The patient was entirely relieved of the pain, the nerve fibres which were preserved evidently supplied the thumb, for sensation partially persists here, but sensation and motion are lost in the second and third fingers.

Pathological Examination.—Specimen consists of a round cystic tumor measuring 3.5 by 3 cm. The wall of the cyst is 4 mm. in thickness, is white and fibrous in consistency. At one pole of the cyst a section of nerve is seen from which small fibrils radiate and spread out over the external surface of the cyst. The cyst is filled with a blood-tinged fluid, its wall is smooth and contains traces of brownish pigment.

On microscopic examination the cyst wall is composed of two layers, the outer consisting of bundles of hyaline fibrous connective tissue containing comparatively few cells and a few blood-vessels. The inner portion or that which corresponds to the lining of the cyst is composed of a very cellular tissue, many new blood-vessels, a small amount of fibrous tissue and traces of blood pigment. The appearance resembles granulation tissue. Sections stained by Weigert's method do not reveal any nerve tissue in the inner portion of the cyst wall, but show remnants of nerve fibres attached to the external coat. The nerves are surrounded by a considerable amount of fibrous tissue and are the seat of degenerative changes.

The diagnosis of a blood cyst in the substance of the median nerve can be made from the above findings. This condition seems exceedingly uncommon as no mention of it is made in numerous text-books. It was unfortunate that the relief of pain was the chief indication for operation, as preservation of sensation and motion might have been maintained by less radical measures.

STATED MEETING, HELD MARCH 1, 1915

The President, Dr. John H. Gibbon, in the Chair

SPLENECTOMY FOR GUNSHOT WOUND

Dr. Thomas F. Mullen (by invitation) presented a colored man, twenty-eight years of age, who was brought to the Pennsylvania Hospital at midnight of January 6, 1915, one-half hour after having received a shot wound from a thirty-eight calibre revolver, in the hands of a man standing a few feet distant. The point of entrance was in the left mid-axillary line on a level with the tenth rib, which was comminuted. The patient was in profound shock, temperature 96°, pulse 160, respiration 48; the abdomen was diffusely tender and rigidity was marked, especially on the left side. On percussion, there was shifting dulness in both flanks. The abdomen was opened, beginning twenty minutes after admission; incision was made at the margin of the left rectus, and later enlarged by dividing the muscles transversely to the left, for a distance of three inches. Upon opening the peritoneum, there was a gush of dark fluid blood which, after packing off the intestine, was seen to be flowing from the region of the spleen. The spleen was grasped and lifted into the wound. It was found that the bullet had passed through the upper pole of the spleen, downward and backward, severing the vessels of the pedicle, which was clamped and ligated *en masse,* with catgut. Gauze drainage was instituted and the wound was hurriedly closed, as there was no apparent injury to any other structure. At the close of the operation, the pulse was imperceptible and twenty ounces of normal salt solution were given intravenously. The patient reacted quietly and vomited once during the following day. The drains were removed on the fourth day and the wound appeared to be clean. From this point his convalescence was uneventful, with the exception of a severe chill which occurred on the twenty-sixth day after operation, and was repeated on the twenty-eighth and thirtieth days. An examination of the blood at this time revealed, in fresh and stained specimens, many malarial organisms of the tertian type, and the symptoms promptly disappeared after the use of quinine. On the third day after operation, examination of the blood showed 48 per cent. hæmoglobin, 2,430,000 erythrocytes, 15,000

leucocytes; on the eighth day, 50 per cent. hæmoglobin, 3,160,000 erythrocytes, 20,000 leucocytes; on the sixteenth day, 50 per cent. hæmoglobin, 3,230,000 erythrocytes, 22,000 leucocytes; on the twenty-fifth day, 53 per cent. hæmoglobin, 3,928,000 erythrocytes, 15,000 leucocytes; on the thirty-fifth day, 70 per cent. hæmoglobin, 4,000,000 erythrocytes, 15,200 leucocytes. The erythrocytes were normal in size and shape. Skiagraph showed the bullet lodged just anterior to the transverse process of the first lumbar vertebra on the left. Patient was discharged on the thirty-fifth day after operation as cured. Since his discharge he has been working at his usual occupation and appears to be perfectly normal.

RUPTURE OF THE BICEPS MUSCLE

Dr. Gwilym G. Davis presented a man who ruptured the long head of his left biceps muscle, approximately seven weeks ago, in lifting a bag of coffee weighing 130 pounds. The man says he had pain in the shoulder before he injured it, although there is no other distinct history of rheumatism. He had the typical swelling below. An incision was made along the edge of the pectoralis major; the long head, which was ruptured clear up into the joint, was pulled down, and brought over to the short head of the biceps muscle, which is attached to the coracoid process. Chromic catgut was used for the suture. The wound healed nicely. He now flexes and extends his arm perfectly. The operation presents no especial difficulty, except that it is rather hard to draw back the pectoralis major muscle sufficiently to get a good exposure. This was the second case in which Dr. Davis had operated.

Dr. John H. Jopson said that he had recently seen a case of this injury with a most unusual history. The man was a railroad engineer who in July, 1913, slipped in getting out of a boat and fell a short distance, striking his shoulder against the edge of a railroad tie. The injury was followed by some ecchymosis but there was no marked trouble with the arm for some time. It was not until months later that he suffered much pain, and when he did go to a hospital, more than a year after the injury, he was told that he had a rupture of the biceps muscle. Meanwhile he had been working steadily at his occupation as an engineer. He was operated upon by Dr. Gibbon but he still presents some of the characteristics of rupture of the biceps, in the way of bunching up of the belly of that muscle and on flexion of the forearm, and he complains of pain and disability in his arm with tenderness, just below the acromion process, between it and the head of the humerus.

Dr. John H. Gibbon said that he recalled very well the case referred to by Dr. Jopson and particularly the history of the man. It illustrated the point remarked upon by Dr. Alexander in the paper which he read before the Academy, that the history of not knowing that the rupture had occurred was not an unusual one. Some of the men in Dr. Alexander's series apparently did not know that they had ruptured their biceps and had gone ahead with their work, and the correct diagnosis was not made for some months afterward. In the case which he operated upon he sutured the ruptured tendon to the other tendon. The man had excessive blistering from iodine on the inner side of his arm, and from these infected blisters the wound became infected, so that they did not get a very good result. Some time after healing of the wound he developed much pain in the region of the deltoid. He had been at a loss to understand why he should have had it. It was thought that possibly a nerve was involved but there was no atrophy of the deltoid. The man was asked particularly whether he had this pain in the shoulder before his operation and he stated distinctly that he had not.

THE BONE GRAFT PEG IN THE TREATMENT OF FRACTURES OF NECK OF FEMUR*

AUTHOR'S TECHNIC

By Fred H. Albee, M.D., F.A.C.S.
of New York

Fracture of the neck of the femur is by all means the most disabling of all types of fractures. These fractures were formerly regarded as occurring mainly in old age. Recent personal statistics, as well as those of other surgeons who have large fracture clinics, show a large number of fractures of the femoral neck occurring in individuals below the age of forty-five or fifty. Senile osteoporosis, associated with thinning of the cortex and absorption of many of the lamellæ of the spongiosa of the neck, is the chief cause of the increased frequency of this fracture in the aged, and, as would be expected, traumata of much less severity cause fracture in the aged more frequently than in younger individuals.

There seems to be no object, so far as treatment or prognosis is concerned, in classifying these fractures further than the single term, "fracture of the neck." The terms intracapsular and extracapsular are inaccurate and misleading. The capsular insertion to the neck of the femur is oblique, thus causing the joint to include more of the neck on its anterior and inferior surfaces than on the posterior and superior. Then, again, most fractures are oblique and diagonal, and are only infrequently strictly transverse. If any classification is used, that of Stimson is by all means the preferable one, *i.e.*, subcapital, or fracture through the neck, and fracture at the base of the neck. A fracture is apt to occur in one of these two places, either at the junction of neck with head, or with the trochanter. The associated outward rotation in epiphyseal separation or fracture occurs as frequently and is often more pronounced than in fractures of the neck, which fact cannot be explained by the more fragile posterior portion of the neck. The predominance of the external rotators, especially the short trochanteric muscles, is believed to be the more tenable explanation. Shortening depends upon the lessening of the angle between the femoral neck and the shaft or a sliding by of the fragments.

* Read before the Philadelphia Academy of Surgery, March 1, 1915.

TREATMENT OF FRACTURE OF THE NECK OF THE FEMUR

In speaking of the poor results obtained in treatment of fractures of the femoral neck by the conventional methods, an authority states: "At first one can hardly appreciate how startling these results are unless he has carefully studied various series of statistics; and wherever the usually accepted principles of practice are employed, the long side-splints with Buck's extension, there the average results are uniformly unsatisfactory."

Of value in this connection are the conditions existing in 16 cases of fracture of the limb observed by Scudder many years after the accidents. "In only 2 cases, or 12 per cent., could it be said that the leg was functionally useful."

Walker studied the records of 112 cases of fracture of the neck of the femur treated in Bellevue Hospital between 1906 and 1907. Only 15 cases, or 13 per cent., recovered good function.

The British Fracture Committee tabulated 91 cases, in which 87 of the patients were over fifteen years of age. Only 20 of the adults, or 23 per cent., recovered good function.

Unquestionably Whitman's abduction method offers better results than the foregoing. Certain men, however, have not obtained the favorable results secured by Whitman.

Cotton offers the following objections to this treatment: "First, many men are inclined to doubt the locking of the upper fragment at the limit of abduction, believing rather that tension on the abductor muscles gives the limit of abduction; second, there is real danger that in less expert hands the fragments may be forced by one another, not jammed together; third, plaster spicas in stout patients do not hold abduction firmly."

At best, fracture of the neck of the femur is one of the most difficult problems in all surgery. The anatomico-mechanical conditions, the poor blood supply, the sluggish osteogenesis, and the difficulty of fixation are all potent adverse influences to securing satisfactory union and good functional results, and it is believed that if ever radical measures are justifiable they are indicated in the treatment of this desperate condition. Realizing this, certain surgeons have employed the metal spikes to assure better approximation and fixation than could be obtained by non-operative measures. This method has not given uniformly good results because of the failure of sufficient callus formation.

An illustrative personal case was that of a woman thirty years of age, suffering from a fracture of the neck of the femur ununited after eight weeks. There was no destruction of the fragments from friction, nor was there any systemic disease to inhibit callus formation. It was a favorable case, and a tin-plated square steel spike, three and a half inches long, was driven into good position longitudinally through the centre of both fragments of the neck, which were in excellent apposition. The convalescence was uneventful. The wound healed by primary union, and at no time was there a temperature above half a degree, after the day following the operation. The operation, however, resulted in failure, and non-union occurred. Fig. 8 is a skiagram taken four months after the operation, showing that the spike, owing to its own weight and some destroying influence, had dropped through the lower portion of the capital fragment and no longer engaged it. The metal spike had not only destroyed bone, but it had inhibited callus formation in a region where osteogenesis is at a low grade, to such a degree that it prevented union or, at any rate, was a contributing cause to non-union.

To avoid the disadvantages of metal the author began, in 1912, to use a bone graft peg as a substitute for the metal spike. (For report, see author's report in *Murphy's Clinics,* June, 1913.) If these bone pegs are placed in the cervical fragments by the technic described elsewhere, an equally satisfactory amount of internal fixation is furnished at the same time that the disadvantages of a metallic foreign body are avoided, and the advantages of a living bone graft gained.

A strong autogenous bone peg, accurately fitted into a hole drilled longitudinally through the neck of the femur, with the fragments in good position, offers unquestionably the most ideal condition for the rapid and satisfactory union, in good position, of this difficult fracture. In other words, the influences adverse to union, enumerated elsewhere, are better overcome by this procedure than by any other treatment; also every argument for the autogenous inlay graft in ununited and selected fresh fractures of shafts of long bones holds equally in fractures of the neck of the femur.

Soft tissues are removed, if present, from between the ends of fragments; the fragment ends are secured in good apposition; callus formation is stimulated by the presence of the graft at the same time that the graft produces bone growth itself; and an osteogenetic bridge, capable of conducting both blood-vessels and bone-cells from one fragment to the other, is furnished.

Indications for Bone Graft Peg in Fracture of Neck of Femur.—This operation is believed to be indicated in all ununited fractures of the neck of the femur; in most unimpacted fresh fractures in oper-

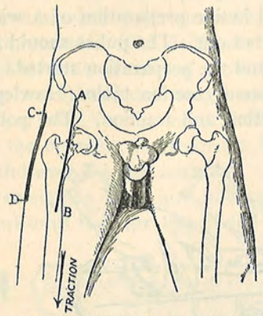

FIG. 1.—Drawing representing patient on Hawley traction table. *A B* and *C D* are skin incisions.

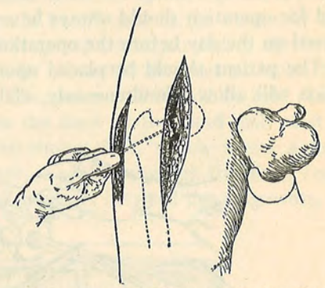

FIG. 2.—Drawing to illustrate author's method of determining with small hand drill the proper situation and direction for the motor drill. This hand drill is withdrawn as the motor drill is inserted (see Fig. 3).

able subjects under fifty years of age; in all old fractures of the neck or at the epiphyseal cartilage where malunion has resulted, with the neck depressed in a coxa vara relationship with the shaft. The bony

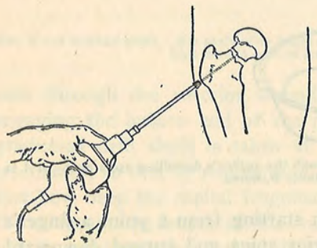

FIG. 3.—Insertion of motor drill.

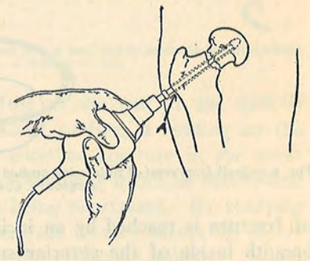

FIG. 4.—When the end of the burr has reached the space between the fragments and is ready to enter the capital fragment, a reading on the graduated shaft of the burr is taken at *A*, one is then able to tell just how far the burr should penetrate this fragment.

deformity is corrected by either a cuneiform or linear osteotomy, and placing the limb in full physiological abduction (Whitman). After the operative correction of these two latter conditions by the usual

cuneiform osteotomy, Hitzrot states that weight-bearing should be prohibited for at least a year. The employment of the bone graft peg reduces this time by at least six months.

Technic of the Author's Bone Graft Peg Operation for Fracture of the Neck of Femur.—A most careful iodine preparation of a wide field for operation should always be carried out. The pubes should be shaved on the day before the operation and the preparation started.

The patient should be placed upon some traction table (Hawley) which will allow, simultaneously, abduction and traction. The point

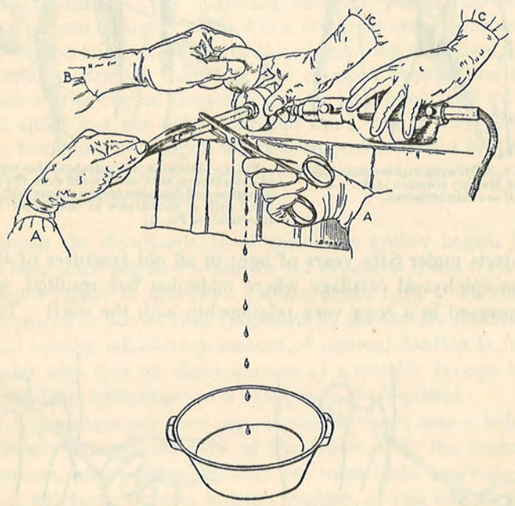

FIG. 5.—Graft from crest of tibia being pushed through the author's dowelling apparatus. *A A* is surgeon; *C C*, assistant; *B*, nurse.

of fracture is reached by an incision starting from a point a finger's breadth inside of the anterior superior spine and curved downward three to five inches along the inner border of the sartorius. The inner border of the muscle is exposed and retracted outward. The tendon of the rectus femoris is also exposed and retracted outward. The iliopsoas muscle is next exposed and retracted inward. The point of fracture is exposed and all soft tissue is cleared from between the fractured ends, which are curetted and freshened.

The limb is now placed in abduction and sufficient traction applied

to bring the fragments into good apposition as determined by both sight and palpation through the anterior wound. An incision two to three inches long is then made over and just below the great trochanter, which is exposed. With a small hand drill, the proper direction for the motor drill is determined by trial, as shown by observation through both wounds. The drill hole should be situated in the centre of the neck of both distal and proximal fragments, and parallel to the neck. The small hand drill may have to be reinserted in order to locate the proper tract for the motor drill. The motor drill should be held ready by the operator for insertion into the tract of the hand drill as it is withdrawn by the assistant. The motor drill, which forms a hole three-eighths of an inch in diameter, is pushed through the distal fragment until the burr end of the drill appears between the fragments, as

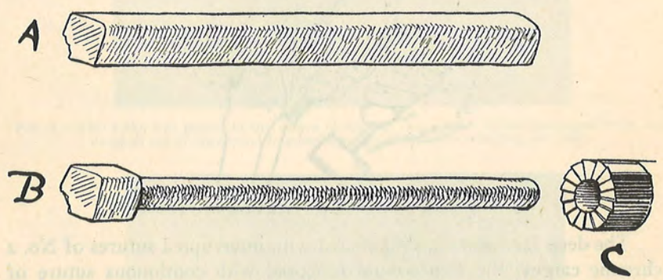

FIG. 6.—*A* is tibial graft. *B* is graft after being shaped into a peg, and is ready to be driven into burr hole in neck of femur. *C* is lathe cutter.

seen through the anterior wound. Just as the end of the drill is engaging the broken end of the proximal surface, a reading on the graduated drill shaft is taken at its entrance aperture in the great trochanter, so that by making additional readings it can be determined just how deep the capital fragment is being penetrated. By studying the skiagram, the length of this fragment can be very accurately determined, and hence the desired depth of the drill-hole obtained. When the fracture has occurred near the head and the proximal fragment is consequently short, the drill-hole should extend close to the articular cartilage of the head.

The drill is disengaged from the motor and left in place, to avoid any possible displacement of the fragments while the tibial graft is being procured.

The crest of the lower portion of the tibia is laid bare, and an area

of the desired size and shape is mapped out in the periosteum with a scalpel. The desired length of graft can be determined by the graduated scale on the motor drill. The cross-section of the graft should be just large enough to be shaped into the peg when the dowel shaper is used.

When the graft peg is ready, the drill is withdrawn from the femur and the peg inserted. The fit must be accurate because the dowel cutter is the counterpart of the drill used. This accuracy of fit is very important. Too tight a fit is undesirable because a pressure anæmia of the surrounding cancellous bone would be produced. Too loose a fit, or an irregular, inaccurate fit, would not produce good fixation or favor an immediate bony union of graft to the host fragments.

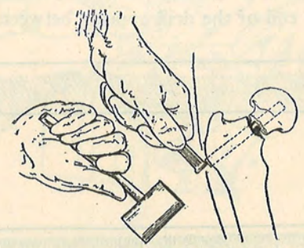

FIG. 7.—Drawing representing graft peg being driven home.

The deep fasciæ are approximated with interrupted sutures of No. 2 chromic catgut; the skin wound is closed with continuous suture of No. 1 chromic catgut.

The limb is put up in abduction (Whitman's position) in a plaster-of-Paris spica extending from the toes to the axilla. Three weeks after the operation, windows are cut in the plaster, and the wounds dressed. The dressing should be replaced with cotton for the purpose of restoring the tension of the plaster splint and retaining the fixation. The long spica should be continued for six weeks and followed by a short one for six weeks longer.

DR. JOHN H. JOPSON said a word in defence of silver wire in certain locations. He had used it in fractures of the patella and of the olecranon for years, and had never had occasion to take it out of either of these locations, and had never seen it give any trouble. He had never seen it break unless there had been a re-fracture of the part. It may be, as has been long taught, that the chemical action about silver in the tissues is different from that of other metals. When

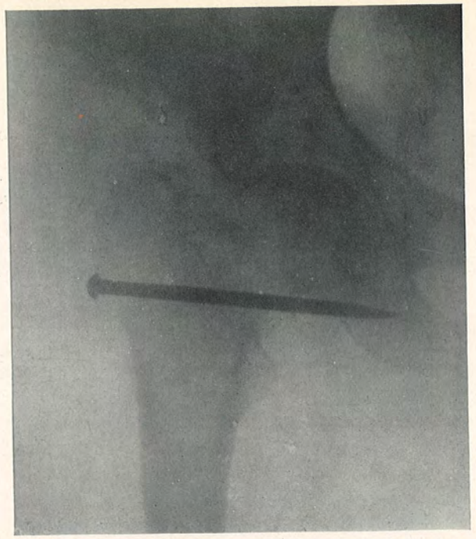

FIG. 8.—This spike was placed in the centre of head at operation. It has destroyed bone and dropped out of the capital fragment entirely, non-union resulting (see text).

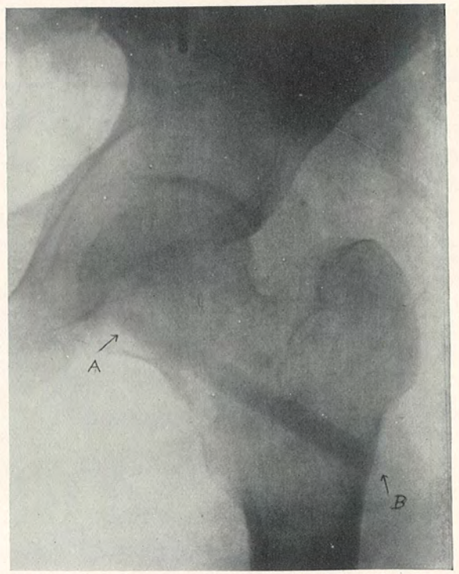

FIG. 9.—*A B* is bone graft peg three months after insertion. Firm bony union resulted immediately. It has been six months since operation and the union is firm. The graft was placed lower than it was intended, but did not interfere with the result.

silver plates have been used and required removal subsequently, it is often found that it was the plated or steel screws rather than the silver plate itself that caused the trouble. In the case of one young woman upon whom he had operated for ununited fracture of the tibia and from whom he had to remove the plate years afterward, it was found that the abscess had originated around the screws, which were rusted. The silver plate had caused no irritation. It was firmly embedded in the tibia, which had to be chiselled away before it could be taken out, after removal of the screws.

Dr. William L. Rodman said that he had had very excellent results with silver wire in fracture of the patella and elsewhere. One case operated upon fifteen years ago is still in good condition. He had also had good results in the use of plates, particularly the plate of Dr. Estes, of Bethlehem. But he believed that plates of all descriptions were for the exceptional, not the average, case and that the very frequent use of plates now in vogue was hardly necessary. In many cases the plates do harm.

Dr. Charles F. Nassau said that he had used silver wire in fractured patellas for many years without being obliged to remove it because of any trouble for which it was responsible. He believed that silver wire in the tissues is harmless. It may be recalled that for a time abdominal incisions were closed with silver wire; in fact, during the first seven years of his operative work in Philadelphia, he closed every abdominal incision with silver wire—even after operations on such cases as pus-tubes—and was obliged in two cases only to remove the wire. This is not a large percentage in seven years. In one of these cases, three of the six sutures were removed, and in the other case, all the sutures had to be removed because the resident had introduced a probe into the wound within 48 hours after operation. He did not recall, at this moment, ever having removed a silver wire after operation upon a simple fracture. In compound fractures, of course, subsequent removal of the wire is frequently necessary.

Dr. Penn G. Skillern, Jr., recalled the classic comparison between bone and the soft tissues. Bone, after all, is nothing but soft tissue plus earthy salts, and one should deal with it as such. One would not deliberately put metal into soft tissue; rather, remove it when accidentally introduced: why, then, should surgeons put metal into bone? Bone, being living tissue, tries to throw the metal off as a foreign body. One sees this in the plating of fractures. With the plate *in situ* at operation, the fragments are firmly held together, but later, before callus formation has progressed very far, osteoporosis

around the screws causes them to loosen, with consequent shifting of the plate. Those plates that remain *in situ* for several years are merely exceptions to the rule. It is most illogical to put metal into bone, and he foresaw that Dr. Albee's bonegraft inlay and peg methods had sounded the knell of all metal fixtures.

Continuing the comparison between bone and soft tissues, take, for example, a nerve that has been divided for some time. There are bulbs of scar-tissue at the ends. The ends are perfectly contacted, but one never gets union. Why? Because the nerve-fibres cannot penetrate the barrier of scar-tissue. When, on the other hand, the bulbous scarred ends are removed until the brush-like ends of the fibrillæ stand out, and the freshened ends are *accurately* contacted, regeneration occurs, and the nerve resumes its property of conduction. The same state of affairs is met with in an old, ununited fracture. The ends of the fragments are sclerosed (scar-tissue), and with the plate we get contact without union, for the same reason, unless the ends be resected. By the bonegraft inlay method of Albee, on the other hand, healthy bone spans the sclerosed area, and assures union by its osteogenetic, as well as osteoconductive, properties.

Dr. Albee, in closing, said that he had seen silver wire break in several instances in fracture of the patella, in one case coming through the skin. Silver wire in ununited fractures is most untrustworthy. Fixation is a secondary consideration. Something is required to span the sclerosed bone and complete the contact with healthy bone beyond the point of fracture, something that will not only supply bone callus but that will stimulate osteogenesis, and this the bone graft does. He was equally certain that in relatively large grafts a varying part of the central portion acts as a scaffold for migrating bone-cells from the fragments. The reconstruction of the graft is a physiological affair. Regarding extrusion of the graft, there was one case where the graft was applied to the jaw, and the wound connected with the oral cavity, in which practically all the graft came out. In only two in 400 cases has the whole graft been extruded. He had had in several cases little slivers come out. The whole graft has been laid bare by an infected wound and has become covered up with granulations; perhaps little shells have come off, but the graft has served its purpose. It is a most trustworthy surgical agent and of an entirely different class from metal. It has a definite resistance to infection. He had had no experience in the use of the graft in jaw fractures. Some of his cases of fracture of the neck of the femur had been of long duration (*i.e.*, up to two and one-half years).

STATED MEETING, APRIL 5, 1915

The President, Dr. John H. Gibbon, in the Chair

GYNÆCOMASTIA

Dr. Nathaniel Ginsburg presented a man, nineteen years of age, in whom for six months the left breast has slowly and steadily increased in size without evidence of pain, and at present presents the appearance of a young female breast about puberty or a little later (Fig. 1). There is prominence of the nipple and distinct mammary tissue hypertrophy, with an areola of pigmentation about the nipple which is more marked than present on the right side. There is no record of antecedent injury, unless his occupation (a shoemaker) has predisposed him to occupational traumatism to this region. The breast tumor is a diffuse, somewhat circumscribed, enlargement, corresponding anatomically to the normal young adult breast outlines. There is no fixation or retraction of the nipple. There is no mammary secretion and no enlargement of the axillary lymph-nodes. Dr. John Speese (Annals of Surgery, April, 1912) regards this type of benign tumor in the young male breast as an adenofibroma and I am in agreement with his views, believing this case will histologically conform to that type of tumor. I do not believe this case in its inception could have been termed "Adolescent Mastitis" unless this is synonymous with adenofibroma.

Dr. John H. Gibbon (Transactions of the Philadelphia Academy of Surgery, April, 1912) reported the case of a young man twenty-one years of age, also a shoemaker, upon whom he had operated; and examination of whose tumor showed it to be an adenofibroma of the breast.

This is an unusual and rare breast tumor in the male, and since it is steadily increasing in size, with a view of removing the malignant potentiality present, I have advised and shall perform a plastic resection with preservation of the nipple.

Note.—Plastic resection of the breast and histological examination showed the breast enlargement to be a case of gynæcomastia.

Dr. Penn G. Skillern, Jr., disagreed with Dr. Ginsburg in his diagnosis of neoplasm, and regarded it as a case of unilateral gynæcomastia, or physiological metamorphosis of the male breast into the