on each edge of the omentum, and also this "arcus epiploicus magnus," as Broesike calls it, any factor that would lead to its cystic dilatation would produce exactly the conditions described. This factor may well have been, in the present instance, furnished by the inflammatory condition which had at some time existed throughout the lower abdomen and pelvis, as is evidenced by the extensive adhesions and by the round-cell infiltration in the cyst walls. Especially does it seem plausible that the adherence of practically the entire free border of the omentum to the large uterine tumor may well have interfered with the circulation in lymphatic trunks along the vascular arch mentioned above, causing thus mechanically their cystic dilatation, the active inflammatory process acting in addition as a stimulus to proliferation of the endothelial elements, and thus resulting in the production of a true lymphangioma. The much less marked, but still distinctly evident, involvement of the lymphatics accompanying the central vessel in its vertical course would be explained by the less active inflammatory process, and absence of adhesions, in this portion of the omentum.

A certain amount of support to this hypothesis would seem to be furnished by one case, reported by Gairdner in 1851, in which almost identical conditions were present, and resulted in the production of very similar cystic formations in the omentum, this being the earliest instance of omental cysts on record. The patient was a woman who had a large fibroid tumor of the uterus. At autopsy there was found beneath the anterior layer of the great omentum a cystic structure consisting "of a highly transparent closed sac, between 3 and 4 feet in length, and from ½ to 1½ inches in breadth, having a lobulated appearance externally like that of the distended colon, but in no part subdivided by any approach to complete septa. The fluid in the sac was a transparent colorless serum, containing numerous flocculi." An interesting feature of this case was that there were indications of a tendency to cyst formation in other parts of the body also, small globular cysts being found in the cellular tissue of both groins, in the velum interpositum, and in the pineal gland.

Another case of some interest in this connection has been reported recently by Stillman. His patient was a woman of forty-two, whose abdomen had been

increasing in size for about five years; at operation a pedunculated fibroid tumor the size of a man's head was found attached to the uterus, and also to the omentum by a vascular pedicle as thick as the thumb. "Distributed throughout the omentum were numerous elongated, tortuous, exceedingly thin-walled cysts, from 1½ to 2 inches in diameter, showing a characteristic lobulation or sacculation comparable to that of the distended colon. The gastrocolic omentum was also affected, but to a much less extent, the dilatations here being much fewer and none larger than a lead pencil; they were unmistakably dilated and tortuous lymph-vessels." A second, strikingly similar case, reported by Fitz in an unpublished Lane lecture (San Francisco, 1910), is also referred to by Stillman. "It was a case of enormously dilated lymphatics of the omentum, occurring in a woman who also had a fibroid of the uterus, to which the omentum was attached. The omentum was reduced to a web of connective tissue supporting the tremendously dilated lymphatics."

It is not my purpose here to review in detail the literature upon omental cyst formation in general, since this has been done more or less extensively by practically every recent writer upon the subject. In 1911 Dowd was able to collect 37 cases which had been reported up to that time as cysts of the omentum, and his tabulation has formed the basis of most subsequent articles in this country, while in the German literature it has been taken over practically intact by Monnier, who in a recent extensive monograph has added 5 more, bringing the total (including Dowd's own case) up to 43. In addition, however, cases have also been described under the general designation of omental cysts by Frank, Giannettasio, Lipscher, Markoe and McPherson (3 cases), Thornton (2 cases), Buckley, Funk, and others, bringing the total number of instances known in which some form of cystic process has occurred in the omentum up to something over 50. The exact number is of little moment, however, and would be practically impossible of determination, for many of the descriptions are so meagre, and so lacking in essential details, that the cases to which they refer cannot be definitely classified. Moreover, even the most cursory perusal of these reports shows that they cover a distinctly heterogeneous group of pathological processes, many of which have practically nothing in common other than their anatomic situation in relation with the omentum.

Leaving aside entirely the group of cystic formations due to hydatid disease—which is not included in the above-mentioned tabulations, although it occasionally involves the omentum in conjunction with other abdominal viscera—we find that some of the so-called cysts represent nothing but secondary degenerations of malignant tumors (Hasbrouk) or hematomas (Dowd, Simon), or sacculated collections of

fluid following traumatic rupture of an abdominal viscus (Cotman). Others were only parasitic with regard to the omentum, having apparently arisen primarily in some other organ, such as the ovary (Waldy), and others, again, were merely secondary implantations in the omentum from malignant ovarian growths (Thornton). In one unique instance, the origin was probably due to a mycotic infection which had penetrated the walls of the intestinal tract (Ris).

For these various reasons, therefore, quite a number of the reported cases must be rejected from a discussion of cyst formation proper in the great omentum. Those that remain, and which may be considered *true cysts,* in that they represent, as far as can be determined, the result of actual proliferative or secretory processes, have for the most part presented clinically one of two chief types, although the dividing line is by no means a sharp one, and some cases occupy a distinctly borderline position. In some instances the omental tumor consisted of a single or but few loculi, was large and prominent, and was itself the cause of the patient's seeking surgical attention; in others, the cysts were small, multitudinous, and were scattered throughout the omentum, or chiefly about its periphery, as in the present specimen. In this type, the discovery of the omental condition has usually been incidental at operation or autopsy, no suspicion of its existence having arisen clinically. In the former type of tumor, however, the distention of the abdomen has often reached enormous dimensions, as in the one reported before this society a few years ago by Rodman. These cysts have developed at all ages, from earliest infancy to adult life; when occurring in infants and children, the preoperative diagnosis has almost universally been tuberculous peritonitis; when occurring in adults, either this, or in female subjects, ovarian cyst. Under these mistaken diagnoses repeated tappings have been performed in a number of instances, but re-formation has invariably followed, eventually necessitating radical extirpation.

While a number of authors consider many of these larger as well as the smaller cysts of lymphatic origin, and, indeed, Jacoby maintains that all true omental cysts are of this etiology, a number of other explanations have been offered to account for them. Owing to their frequent occurrence in infants and young children, a congenital origin from embryonic rests between the layers of the omentum has been strongly advocated by some investigators. Of several cases so diagnosed, the one in which this explanation appears the most plausible is that reported by Henke, in which at autopsy numerous small cysts were found scattered throughout the omentum, and also pretty generally throughout the visceral peritoneum of the abdomen. These

cysts contained a seromucinous fluid, showed the presence of numerous smooth muscle bundles in their walls, and were lined by a layer of cuboidal to tall cylindrical epithelium.

Another hypothesis that has been offered is that the cysts arise from the flat cells covering the serous coat of the omentum (Seefisch, Himmelheber, Karas), and represent therefore practically nothing more than loculated collections of peritoneal fluid. That cyst formation from the surface-serosa does occur in many of the abdominal and pelvic organs, especially the tubes and ovaries, is of course well known, the inflammatory factor here probably playing an important rôle. Karas, whose case quite closely resembles in some respects the one reported in this paper, makes a great deal of the fact that the cysts were lined with epithelial-like cells, many of which apparently showed in places the presence of *cilia,* structures which certain authors claim to have demonstrated as a normal constituent of the lining cells of the peritoneum. From this fact, Karas concludes that the cysts in his case were of peritoneal origin; he thinks, however, that this cyst formation on the part of the peritoneum was the result of some abnormality in the embryonic development of the omentum, since he could not find anything to suggest a post-embryonal occurrence, such as inflammation, notwithstanding the fact that a marked round cell infiltration was present in the cyst walls.

At first sight, this theory of origin was the one which most strongly suggested itself as the explanation for the occurrence of the cysts in the present instance, until more careful examination of the specimen led to the different conclusions stated above. To sum up, therefore, it may be said that while the possibility of the origin of some cases of true cysts of the omentum from embryonal rests, or from the surface peritoneum, cannot be positively denied, it may be considered demonstrated beyond any reasonable doubt that in other instances the lymph-vessels are the starting point for such growths, and this latter explanation would certainly appear to be the one which would apply in the majority of cases.

With regard to the diagnosis of omental cysts, there is not a great deal to be said. In view of the rarity of the condition and the lack of any distinctive symptoms, it is not strange that in only two or three of the reported cases has even a tentative diagnosis been made before opening the abdomen. Brandt claims to have diagnosed a large cyst of the omentum "by exclusion," and in one of Stillman's cases a preoperative diagnosis of "either an omental cyst or an ovarian cyst with a very long pedicle" was made. The presence of a distinctly sacculated collection of fluid, not associated in any way with the genital organs, might, in the absence of any symptoms suggestive of a tuberculous condition, lead to the suspicion of omental cyst; beyond this, however, it is hardly possible to go with our present diagnostic resources.

The only rational treatment for the condition is extirpation of the cyst-bearing portion of the omentum. Tapping is of course, as has been stated, not only ineffectual, but may give rise to hemorrhages and adhesions, which markedly increase the difficulty of subsequent operation. It is possible that in a very occasional case drainage and marsupialization might be necessary, but with the present development of surgical technique, and in view of the excellent results which have followed the more radical type of operation in most of the reported cases, instances in which any other procedure would be indicated must be considered decidedly the exception.

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DR. J. STEWART RODMAN said that the case to which Dr. Outerbridge referred was one which occurred in his father's clinic and was reported in 1909. The diagnosis was presumably an ovarian cyst of enormous dimensions in a girl of seventeen, and at operation this cystic tumor seemed to fill the entire abdominal cavity; even after opening the abdomen it was still considered an ovarian cyst, but after evacuating the contents of the unilocular cyst it was seen that it did not originate in the pelvis but in the upper abdomen; and, finally, its origin was found to be between the layers of the great omentum, from which it shelled out rather easily. The patient made an uneventful recovery.

DR. P. G. SKILLERN, JR., remarked that there is a type of congenital mesenteric cyst that arises from anlage of tubules of the Wolffian body, which become sequestrated between the layers of the mesentery. An example of this type was reported by Dr. H. C. Deaver in the ANNALS OF SURGERY for May, 1909, page 619. It occurred in a seven-year-old school-girl, in whom symptoms of intestinal obstruction presented themselves. At operation three cysts the size of plums and with clear contents were found between the layers of mesentery in relation with the terminal loop of ileum, so embracing it as to cause the obstruction. It was necessary to resect ten inches of the ileum, together with the cysts. A lateral anastomosis was then performed.

In the differential diagnosis, mesenteric cysts are not uncommonly mistaken for ovarian cysts. In avoiding this error, it is helpful to ascertain if the tumor has grown from the abdomen towards the pelvis or *vice versa*, if an inferior zone of resonance can be obtained by the Trendelenburg position, and if both ovaries are independent of the tumor.

If discovered accidentally, mesenteric cysts should be removed for

prophylaxis of intestinal obstruction, and even for malignant degeneration.

There are four ways of dealing with intramesenteric cysts: (1) By aspiration; (2) by cystostomy and drainage, with or without the use of caustics; (3) by enucleation; (4) by resection of the involved intestinal segment. The first is obsolete because followed by recurrence. The second is useful in the presence of numerous adhesions. The third is ideal when practicable. The fourth is useful in the presence of multiple, juxtaposed cysts.

DR. ASTLEY P. C. ASHHURST asked Dr. Outerbridge whether the arcus magnus, corresponding to the free border of the omentum, was present in his case. That the diagnosis of omental cyst is sometimes made clinically is evidenced by this fact. He recalled hearing his father talk about a case at the Pennsylvania Hospital about twenty-five years ago: he said he had not seen the patient, but from what he had heard he had thought it must be a case of omental cyst, and of all the physicians and surgeons who had examined the patient in the hospital, no one but Dr. William Hunt had made the correct diagnosis. This diagnosis was confirmed by operation.

DR. GEORGE W. OUTERBRIDGE, in closing, answering Dr. Ashhurst's question, said that he could not tell whether in this case there was a blood-vessel running along the free border of the omentum owing to the extensive development of cysts in this region, whereby the relations were largely destroyed. He thought the blood supply of the omentum undoubtedly varied enormously in individual cases, and that the conditions described would probably only be found in an occasional instance.

Regarding Dr. Skillern's statement that omental cysts are closely related to mesenteric cysts in the manner of formation, he would say that most of the true mesenteric cysts are likewise lymphatic in origin. Many of these have chylous contents, a condition not found of course in cysts of the omentum.

PERFORATED ULCERS OF STOMACH AND DUODENUM

DR. GEORGE G. ROSS said that it has so happened that between November 1, 1913, and the first of April, 1914, he had seen five cases of perforation of the stomach or duodenum, and one case which he believed was a perforation of the stomach on the posterior surface at the greater curvature. There was, however, considerable doubt as to the correctness of the diagnosis, the case being the one that he reported to the Academy several meetings back.

The first case he reported was seen by him in consultation and was referred to the wards of the German Hospital, being operated upon by Dr. John B. Deaver during his clinic the same afternoon.

CASE I.—An adult man.

History.—Seven or eight years ago had an attack of indigestion which lasted for several weeks. He described this indigestion as follows: a fulness coming on immediately after eating and a feeling that he would be relieved if he could belch, but he could not belch. He was put on milk and toast at that time and some medicine, and after two weeks' treatment regained his normal health, except for constipation which had been the case throughout his life. About three months ago he began to have an uncomfortable feeling of fulness in his stomach, coming on immediately after eating, which was relieved by light diet. He was unable to belch; never vomited; passes considerable flatus. November 14, 1913, he ate a heavy lunch and was very uncomfortable during the afternoon. About 6.30 P.M., while sitting at a desk writing, he had a severe attack of epigastric pain, coming on suddenly and radiating up over the chest. He said his pain was constant, not spasmodic, and was made worse by inspiration. There was no nausea; nevertheless he attempted to empty his stomach by putting his fingers down his throat. He said that once last evening he felt like fainting but got to the outside air and averted it. His pain kept up all night, referred to the back of his neck and right shoulder. Drank a glass of warm milk this morning, retained it, and his pain was not exaggerated. Says bowels have been moving with purgatives but has not passed any flatus lately.

When admitted to hospital his eyes were sunken, pupils normal; heart and lungs surgically negative; abdomen distended, general board-like rigidity; liver dulness diminished; point of greatest tenderness midway between umbilicus and xiphoid: peristalsis present; extremities normal.

Operation.—By Dr. Deaver. Dorsal position. Iodine preparation. Low right rectus incision. Appendix adherent. Appendectomy. Gas and cloudy serum escaped when the peritoneum was opened. Purulent material appeared when the adhesions about the appendix were broken up. Culture taken. Upper right rectus incision. Gas bubbled out when peritoneum was opened. Perforation of the posterior surface of the duodenum. Duodenum was plicated with double linen. *Gastrohepatic* and *gastrocolic* omentum stitched over ulcer. Upper abdomen wiped out with gauze. Posterior gastro-enterostomy done in the usual manner. Pelvis mopped out. Glass tube for drainage. Wound closed in layers to drainage. Dry dressing. Uneventful recovery.

This diagnosis was made in this case from the previous personal history, the character of the onset of the attack, the appearance of the man being hard hit, the location of the pain and tenderness, the board-like rigidity and the early appearance of distention, as demonstrated by the diminished liver dulness.

CASE II.—Female, aged sixty-eight, was admitted to the Germantown Hospital, January 26, 1914.

History.—For about three years she has had attacks of indigestion. These would occur every six or seven weeks and would last three or four days. For the last five months these attacks have been getting more severe and frequent. Recently they have occurred every week. Had a severe attack about one week ago, Monday, January 19. On Thursday following she had to go to bed. On Sunday she suffered intense pain in abdomen with constant vomiting. This continued until Monday morning, January 26, when she had a few hours' respite from vomiting; but in the afternoon the vomiting returned following the ingestion of a cup of broth. Bowels have not moved for seven days. Has always had trouble with her stomach since childhood, having spells of acute indigestion coming on three or four hours after eating, causing vomiting. For the last five or six years she has been unable to have a bowel movement without taking a purgative. She has had four children, all living and well.

When admitted her abdomen was tender, very little distended; visible peristalsis. Knuckles of gut could be seen through the emaciated, relaxed abdominal wall. There was very little audible peristaltic sound. The vomiting ceased upon withdrawal of all food and liquids by mouth. The case did not impress him as one of acute mechanical obstruction of the bowels and so she was not operated upon as an emergency case. His diagnosis was malignant growth of the sigmoid with partial obstruction. For several days she remained the same, excepting the failure to empty the bowels of fæces or gas. Her leucocytes were 10,300.

Operation.—Long incision. Right rectus muscle. No evidence of peritonitis, localized collection or malignancy in lower abdomen. A knuckle of ileum was found to be adherent to the stomach at the pylorus, and this, having become kinked, had given rise to mechanical obstruction. When the gut was freed from the stomach wall, a perforation of the anterior wall large enough to receive a lead pencil was exposed. There was no pus in the locality and very little lymph. The perforation was closed by purse-string suture, oversewn with Lembert sutures of linen thread, and reinforced by a graft of gastrocolic omentum. Wound was close without drainage; gastro-enterostomy was not per-

formed. Patient made an uninterrupted recovery and was discharged, 31 days after admission.

Dr. Ross said that he was unable to make a diagnosis in this case because he did not properly credit the previous history of stomach indigestion. She had stated that she had had trouble with her stomach since the age of 7, a period of 61 years. The pain of her perforation has occurred 8 days prior to her admission and all her symptoms at that time indicated a partial intestinal obstruction without marked toxæmia.

CASE III.—Adult, female; admitted to the Germantown Hospital, February 11, 1914.

History.—Was seized 48 hours before with intense pain in the upper abdomen. She described this pain as resembling a knife going through her stomach. The pain came on about five o'clock in the afternoon, after she had eaten her dinner. The patient states that during the day she had worked very hard. She was treated outside from Monday night until Wednesday afternoon, when she was admitted to the hospital. She stated that for the last 10 years she has been having pain after eating. This would come on immediately after the taking of food. She would belch sour material and would frequently vomit; vomiting relieved pain. Was admitted to this hospital in the Spring of 1913 and operated on for uterine fibroids. Following this operation the patient's symptoms were not relieved. No history of gastric ulcer in family. The abdomen was markedly distended, with rigidity and marked tenderness. The rigidity and tenderness were most marked in the epigastrium.

The abdomen was opened in the midline, from the ensiform cartilage to the umbilicus. A large subdiaphragmatic collection containing pus, lymph and stomach contents was opened. The collection was to the left of the suspensory ligament of the liver. When this was cleaned out a perforation the size of a silver three-cent piece was discovered on the anterior wall of the stomach, about half way between the greater and lesser curvatures and 3 or 4 inches from the pylorus. The perforation was closed by a chromic catgut suture and reinforced by two layers of Lembert sutures of linen thread. Gastro-enterostomy was not performed. The subphrenic abscess was thoroughly drained by two rubber tubes and three cigarette drains. A glass tube was placed in the pelvis through a button-hole incision. This patient developed pneumonia, which was followed by an abscess of the left lung for which she was operated on by Dr. Francis T. Stewart, who stated that the abscess he opened was probably not the only one, as she continued to run some temperature.

CASE IV.—Male, age forty-two, admitted to the Germantown Hospital, February 28, 1914, about 2 A.M., suffering intense pain in the upper abdomen. Patient states that while at work lifting a heavy bar he was taken with a sudden pain in the epigastrium, which he described as feeling like being stabbed with a knife. Patient managed to get to a drug store where he was given some treatment by the druggist. A few minutes after the first dose he felt a little better and was then given a second dose. Following this he had intense pain which was sharp and excruciating, like the first. Before he left, the druggist gave him a dose of magnesium sulphate. He was suffering such intense pain that he was unable to get home, but managed to reach a cousin's house in Germantown where a doctor was called in. The doctor immediately washed out his stomach; a great deal of fluid was poured into the stomach but little removed. As the patient grew very much worse he was sent to the Germantown Hospital where a diagnosis of perforated gastric ulcer was made by the surgical resident, Dr. Williams, and Dr. Ross was notified and came out immediately and operated. White blood-cells were 24,000.

The patient had never been troubled with indigestion; never had pain before or after eating; always healthy. No history of gastric disturbances. Examination revealed a poorly nourished adult male, with abdomen markedly distended and rigid.

On opening the peritoneum, large quantities of gas and stomach contents escaped, including all three doses of medicine administered by the druggist, to say nothing of the washings of the doctor. Owing to the kindly ministrations of the druggist and doctor it was some time before the perforation could be located. It was finally discovered on the anterior wall, about one and one-half inches from the pylorus. The opening was closed as described in the other cases and a posterior gastro-enterostomy performed, because of some induration extending from the perforation to the pylorus, suggesting the probability of pyloric obstruction; also because the closing of the ulcer diminished the size of the pyloric end of the stomach corresponding to the area of the ulcer. The upper wound was drained by a cigarette drain to the site of the closed perforation and a counter drain by glass tube was placed in the pelvis to allow the various medicines, etc., to escape from the pelvis. For 18 days this man steadily improved; was on modified house diet and seemed to be getting well. Then he developed peritonitis which seemed to start in the lower abdomen. He died on the twenty-second day after operation, of general septic peritonitis. Unfortunately no postmortem was permitted.

CASE V.—Male, aged twenty-three; admitted to the Germantown Hospital, March 26, 1914.

History.—His trouble began on March 20, 1914, with feeling of malaise. On March 21, he got worse, had a chill and had to go to bed. He then felt better and got up. His nose bled yesterday (March 25, 1914). To-day he developed his abdominal soreness and pain in back of head and neck muscles. This evening he vomited. No nausea now. No appetite, very thirsty; bowels normal; occasional short dry cough, but this does not persist. He expectorates very thick tenacious mucus which is mixed with a sort of black blood. No pain in chest; no dyspnœa; feet never swell; no palpitation. Abdominal pain makes breathing very painful. Passes less urine than usual and it is dark colored and burns a good deal; no frequency.

Inspection of the abdomen revealed a few scattered minute pustules. One point suggestive of a rose spot was found. Tenderness over epigastrium. A little abdominal rigidity. No tenderness over McBurney's point. A mass is felt in upper left quadrant, extending about 6 c.c. below costal margin, presumably spleen. Abdomen tympanitic throughout. Audible peristalsis.

On the third day thereafter there was much more rigidity with a definite point of increased tenderness in the epigastrium. He now says that he has had pain occasionally for three years when hungry and this was relieved by eating. He had a sore throat the day before yesterday. Movable dulness elicited, suggesting fluid in abdomen. He cannot rest on his left side now, as it is too painful. Some blood, small amount, expectorated. Patient was transferred to surgical ward with a diagnosis of left side subphrenic abscess, probably due to perforating ulcer.

Operation on March 30, 1914, by Dr. Ross, assisted by Dr. Cope. A right rectus incision was made from costal margin extending downward along the border of rectus muscle—six inches long. On opening the abdomen quantities of pus escaped, which was carefully sponged away. On examination of stomach it was found distended, seemingly by gas, but none was seen to escape. Along the fundus was found a large, massive lymphatic exudate which extended upward over anterior surface, including gastrohepatic omentum and from gastrohepatic omentum upward, involving under surface of liver and posterior surface and lesser curvature of stomach. The finger was passed through gastrohepatic omentum and foramen of Winslow and a rough mass was detected on the posterior surface along the lesser curvature of stomach, which was taken to be a lymphatic exudate walling off the site of perforation. The different adhesions were broken up as well as it was possible to do so. On the left side of the suspensory ligament was found the abscess, which was directly underneath the diaphragm and between it and the liver. A cigarette drain was inserted directly to the right of the suspensory ligament to allow sufficient drainage of the subphrenic abscess. On the left two drains were inserted through the lesser omentum, one a cigarette drain and the other a rubber tubing, down to the site of perforation. The abdominal wall was then closed in the usual manner. As the abscess was definitely localized to the upper abdomen no drain was placed in the pelvis which proved to have been an error. The patient survived three days and then died of general suppurative peritonitis. The report of a partial postmortem follows:

The examination was of the abdomen and was performed through the incision made at operation for perforated gastric ulcer. The cadaver is one of an adult male, apparently thirty years of age, somewhat emaciated, with cheeks drawn and eyes sunken. Hair is normal; eyes, ears, and face show no special phenomena. The body frame is small and musculature is poor. Abdominal inspection: The abdomen presents an unhealed scar of the recent operation; and is flat, with little or no panicular adiposa and poor belly walls. Abdominal incision made by slightly enlarging the wound made at aforementioned operation. On inspection the whole abdomen presents the picture of a plastic suppurative exudate and older adhesions. This extends down into the pelvis and involves all the peritoneum. The pelvis contains about 20 c.c. of cloudy, flaky, serous fluid. The lesser curvature of the stomach is hemorrhagic; the gastrohepatic omentum shows a perforation about one inch in diameter; the entire upper abdomen is covered by a plastic exudate, while the jejunum and ileum are more free from this, but the great omentum is affected in the same degree with the upper abdomen. There is a bunch of small intestines firmly adherent in the pelvis. The appendix is normal. The cæcum and ascending colon are highly congested and firmly adherent to the wall. On section the stomach shows two small ulcers on the lesser curvature nearer the cardiac end; and one on the posterior surface which had perforated into the lesser peritoneal cavity. The duodenum is much degenerated and thin and presents one perforation about an inch in diameter on the posterior lateral aspect and still another about 2 inches in diameter on the anterior inferior surface. The lesser peritoneal cavity contained some fluid, while the peritoneum was markedly hemorrhagic. The wall of the duodenum is very thin in several places, having little more than the serous coat remaining. The liver and gall-bladder are normal. The kidneys are normal. The spleen is somewhat enlarged and shows hypertrophy of the lymphoid tissue. The intestines are congested throughout their entire length. No enlargement of Peyer's patches were found.

Summary of Findings.—1. Plastic and suppurative peritonitis. 2. Perforation into the lesser cavity. 3. Perforation in the duodenum. 4. Two ulcers on stomach mucosa nearer cardiac end.

The sixth and last case is the one in which the diagnosis is still in doubt, although the reporter was of opinion that it was a case of perforation of the stomach at the greater curvature on the posterior surface, in which there was erosion of one of the vessels running along the greater curvature accounting for the massive hemorrhage.

CASE VI.—Male, fifty-two years of age; there was nothing in his family history that threw any light on his case. He was a farmer and said he had been a little less strong than the average man of his class, not being able to lift so much. He had also been troubled with chronic dyspepsia and for some time past, when he leaned over, he had tenderness in the epigastrium. Two weeks ago, while at the dinner table, he had a pain in his epigastrium sufficiently severe to make him lie down. This continued during the afternoon, and although it continued through the night he obtained some sleep. The following morning at the breakfast table he had no desire to eat, and had an attack of excruciating pain so severe that it made him faint. When coming out of his syncope he vomited dark brown granular material resembling coffee ground vomit. He then sent for his physician who said the man had no rigidity at all of the abdominal muscles. He was tender in the right iliac fossa extending up toward the liver. The doctor wanted him to to go the hospital that day, but he did not come till the following morning, travelling some 40 miles. About 9.30 A.M. he was seen by Dr. Ross. His temperature was normal, pulse under 90; appearance rosy, lips pink; he had a leucocyte count of 11,000. There was absolutely no abdominal rigidity. He was tender, starting to the left of the median line at the epigastrium, going over to the right side and down to Poupart's ligament, dull in right flank and a little less dull in the left flank. There was no distention, but his belly felt full and doughy and a little dull to percussion. It was evident that he had a serious intra-abdominal lesion of some sort. Abdominal section was done at once. On approaching the peritoneum the bluish appearance of hemorrhage was seen. When the peritoneum was opened there gushed forth a tremendous amount of bright red blood, being more than in the ordinary case of extra-uterine pregnancy, followed by some thin, current jelly clot, while from the pelvis the clots were much darker and denser. The appendix was inspected and found normal. The small intestines were also normal as was the mesentery; the gall-bladder was normal. His gastrocolic omentum had an immense hæmatoma in it; between the layers of the transverse mesocolon there was another hæmatoma with a place in the left side which permitted the opening of his lesser peritoneal cavity in which was found some blood, and the posterior wall of the stomach, starting at the greater curvature, was infiltrated with hemorrhages.

The man is making a good recovery. A drain was introduced through the opening in the transverse mesocolon into the lesser peritoneal cavity and he is sitting up out of bed now, two weeks after operation, perfectly comfortable. An examination of his pancreas, made rather hurriedly because of his general condition, showed nothing abnormal. There was no evidence of effusion, no serum but comparatively fresh blood. The liver, so far as could be seen, was all right; hemorrhage from a pancreatic vessel would not explain the hæmatoma in the posterior layer of the stomach, nor would it account for the immense hæmatoma in the gastrocolic omentum. The veins around the stomach did appear very large but his conclusion was that the condition was due to a pin-point perforation at the greater curvature, going through the stomach wall and opening up one of the vessels on the greater curvature, the hemorrhage coming through the foramen of Winslow into the greater peritoneal cavity. The liver was not materially changed in size from the normal. There was an infinitely larger amount of blood in the greater peritoneal cavity than in the lesser.

This series presents several facts worthy of notice: Males, 4; females, 2; ages varied from 23 to 68. Time intervening between onset of symptoms and operation: longest period 8 days; shortest, about 11 hours. Of the two who died, perforation occurred about 6 days before operation. Of those recovering one had perforated 8 days before operation and in one two days intervened; in the third about 20 hours and in the fourth over 24 hours. Gastro-enterostomy was performed in two of the cases; one recovered (Dr. Deaver's case); one died (Dr. Ross' case). Site of perforation: Duodenum, 1; stomach, 3. Multiple ulcer of the stomach and duodenum with perforation of stomach ulcer and two perforations of the duodenal ulcers. The sixth case was gastric if the diagnosis of perforation is correct.

DR. MORRIS BOOTH MILLER reported the case of a man twenty-four years of age, who was admitted to the Polyclinic Hospital on January 22, 1913. He was taken suddenly ill with severe abdominal pain about five o'clock in the afternoon. Previous history was that he had had attacks of pain over the region of his stomach for a number of months, but for about a month before this accident the pain had been more severe and had recurred more frequently. He, however, had no vomiting at any time before the day he was stricken. The painful

attacks would occur about three hours after ingestion of food. He was constipated. When admitted to the hospital he presented that appearance which has been described aptly as one of abdominal tragedy, —sunken eye, pale face, anxious expression, with board-like, rather scaphoid belly, and tenderness marked in epigastrium and along the right flank. The operation in this case was performed about four hours after the perforation. As soon as the belly was opened the appearance of stomach contents and of gas was characteristic. The perforation was about the size of the end of a lead pencil and was situated about two inches beyond the pyloric vein and well over on the upper surface of the duodenum. On account of its depth it was difficult to catch and close, but he finally was able to close it with a double layer of sutures followed by a posterior gastro-enterostomy without a loop. The necessity of that procedure had come home to him through a lesson which he learned in a previous case, in which he was obliged to reopen to do a posterior gastro-enterostomy to cure a man whose pain and other symptoms persisted after a simple closure of the perforation.

Dr. John H. Jopson mentioned a case of perforation which developed a chronic lung abscess. Dr. Ross spoke of an acute lung abscess with drainage and recovery. In one case in which perforation had occurred some two weeks before he saw the patient and in which the attending physician had made a diagnosis of perforation, the perforation had eventually been walled off. At operation he found this condition—a subphrenic collection of cloudy fluid in the epigastrium, extending over the upper and under surface of the liver, which was covered with a thick fibrinous exudate. The perforation had been sealed over; it seemed to have been in the first portion of the duodenum. The area was drained, and in a short time the exudate broke down and the wound discharged thick pus. This diminished and the man was discharged with a sinus. A year later he died of brain abscess. At autopsy an old abscess was found at the base of the man's lung, adherent to the diaphragm. The pathologist's idea was that this abscess at the base of the lung was chronic, had antedated the perforation and was associated with pulmonary tuberculosis from which the patient suffered. Dr. Jopson was convinced that this infection had spread from below upward and resulted in a chronic abscess of the lung and that the brain abscess was secondary to that, and this in turn secondary to the perforation of the duodenal ulcer.

Dr. George P. Müller reported the following cases of perforation of the stomach and duodenum.

Case I.—Occurred in a woman, twenty-six years of age, who presented a history of symptoms suggestive of gastric ulcer. She was given a thorough treatment by an osteopath and shortly after complained of acute symptoms over the gall-bladder, tenderness, rigidity, and finally the appearance of a mass. There was fever and increased pulse rate. At operation at the Chester County Hospital, October 23, 1909, a large, perforated ulcer was found. It was carefully sutured and the site drained. Symptoms of pyloric stenosis gradually appeared and finally became so intense as to demand operation a year later, at which time a posterior gastrojejunostomy was done. The patient immediately began to gain weight and now is in perfect health.

Case II.—Man, aged forty, who gave a typical history of duodenal ulcer for six or eight months previous to perforation. The symptoms of the latter resembled appendicitis and he had marked tenderness over the appendix upon admission to the hospital. Temperature, 101.8°; pulse, 88; respiration, 32; leucocytes, 17,700. The operation (University Hospital, December 18, 1909) was performed thirteen hours after perforation. The appendix was first exposed and found congested, but as turbid fluid was seen running down from above a second incision was made and the perforation discovered, two inches from the pylorus. The perforation was rather large and was closed with a purse-string catgut suture, reinforced with a catgut mattress suture; drainage was introduced to the site of suture, to the kidney pouch, and through a stab wound to the pelvis. Ten days later a duodenal fistula appeared and discharged bile and pancreatic juice, greatly excoriating the skin. Accordingly, a posterior gastrojejunostomy was done through a second incision and in a week the fistula had closed. Patient was discharged 31 days after operation with the wounds practically healed.

Case III.—Man, aged fifty-five, without any previous history whatever of dyspepsia. He was suddenly seized with pain in the epigastrium and marked rigidity. There was tenderness over the gall-bladder region and the pain was referred through to the back. On admission to the hospital temperature was 98.6°; pulse, 90; respiration, 28. Perforated duodenal ulcer was diagnosed and operation performed three hours from the time of perforation at the University Hospital, July 12, 1910. A small perforation was found and closed with silk and the site of perforation drained. Patient was discharged five weeks after operation with wound entirely healed.

Case IV.—Admitted to the St. Agnes Hospital during 1912. She was a woman, thirty-five years of age, who for some time had

had dyspepsia and was then seized with pain followed by symptoms of peritonitis, although they were not recognized by the attending physician. She was sent in as a case of intestinal obstruction, about one week after the onset of symptoms, and the abdomen opened under local anæsthesia under that impression. A large perforation in the anterior wall of the stomach was found and also a general suppurative peritonitis. A rubber tube was sewed in to the perforation and nothing else done. Patient died in three hours.

CASE V.—Man of sixty-eight years who had suffered for some years from attacks of pain after eating and accompanied by belching. On April 20, 1912, he was suddenly seized with severe pain over the liver, radiating to the right shoulder, followed by vomiting and then by some distention of the abdomen. Temperature rose to 101° and remained about that figure. Vomiting continued and the distention increased; patient was never shocked and seemed bright and cheerful. Three days after the onset of symptoms he was seen by Dr. Müller, he was complaining of abdominal pain, mostly in the right iliac fossa, with persistent nausea and vomiting of black material. The abdomen was tightly distended. At operation (Presbyterian Hospital, April 23, 1912) there was found a very small perforation in the anterior wall of the duodenum. This was closed with linen and catgut reinforced by a tag of omentum. In addition he had a general purulent peritonitis, especially in the upper portions. The site of anastomosis was drained and the pelvis was drained, but the patient died twelve days after operation with symptoms of increasing toxæmia and perhaps of subphrenic abscess. We were not allowed to operate a second time and were not allowed to perform an autopsy.

CASE VI.—Man, thirty-eight years of age, who gave a vague history of previous indigestion. While at work he was suddenly seized with pain in the epigastrium, followed by vomiting, and on admission was extremely rigid in the epigastrium and had tenderness over the gall-bladder. Temperature was 99°; pulse, 100; respiration, 20; leucocytes, 20,700. The lesion was correctly diagnosed and the patient operated upon one and one-half hours from the time of perforation. At operation (Polyclinic Hospital, September 24, 1913) a small perforation of the anterior wall of the duodenum close to the pylorus was found. The perforation was closed and a posterior gastro-enterostomy performed and the site of perforation drained. A second drain was introduced to the pelvis. He was discharged in a few weeks with wounds entirely healed.

It will thus be seen that of the four cases which recovered, three were operated upon at a very early period and in the fourth, localization occurred, saving the patient. The reporter believes that a primary gastrojejunostomy should be performed if feasible, that is, if the operator is skilful enough to avoid extensive soiling of the peritoneal surfaces and if time is not an important element affecting the prognosis. It is interesting to note the almost immediate cure of a duodenal fistula by gastrojejunostomy.

In addition to these six acute perforations he had had two examples of what might be called chronic perforation.

The first occurred in a woman of twenty-two, with a typical history of ulcer, who was treated medically for some time with relief, but with recurrence. At operation (University Hospital, October 8, 1913) a duodenal ulcer was found which by reason of scarring and infiltration had produced some stenosis. In addition an ulcer of the posterior wall just below the lesser curvature had perforated the entire stomach wall, the infiltrated transverse mesocolon forming the base of the ulcer. The latter had almost perforated and, accordingly, the mass of infiltrated mesocolon together with the ulcer was excised. The wound in the stomach was closed and just posterior to it a no-loop gastrojejunostomy was performed in the usual manner. This patient seems to have made a perfect recovery. She had hemorrhage from the stomach two weeks after operation but recovered therefrom and is now doing well.

The second case was most interesting. It was in a man fifty years of age, who following an attack of dysentery began to suffer from pain in the upper abdomen which, during three years, gradually developed into a typical case of duodenal ulcer. At operation (University Hospital, November 19, 1910), a mass of adhesions was found in the region of the pylorus but no evidence of ulcer, although the pyloric end of the stomach felt thick and beefy and the duodenum was dilated. The adhesions were separated and the wound closed. Through a second incision a thickened constricted appendix was removed, the omentum being adherent. The patient improved and recovered from operation and for some time did well, but gradually the symptoms recurred, although there was some difference, as the pain was noticed more immediately after eating. After several years of medical treatment, a radiogram by Dr. Pfahler diagnosed a perforated gastric ulcer together with evidence of adhesions, etc. At operation at the Chester County Hospital, May 2, 1914, a perforated ulcer of

the posterior wall was found surrounded by a small mass of exudate which in turn was adherent to the pancreas. The ulcer and a portion of the stomach was excised and the wound closed. Because the operation took time and owing to the difficulty in separating the adhesions and the presence of much oozing, it was deemed inadvisable to perform gastrojejunostomy at that time.

CONGENITAL PERFORATIONS OF THE PARIETAL BONES

Dr. Penn G. Skillern, Jr. presented a calvarium, discovered in the dissecting room of the University of Pennsylvania, which presented a very rare condition, and one that would give rise to confusion clinically were its occurrence not borne in mind, namely, congenital perforations of the parietal bones. In a review of the subject in 1902, Piersol (*Univ. of Penna. Med. Bull.*, August–September, 1902) described and illustrated a case, and was able to collect but fourteen other specimens.

In this case (Fig. 11) the perforations are irregularly round, and very symmetrical as to size and position. Both occupy the centre of a depressed area, which readily transmits light (Fig. 12). The edge of each perforation is as thin as paper, and the surrounding bone increases in thickness until the periphery of the depressed area is reached.[1] On the right side the perforation measures 14 mm. transversely and 12 mm. anteroposteriorly, and readily admits the tip of the little finger. It is situated 3.5 cm. from the sagittal suture. On the left side the perforation measures 15 mm. transversely and 13 mm. anteroposteriorly, and admits the tip of the index. It is situated 2.5 cm. from the sagittal suture. Each perforation was filled in by the epicranium externally and the dura internally, both of which were inseparably blended.

These parietal perforations are probably due to an exaggeration of the local disturbance of ossification which ordinarily results in the formation of the normal foramina, induced by unusual intracranial pressure within the immature skull. Welcker and Toldt (*Spee. Skeletlehre, Bardeleben's Hands. D. Anat. D. Menschen.*, 1896, Band 1., S. 114, cited by Piersol) state that the normal development of the parietal foramina is closely associated with a cleft, usually about 5 mm. deep, on the mesial border of the young parietal bone. Within this cleft lies a perforating blood-vessel, commonly the emissary vein,

[1] Prof. Geo. A. Piersol, who examined this specimen, suggested that this progressive thinning represented an attempt at complete filling of the defect by ossification.

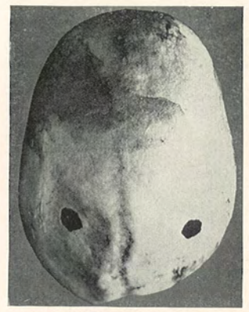

Fig. 11.—Congenital perforations of the parietal bones (external aspect).

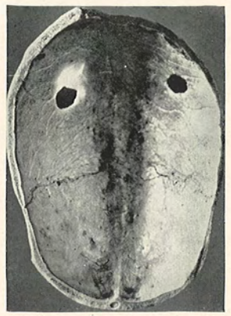

Fig. 12.—Congenital perforations of the parietal bones (internal aspect). Thinness of bone shown by light area behind left foramen.

which obstructs ossification at that point and causes the separation of the rays of developing bone. The subsequent closure of the fissure proceeds from the sagittal suture outward, the lateral or outer end of the cleft persisting as the parietal foramen. Piersol states that the generally recognized close relation between parietal perforations and parietal foramina admits of little question, especially when we consider the similarity of position, the symmetrical form and disposition of the apertures, as well as the observed gradual transitions from the large foramen to the huge hole.

Clinically, such perforations, were their occurrence not borne in mind, would cause confusion in palpation of the skull, in which the pulsations of the brain may be felt, in the examination of lacerated wounds of the scalp for underlying fracture of the skull; in the exposure of this area of the skull at operations; and in the examination of skiagrams of the skull.