TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting Held March 7, 1921

The President, Dr. George G. Ross, in the Chair

SUPRAPUBIC SARCOMA

Dr. Emory G. Alexander presented a boy, eleven years of age, who was admitted to the Episcopal Hospital, July 15, 1920, on account of pain in the lower abdomen and inability to void. Two days before admission to the hospital, he jumped down from an elevation a distance of about six or seven feet. Immediately after the jump he had to lie down for several minutes on account of weakness and severe pain in the lower abdomen. In a short time he felt better and was able to walk to his home, a distance of three blocks. A few hours after arriving at home he had a chill, followed by fever and difficulty of urination.

When admitted there was a mass in the lower abdomen resembling a distended bladder: it extended to the umbilicus. The patient was catheterized and three ounces of clear urine was obtained without any diminution in the size of the mass. The bladder was injected with six ounces of sterile water without increasing the size of the mass. After permitting the water to remain in the bladder for a few minutes it was siphoned off and the amount instilled was recovered. On July 17, 1920, a mid-line incision three inches in length was made below the umbilicus. A large organized hæmatoma was found anterior to the bladder. This was evacuated and exposed the bladder. The blood clot was the size of a medium-sized grapefruit and extended well down back of the bladder. The condition resembled very much that of the organizing blood clot often met with in ruptured extra-uterine pregnancy.

The bladder was again distended with water and a leak looked for but none could be found. The clot was extra-peritoneal. The clot cavity was drained by two cigarette drains. The patient left the operating table in good condition.

The convalescence was uncomplicated and the patient was discharged from the hospital on August 2, 1920, two weeks after the operation. At the time of the operation, a culture was taken and some of the clot sent to the laboratory for study. The laboratory report on the culture was "no growth," but on the specimen a " large round-cell sarcoma."

Repeated X-ray studies have been made of the pelvis, spine, chest and femurs with invariably a negative result. An examination by Dr. W. H. MacKinney revealed the prostate hard and much larger than normal, "as large as that of a man's."

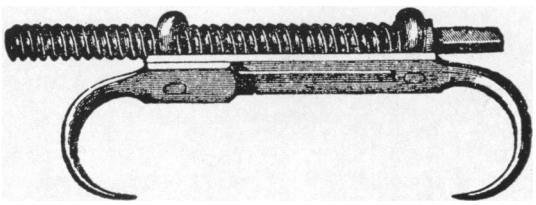

FIG. 1.—One of a pair of Levis' separated hooks for fracture of the patella.

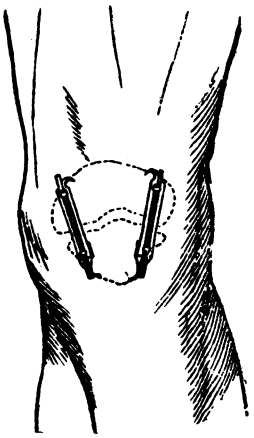

FIG. 2.—Diagram of Levis' patella hooks applied.

FIG. 3.—Case of bony union of patella after treated with Levis' modified Malgaignes hook.

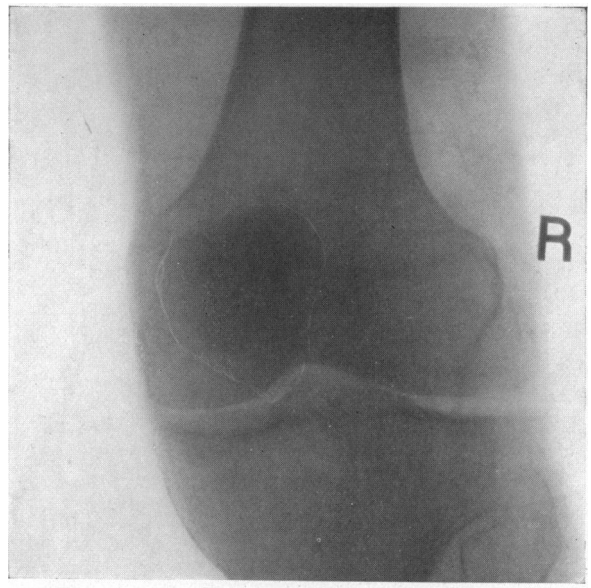

FIG. 4.—J. B. Roberts' case of fracture of patella treated with separated hooks, as used by Dr. R. J. Levis.

FIG. 5.—Patella fracture treated by non-operative dressing followed by short fibrous union.

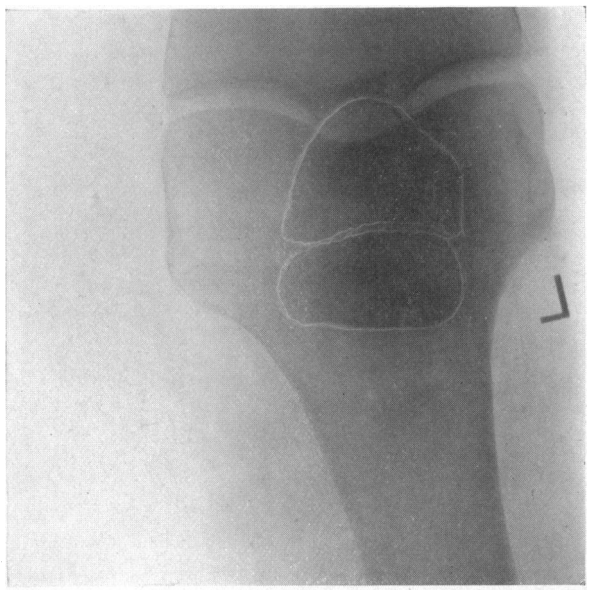

FIG. 6.—Dr. Roberts' case of patella fracture treated without direct fixation.

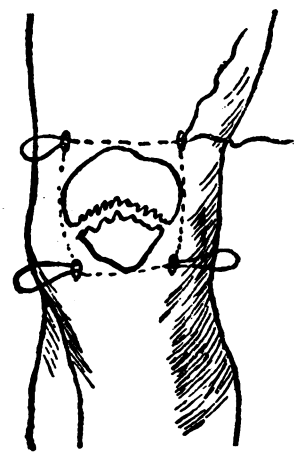

FIG. 7.—Purse string for subcutaneous fixation of fracture of patella.

The patient remained perfectly well except for asthmatic attacks until February 4, 1921, when the mass suddenly appeared again in the suprapubic region, this time without any chill, fever or urinary disturbance. The patient was again admitted to the Episcopal Hospital on February 4, 1921, when practically the same condition was found as on his first admission.

Careful X-ray, ophthalmological and physical examinations were negative. A complete blood count was as follows: 3,730,000 r.b.c., 7,200 w.b.c., 55 per cent. hg., polymorphonuclear 78 per cent., mononuclear 4 per cent., transitional 6 per cent., lymphocytes 11 per cent., eosinophiles 1 per cent., basophiles 0. The urine was negative except for a trace of albumin, a few leucocytes and an occasional red blood-cell.

Further operative measures were deemed useless and the patient was placed on intensive X-ray treatment. A treatment of one hour was given on February 8, 1921. This was followed by fever, nausea and vomiting, and a rapid diminution in the size of the mass. In three days after the treatment the mass had practically disappeared.

A recent rectal examination shows that the prostate is still slightly enlarged and harder than normal. The induration and enlargement is more marked on the right side, and extending up from the prostate along the wall of the pelvis on that side is a faint cord-like induration.

As to the origin of the growth. Certainly it does not spring from the periosteum or bone. It is possible that it may have originated in the prostate or prostatic sheath. If that should prove true it is quite a rare condition, as only about forty cases of sarcoma of the prostate have been recorded in the literature.

It is quite probable that the origin of the growth was in the immediate vicinity of the hæmatoma and that it sprang from the areolar tissue in the suprapubic region or from the bladder wall.

SUBCUTANEOUS FIXATION OF TRANSVERSE FRACTURE OF THE PATELLA

Dr. John B. Roberts said that although open operations upon the usual transverse fracture of the patella give a clear understanding of the exact degree of damage to the bone and the enveloping musculo-aponeurotic structures and are followed by cure, they possess a considerable degree of risk to the patient even in the hands of trained surgeons. He had always felt that the septic risk, though small with fully qualified operators and careful aseptic or antiseptic technic, demands that less formidable treatment has a certain degree of plausible advantage. In his early professional days the use of Malgaigne's hook was revived by R. J. Levis and Thos. G. Morton (Figs. 1 and 2), and good results obtained with little risk to the patient, and what was believed to be bony union. He presented skiagrams (Figs. 3 and 4) to prove the value of direct fixation with Levis's separated hooks. He also presented a man, aged fifty-five years, who broke his right patella, in 1886, when thirty-four years old, and was treated by him with Levis's

separated Malgaigne's hooks. Solid bony union was obtained as demonstrated in these skiagrams taken in the winter of 1920 (Figs. 3 and 4).

Eight years later (1894), he broke the left patella, which was treated at the Polyclinic Hospital by Doctor Roberts, with a posterior splint and adhesive plaster. The X-ray plates (Figs. 5 and 6) show close fibrous union with an increased length of bone. The right bone is of good shape, the mobility of the knee-joint perfect, and the scars of the hook points visible in the skin. There must have been originally considerable separation of the fragments in this case or he would not have used the hooks.

The left bone is a little longer than the right and a shallow transverse groove can be felt by palpation. There is also some distortion of the periphery of the left patella. The flexion of the knee is slightly restricted when one attempts to force his left heel strongly towards the buttocks.

This man goes up and down stairs readily and works as a laborer. His left ankle is somewhat distorted because he broke his fibula on that side in 1916. He also has a hammer second toe on that foot. It is apparently these troubles, rather than the fibrous union of the left patella, that now cause him to go down steps a little cautiously. He seemed to save putting full weight on his left foot when he walked up twenty-five or thirty steps and down again.

Doctor Roberts showed the instruments used by Levis himself. They are better than the original Malgaigne instruments, because they can be placed parallel to each other or at any oblique angle.

Doctor Roberts also shows a diagram (FIG. 71.) of the purse-string method of drawing the fragments together in fractures of the patella which are transverse.

This was made some eighteen years ago to illustrate a paper read before the Surgical Section of the American Medical Association. At that time he showed X-ray pictures of experimental fractures brought together by the purse-string method and others of actual results in patients. He does not know who originated the purse-string method, which is good and less dangerous than the suture placed under the patella through the joint.

DR. J. TORRANCE RUGH called attention to the tilting of the fragments as shown in the skiagrams presented. The first cases showed excellent bony union, but a line of cleavage where the fragments were tilted forward by the Malgaigne hooks. To prevent this tilting a careful and accurate closure of the capsule at the lower edge of the two fragments should be made and by avoiding tying the wire or kangaroo suture too tightly.

EPIPHYSIAL SEPARATION UPPER END OF HUMERUS

DR. GEORGE P. MULLER reported the case of S. B., age six, who was admitted to the Misericordiae Hospital, December 20, 1920, having been struck by an automobile. He had sustained an epiphysial separation of the upper end of the right humerus. The arm was apparently reduced and placed in abduction in a Thomas arm splint, but X-ray examination showed no change in the deformity (Figs. 8 and 9), the upper fragment being out-

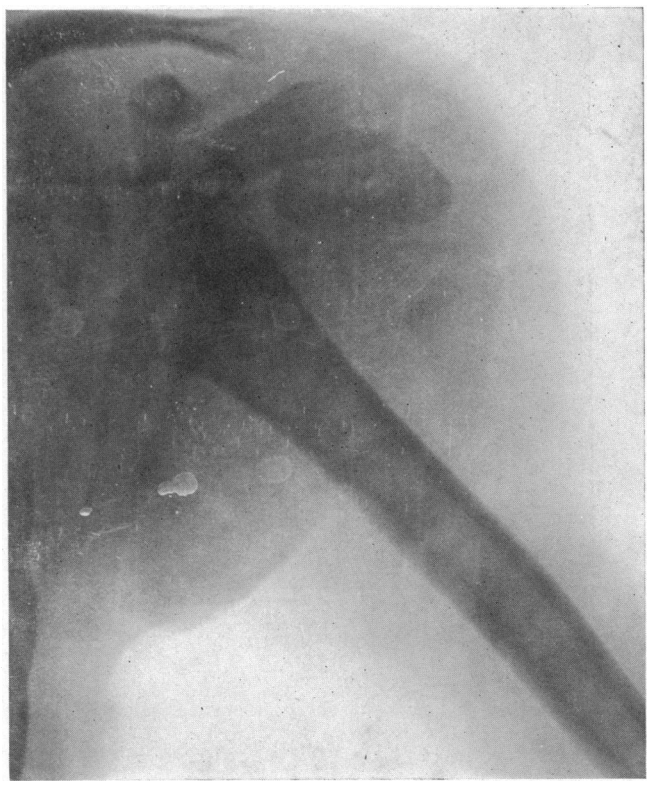

FIG. 8.—Epiphyseal separation upper end of right humerus. Note the deformity.

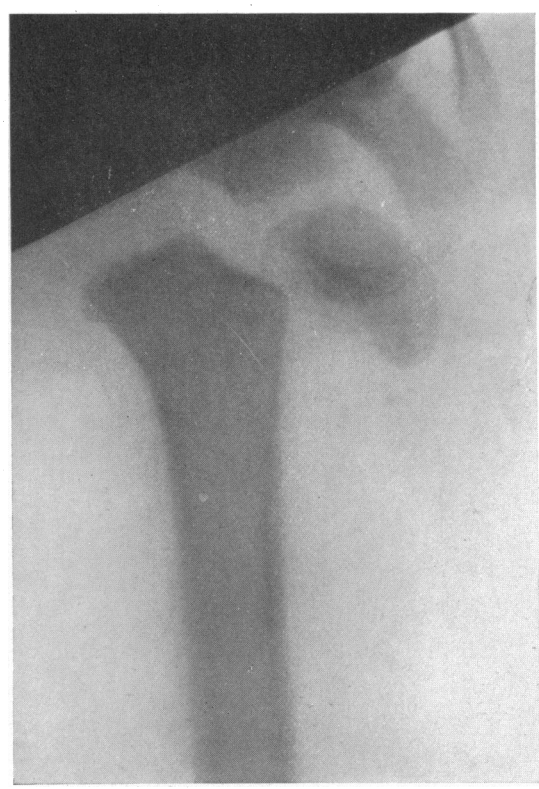

FIG. 9.—Epiphyseal separation upper end of right humerus. Note the deformity after abduction.

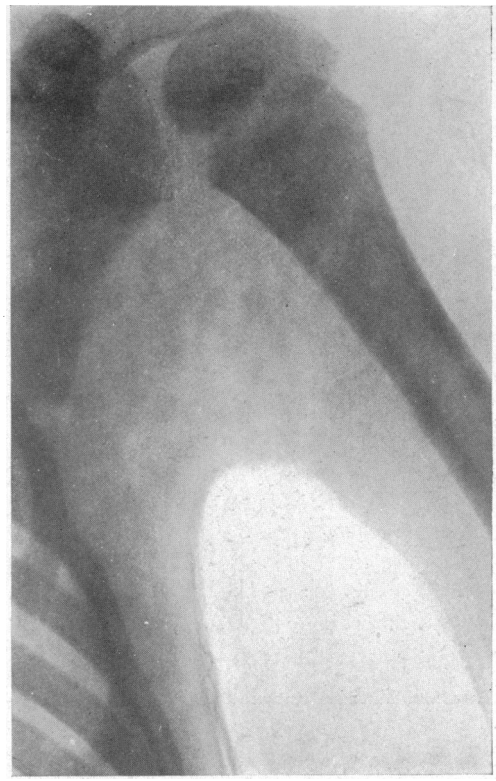

FIG. 10.—Epiphyseal separation upper end of right humerus. Perfect position after final reduction.

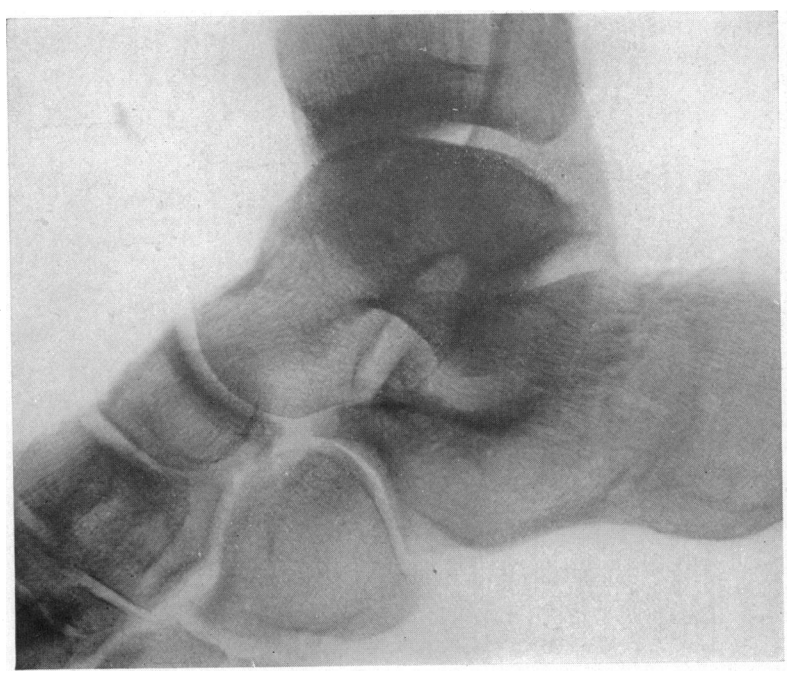

FIG. 11.—Lineal fracture of right os calcis. No deformity.

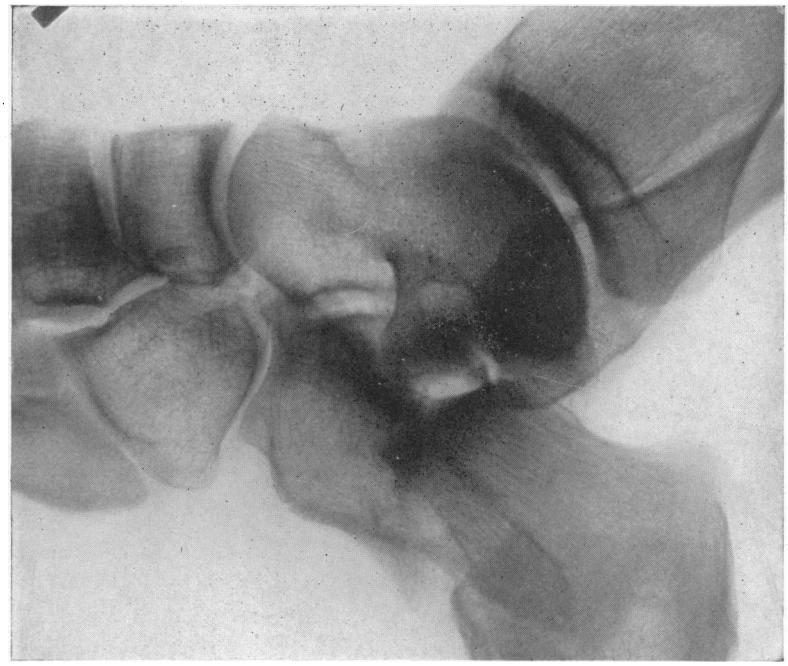

FIG. 12.—Comminuted fracture of left os calcis. Moderate deformity.

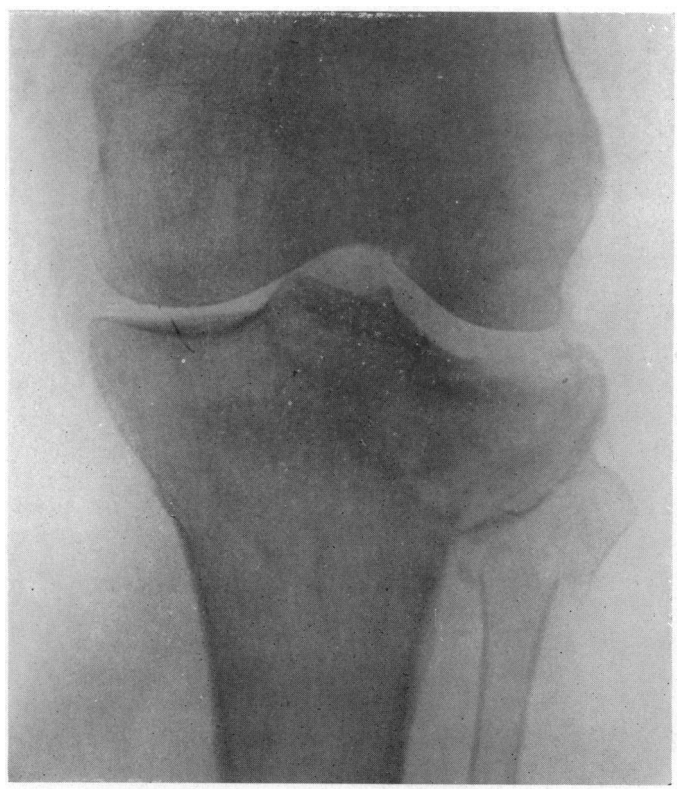

FIG. 13.—Impacted fracture upper end of fibula and tibia. Anteroposterior view.

ward and the upper end of the lower fragment up under the coracoid process. Under ether the fracture was reduced and maintained by the usual dressing for a fracture of the surgical neck (Scudder), (Fig. 10).

The interesting feature of this case was the unusually high deformity and the fact that had the common teaching that abduction be used in treatment, the deformity would have persisted. The importance of checking reduction by X-ray examination can be appreciated.

FRACTURE OF THE OS CALCIS

DOCTOR MULLER also reported the case of W. V., age thirty-three, who fell twenty feet and landed on both heels. He was admitted to the Misericordiae Hospital, November 12, 1920, suffering from severe pain in the feet and in the right sacro-iliac joint. The feet and legs were encased in plaster of Paris. The man has made a good recovery and walks without pain.

He was under the impression that bilateral fracture of the os calcis was rare, but finds that Cahill (ANNALS OF SURGERY. 1917, LXVI, 711) in seventy-two cases noted bilateral fracture eight times. In this case one bone (right) showed a lineal fracture practically without displacement (Fig. 11), and the other (left) was comminuted with moderate displacement (Fig. 12). Both Cahill and Cotton (ANNALS OF SURGERY, 1916, LXIV, 480) dwell upon the marked disability following this injury. Cotton advises impaction after pulling the heel down with ice tongs.

IMPACTED FRACTURE OF THE UPPER END OF THE FIBULA AND TIBIA

DOCTOR MULLER reported the case of L. C., age fifty, who was injured by being struck by an automobile and admitted to the Medico-Chirurgical Hospital, January 25, 1920. There was swelling, pain and tenderness of the right upper leg and a large hæmatoma in the left thigh. There was an effusion in the right knee-joint. The X-ray revealed a fracture of the upper end of the tibia with slight impaction and of the head of the fibula with considerable impaction (Fig. 13). A plaster case was applied and recovery was uneventful. This unusual fracture seems to offer no opportunity for correction of the deformity except by open operation. This might be indicated where there was marked deformity, but in cases of lesser grade it seems better to avoid manipulation.

DR. J. TORRANCE RUGH said that in these fractures through the body of the os calcis the most troublesome feature in his experience has been the pain which persists. Most of these patients complain of pain for two or three years. Of course, they require some form of support, whether felt or steel pads, or whatever it may be, accurately fitted, but the explanation of that pain which these cases have after this length of time lies in the fact that in this type of bone, bony union does not become solid under one and a half to three years. Bone is thrown out so slowly that the pain is due to the strain upon the fibrous union between the fragments of the part. When bony union is firm and complete there is no further pain.

DR. T. TURNER THOMAS said, in regard to Doctor Muller's case of impacted fracture of the tibia, he had one very much like it last October and was still treating it. In his case there was an outward displacement of the lower fragments on the upper, that is a general outward turn of the leg. The upper end of the tibia was broken into a number of fragments. The fracture was apparently the result of a fall, perhaps on the foot, with a turning outward of the leg carrying the lower fragment outward. He put strong extension on it with counter-extension and with the limbs under strong extension he forced it over as far as it would go in the opposite direction. He got a pretty good reduction of the deformity and maintained it as to epiphysial fracture of the humerus. He had been using in treatment the idea Doctor Muller brought out. Assuming that the fracture was due to abduction pulling strongly on the arm in right angle abduction and forcing the lower fragment out into position by the hand of your assistant the arm was brought down under traction and dressed at the side in the Velpeau position. He figured that the fragments put into position by strong traction and abduction would stay better with the arm kept at the side. New non-operative reduction is difficult. Sometimes he nailed them. Epiphysial separations are more difficult to hold in position after reduction than the pure fractures in older people.

FRACTURE OF THE CALCANEUM

DR. ASTLEY P. C. ASHHURST reported from his service in the Episcopal Hospital, a case of *Malunion of the Calcaneum from Crushing Fracture, Bone Transplantation.*

W. George E., thirty-nine years of age, was admitted July 6, 1920, with a crush of the left os calcis, sustained in falling from a height of forty feet when scaffolding gave way. There was great swelling of the soft parts, followed by the formation of bullæ, and the originally filthy condition of the skin soon induced suppuration in the blisters thus rendering inadvisable any operation at the time of injury. The deformity was such, however, when compared with the normal foot, that it was not thought proper to leave it permanently uncorrected (Fig. 14).

Accordingly on August 8, 1920, four weeks and a half after the injury, when the condition of the soft parts seemed to promise clean healing of an operative wound, Doctor Ashhurst made an incision 15 cm. in length parallel with the plantar surface, and extending entirely around the posterior surface of the heel from beneath one malleolus to a point beneath the other. The tendon of Achilles was divided by a Z-shaped incision, to permit of its being lengthened about 2.5 cm. when it was again repaired. The upper surface of the calcaneum thus exposed was divided transversely by osteotome from just above the insertion of the tendon of Achilles downward and forward for about 5 cm., and the lower segment of the bone was pried downward toward the sole of the foot, to restore the normal angle with the anterior tarsus. Into the wedge-shaped gap thus made were driven two aperiosteal pegs of bone cut from the subcutaneous surface of the tibia of the same leg (Fig. 15). These pegs measured

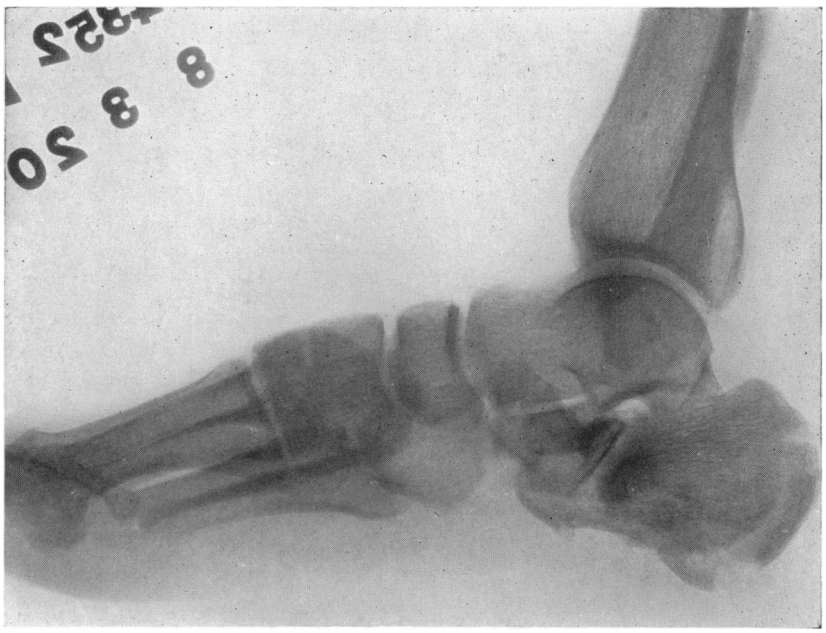

FIG. 14.—Comminuted fracture of l. calcaneum with traumatic flat foot.

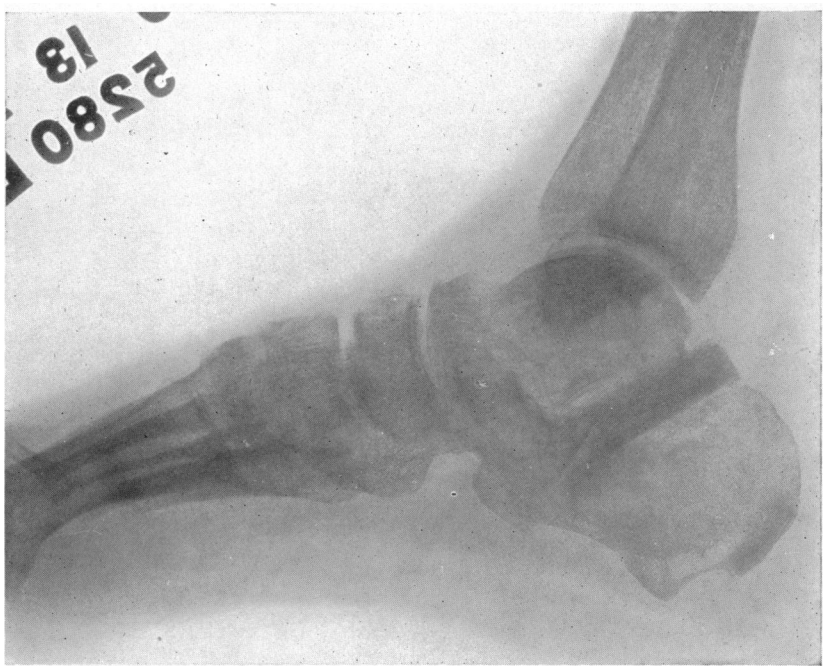

FIG. 15.—Two months after bone pegs were inserted. Note bone atrophy from disuse compared with normal foot.

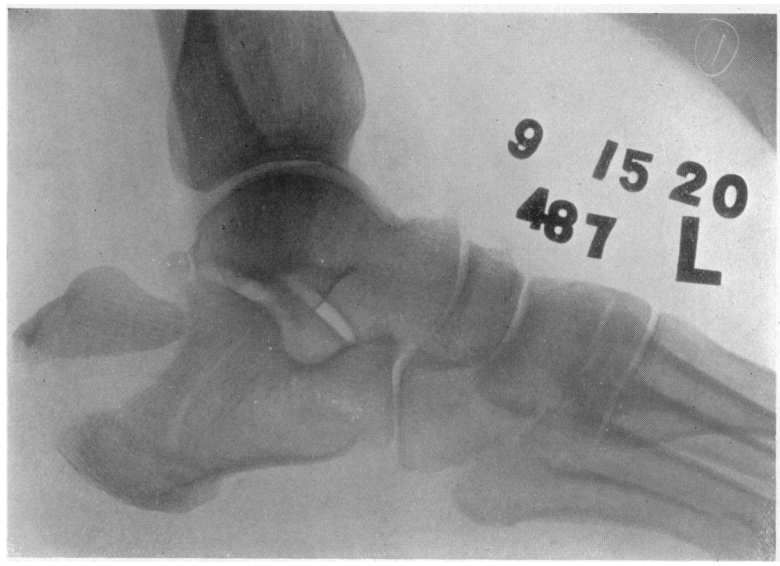

FIG. 16.—Fell from height, landing on ball of feet.

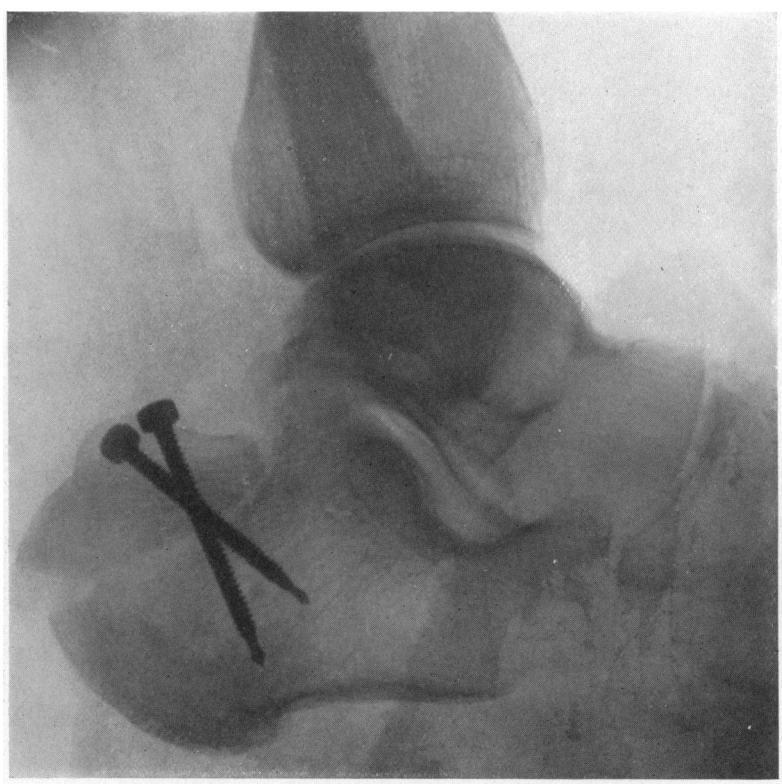

FIG. 17.—After operation (done on third day after injury).

about 5 x 1 x 1 cm., and 3 x 1 x 1 cm. The tendon of Achilles, the deep fascia and the skin were closed separately with chromic gut, and a plaster-of-Paris dressing was applied. Nine days later the patient was discharged walking with crutches.

September 14, 1920. Six weeks after operation the patient returned for his first dressing, when the plaster case was removed. There was a small opening in the skin incision through which a small slough of the tendo Achillis, partly detached, could be seen. He was provided with a felt pad in the shoe, under the instep of this foot, and returned to the dispensary for further dressings.

November 3, 1920. Is still attending the dispensary. There is a minute dry sinus at the heel. He says that a few days ago he had "chills and fever" and has been feeling ill since. The leg is red and tender over the wound from which the transplant was taken, though this incision has been firmly healed from the first. He declined to stay in the ward.

November 8, 1920. Readmitted to the ward with an abscess over the upper end of the left tibia, not under the scar of the bone transplant operation, but above it. There is also a red, hot tender area over the lower end of the rectus femoris. The knee-joint is normal.

November 9, 1920. Under nitrous oxide anæsthesia an abscess is opened by an incision along the lateral margin of the quadriceps tendon, and another over the lateral surface of the leg below the knee. Both abscesses contained thick creamy pus, from cultures of which staphylococci were grown. Neither had any connection with the bone.

November 22, 1920. A third, very small abscess on the median side of the thigh opened itself spontaneously. He says he has had abscesses like these over his body once before.

November 24, 1920. Discharged from ward, still using crutches. Abscesses healed.

March 2, 1921. Still uses a cane, but has very little disability. The bony spur on the sole under the point of the heel (a fragment of the original comminution) seems to be rounding off, and a bursa seems to be forming in the plantar tissues over it.

AVULSION OF THE UPPER SURFACE OF THE TUBEROSITY OF THE CALCANEUM BY THE TENDON OF ACHILLES; SCREW FIXATION

Doctor Ashhurst also detailed in case of Francis M., fifty-one years of age, was admitted September 14, 1920, with an injury to his left heel. While standing on a coal truck he caught this foot between the body and the spring of the wagon, and had to leap to the ground to keep from falling headlong. He landed on the balls of his feet. Evidently the tendon of Achilles on the left was held so taut by the calf muscles that it tore off the upper surface of the calcaneum as the plantar surface descended to the ground. Though there was very great pain, he was able to walk on the toes of this foot. On admission there was considerable swelling around the heel, but a depression admitting the tips of two fingers could be felt between the plantar surface of

the calcaneum and that part into which the tendon of Achilles was inserted. and the nature of the fracture was confirmed by the X-ray picture (Fig. 16), by Dr. R. S. Bromer.

Three days later, under Esmarch anemia, an incision 15 cm. long was made over the tendon of Achilles down to the lateral margin of the calcaneum, slightly convex to the fibular side. The tendon of Achilles was divided by a Z-shaped incision, to permit it to be lengthened about 3 cm., when it was sutured. The V-shaped interval between the bone fragments was cleared of clot, and while the upper fragment was held in contact with the lower by means of a large hook, two self-boring Lambotte screws were introduced from the superior surface of the upper fragment, ventral to the insertion of the tendon of Achilles. These screws were inserted at different angles so as to bind each other (Fig. 17). The tendon of Achilles, the fascia and the skin were repaired separately with chromic gut, the Esmarch band being removed before closure of the skin. Plaster-of-Paris dressing.

In October the patient developed erysipelas over the shin of the left leg, where was an old scabbed leg ulcer. By the end of October a frank cellulitis had developed, and an abscess was opened on the lateral side of the knee on October 27.

Early in November a cellulitis developed around the operation wound in the heel, which was entirely closed and dry except where a small portion of the tendon of Achilles had sloughed. This cellulitis subsided without further complications, and the patient was discharged December 17, 1920, just three months after operation, with only a small sinus in the heel remaining unhealed

LOCAL TETANUS

DR. K. P. A. TAYLOR, said that the usual phenomenon of tenanus in man is a tonic spasm of the masseter muscle (trismus) with spreading to other muscular groups (descending tetanus). Occasionally the spasm begins in the muscles of the wounded limb and spreads to the body generally(ascendingte tanus) or remains confined to the affected limb (local tetanus). He believed the case to be reported to be an example of the latter group.

M. C., a schoolgirl, aged seventeen, fell from a buggy in rapid motion on September 27, 1920. She struck upon her left shoulder and side, with the left arm doubled beneath her. A compound fracture of the lower end of the left humerus resulted. A neighboring physician sutured the skin over the bony ends and reduced and fixed the fracture. Three nights later the left hand became cold and discolored and the patient was brought to the University Hospital.

On admission, the temperature was 102° F. and the pulse 112. The general condition was good. The left arm was swollen and discolored from a point six inches below the shoulder to below the elbow. The hand and forearm were cold and no pulsation was felt in the radial artery. There was an offensive odor. The diagnosis of gangrene incident to traumatism of the brachial artery was made.

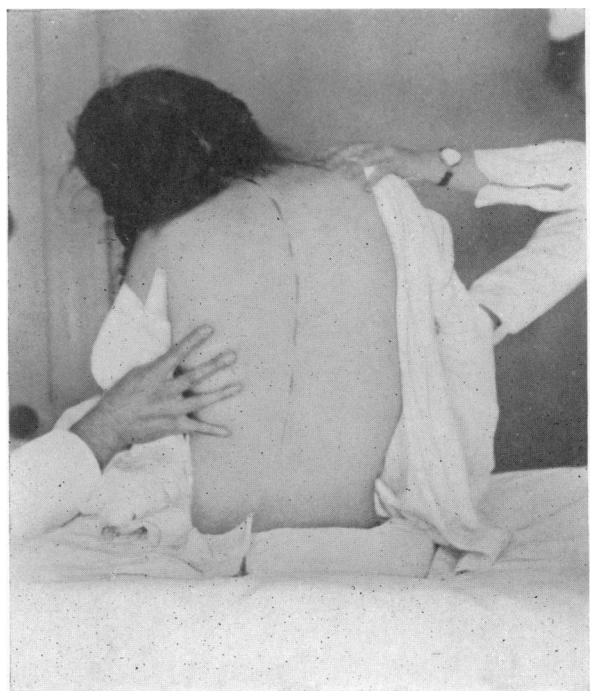

FIG. 18.—Contraction of the neck and shoulder muscles simulating opisthotonus.

Under nitrous oxide anæsthesia Doctor Muller amputated the left arm about four inches below the shoulder. Short flaps were made, the stump was washed with hot sublimate solution, and Dakin's tubes introduced between the flaps, which were not sutured. Through a miscarriage of instructions, tetanus antitoxin was not given. Culture taken at time of operation yielded B. Coli communis.

A good recovery was made. The stump was propped up and the patient voluntarily lay with her head inclined toward the left side, this position giving her the greatest comfort.

On the third day the patient complained of slight pain and stiffness in the neck, which, however, could be straightened voluntarily.

On the tenth day patient complained of "cramps" in the right shoulder, which were quickly relieved by change of position and massage. Patient persisted in keeping her head bent toward the left. On the following day the stump of the left arm was found to be rigid, and there was pleurothotonos toward the left. This was somewhat relaxed by placing patient on her right side (Fig. 18).

This condition remained constant until the thirteenth day, when spasmodic twitching of the stump was observed. These spasms became very painful. The temperature, which had been mounting to 100° F. in the evening, remained unmodified. The pulse, however, had shown a slow and irregular rise from the time of operation, and now averaged 120. Patient seemed nervous and apprehensive, and began to perspire excessively. The probability of tetanus was considered, but with the thought that antitoxin had been administered the diagnosis was held in abeyance.

On the fourteenth day the painful spasms became more intense and more frequent. They occurred almost every half minute, and consisted of a short upward and outward jerk of the stump. A positive diagnosis of tetanus was made. It was furthermore determined that antitoxin had not been administered. There was slight difficulty in mastication but no true trismus. All of the deep tendon reflexes were somewhat exaggerated.

Ten thousand units of antitoxin were given intraspinally, and a like amount intravenously. This was followed by the subcutaneous administration of 5000 units every twelve hours. Large doses of chloral hydrate, chloretone and luminol were used, and a somnolent condition maintained. It was found that luminol alone in doses of 0.1 G. every eight hours was sufficient to maintain the desired state.

On the sixteenth day a second intravenous dose of 10,000 units was given. On the nineteenth day the spasms of the stump became very infrequent, and the general condition was improved, though the patient was very somnolent and perspired excessively. Antitoxin and luminol were stopped on the twenty-second day, and from this time improvement was regular and uneventful. The contracture of the neck and back slowly became released and the patient was discharged on the fortieth day with a healthy granulating stump and in good condition.

A total of 115,000 units of antitoxin was administered, of which 20,000 units were given intravenously, 10,000 intraspinally and the remainder subcutaneously.

Local tetanus was considered a rare occurrence prior to the war, and even some of those so reported were cases of general tetanus with preliminary local manifestations (tetanus ascendens). Thus Demontmerot[1] reported four cases of "parapletic tetanus," of which only one can be properly classified as local tetanus. Axhausen,[2] in analysis of eleven assumed cases, believed only one to be truly localized. A few single case reports appeared up to the time of the war when the number greatly increased, and among the French caused such interest as to justify the publication of the book on abnormal forms of tetanus by Courtois, Suffit and Giroux.

Etienne[3] ascribes the great frequency of local tetanus after war wounds to the fact that the prophylactic injection is able to neutralize the toxin circulating in the blood stream and thus prevent general manifestations. Francaise[4] states that the antitoxin is not effective in preventing localized tetanus, since it cannot affect the toxin already combined in the nerve or nerves. With these opinions a third French writer, Chauvin,[5] is in accord, stating that antitoxin either destroys the circulating toxin or renders the blood unable to transport it.

Bruce,[6] in his tabulation of the 1458 cases of tetanus which occurred in British Home Military Hospitals during the war, states that 201 of these were examples of local tetanus. The ratio of cases of local tetanus to cases of general tetanus tended to become higher each year. He presumes that this was due not only to the introduction of the prophylactic injection of antitoxin, but also to an improvement in the diagnosis of mild and obscure cases. "What in the first years of the war would be considered to be due to a non-specific irritation of nerve and muscle, came afterwards to be recognized as a local manifestation of tetanus." Ashhurst in a recent article points out the similarity between local tetanus and the "experimental" tetanus which had long been observed to follow the injection of relatively non-virulent organisms into the limbs of animals. He ascribes local tetanus to infection by ascent of the toxin along the nerves to the spinal cord, when an arc of increased irritability is established and rigidity and spasm occur. On the other hand, the toxins of a more virulent infection are carried to the spinal cord through the medium of the blood, and affect the shorter nerves supplying the muscles of the neck, the back, mastication, etc.

If we accept the teaching that the toxin of tetanus ascends the motor nerve to the cord, the local muscular spasm of ascending tetanus is due to the involvement of the related segment of the cord. Roughly, the area involved in our case would correspond to the fifth, sixth, seventh, and eighth cervical and first dorsal, as these are the roots reached by toxin ascending the arm nerves (median, ulnar, musculospiral, musculocutaneous, and internal cutaneous). The wide area of spasm—neck, shoulder, and chest—is thus explained. It is difficult to explain why generalization did not occur in this case. The

current explanation of local tetanus is that as a result of prophylactic injection only a small amount of free toxin is possible in the blood and lymph, and only such toxin as is introduced by the motor nerves produces an immediate effect. But this patient received no antitoxin as a prophylactic, and we have noted other similar cases in the literature. We may fairly assume that local tetanus developing after prophylactic injection is the degenerate offspring of what would have been an extremely virulent case of generalized tetanus, and local tetanus developing when no prophylactic injection has been given is probably the counterpart of the mild "experimental tetanus."

A word or two about treatment. All methods for administering the antitoxin were used in this case.

Andrewes[7] questions the value of the intra-thecal route in cases of local tetanus. He concurs in the view of French authorities that it is sufficient to maintain, in these cases, the existing protection by subcutaneous doses, but believes that if trismus is superadded intraspinal injection is indicated. The important point is made that an insufficiently treated case of local tetanus may become general as protection becomes weaker. The matter of dosage is of great importance.

In 1915, Irons[8] condemned the frequently employed method of giving small doses subcutaneously every few hours and gradually increasing the doses as the symptoms advance. She advocated prompt neutralization of all free toxin in the circulatory blood by a large intravenous injection and the neutralization of the toxin already in the central nervous system by intraspinal injection. In the same year Nicoll and Park[9] also wrote of the value of intraspinal (5000 units) and intravenous (10,000 units) injections at the first treatment. The spinal injection to be repeated in twenty-four hours and 10,000 units to be given subcutaneously three or four days later. Ashhurst,[10] in a late paper, follows this plan with a double dose.

There seems to be considerable divergence of opinion as to whether the intraspinal route affords a means to effect a dissociation between the nerve cells and the toxin molecules. Clinical experiences and the experimental researches of Park and Nicoll, Zolla and Sherrington are in favor of this method. Andrewes[7] well says that the "fallacy of all reasoning on this matter lies in the fact that there are no secure physiological premises. There is no actual proof that antitoxin can pass from the cerebrospinal fluid into the substance of the central nervous system, nor any proof that it can reach the neurons from the capillaries adjacent to them. There is no proof that, if these things were true, the antitoxin could dissociate from the neurons the toxin which had already entered into combination with them. Many physiologists hold opinions on these points and arguments can be arrayed on either side, but we have not sufficient proof or even consensus of opinion to enable us to reason safely on such a difficult subject as this."

The following cases seem fairly to be examples of localized tetanus as observed before the changed conditions brought on by the great war.

Esau[11] in 1909 observed the following case: A boy, aged twelve, received

a large charge of bird-shot and powder in his hand. The following day a liberal excision was performed, and three days later the wound was nearly healed. On the next day there occurred painful contracture of the wrist, and this persisted for eight days, the diagnosis of irritation due to the presence of foreign body being made. Re-operation was performed and twenty more shot removed, with the result that the local manifestation in the hand rapidly became general. Serum was used and recovery reported. The injured hand was the last part to lose its contracture.

Axhausen[2], reciting the case of Socin (Kriegschirurgie Erfahrungen, Leipzig, 1872), declared that a soldier with a flesh wound of the shoulder suffered stiffness of the muscles in the neighborhood of the wound beginning on the forty-eighth day. This was succeeded by some stiffness of the neck and clonic contractures of the shoulder at night. Gradual and complete recovery ensued. No antitoxin.

Jacobsen and Pease[12] described a case of Rixford's as occurring seven days after a perforating wound of the lower lip in a man of fifty, and consisting of localized spasms of the face and neck without trismus. The case was of such a mild nature that the diagnosis was questioned. Serum was used from the second day, with recovery.

Demontmerot[1] reported painful spasms of both legs in a man thirty-five years of age, thirteen days after injury (nature and location of injury not stated). There was slight opisthotonos at times, and dysphagia but no trismus though the patient thought he had had trismus before admission. Recovery followed a single injection of antitoxin.

Dr. George P. Muller said that this patient was a typical case of traumatic gangrene, black, malodorous, and with a line of demarcation dividing the part which had lost its blood supply. The injury was of the brachial artery just above the elbow. An amputation by transfixion was done and the flaps were left open. A bacteriological examination was made for gas bacilli and none was found, only bacillus coli communis. When she first developed symptoms he thought that torticollis had developed. She was perfectly well and smiled and talked of the stiffness of her neck and shoulder. It was only two or three days later that they realized the nature of the trouble. All this time they were under the supposition that antitoxin had been given, and it was only when the details of her care in the ward were discussed that no record could be found of antitoxin injection having been given. The one responsible for giving it stated that he believed he had not given it. Doctor Frazier and Doctor McConnell also thought it was tetanus. As to the treatment. In regard to the use of luminol, last summer in Atlantic City he heard Doctor Dercum talk on epilepsy. He asked him if luminol could be used in conditions of motor convulsions such as tetanus, and he thought it might be very valuable, and so he tried the luminol in this case. The results were quite satisfactory in producing somnolence, not only in this but in a subsequent case in the University Hospital, when the boy was practically asleep during the entire twenty-four hours after they got him under its influence. As to the value of

the intraspinal injection the evidence is very conflicting, and it is not possible at the present time to reason clearly that the antitoxin put on the outside of the cord enters the cord itself and fuses with the nerve cell and dissociates the toxin. It seems much more reasonable to believe that the intravenous method would carry antitoxin to the motor cells just as efficiently as does the cerebrospinal fluid with its different specific gravity from the tissue serum. However, one must consider clinical experience, and spinal injection has showed its value and should not be abandoned until someone definitely shows us why it should. War literature shows us nothing; Bruce's statistics show conflicting evidence for and against the intraspinal method of administering antitoxin. He thought probably too much antitoxin was given to this particular patient. If they had been satisfied with one injection in the vein, one in the spinal fluid, and given small doses subcutaneously to further saturate the blood serum, say 50,000 units in all, they might have accomplished just as good results. But it is interesting to study the statistics of Gessner at the Charity Hospital in New Orleans, in which there was very little difference in the series of cases between those who received antitoxin and those who did not receive antitoxin; when tetanus has developed, ordinarily it proceeds with the most startling rapidity and severity and then one realizes the inestimable value of the prophylactic dose. One other point: Hurst in a recent paper on tetanus states that the British Tetanus Committee wrote to a large number of surgeons asking what was their experience with muscular contractions following civil injuries in industrial establishments, and with one exception eighty replied that they did not see them; whereupon it was concluded that muscular contractions following war injuries were due to local tetanus. Hurst believes that some of the cases are of hysterical origin. So the larger number in Bruce's table may upon further study be materially lessened. All writers mention the fact that Courtellement in 1915 was the first to mention local tetanus and that it was a product of the war, but Doctor Taylor searching the literature found several strictly local cases in the pre-war literature.

THE SURGERY OF INFANTILE PARALYSIS

DR. J. TORRANCE RUGH then delivered the annual oration on surgery before the Academy, his theme being "The Surgery of Infantile Paralysis." For this oration see page 61.

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