TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, November 6, 1899.

The President, RICHARD H. HARTE, M.D., in the Chair.

PYLOROPLASTY FOR NON-MALIGNANT STRICTURE.

DR. JOHN B. ROBERTS presented a man, fifty-five years of age, who had suffered with gastric symptoms accompanied by vomiting for fifteen or eighteen years. It was difficult to get from him an explicit history by which the exact date of the beginning of the vomiting could be ascertained. He, however, had been getting worse for the past year. He was greatly emaciated and vomited nearly all food taken. Eructations and intestinal flatulence were more or less constant symptoms when he first came under the reporter's observation in February, 1899. The character of the material vomited was suggestive of dilated stomach. This diagnosis was confirmed by physical examination, which showed the lower border of the stomach to be much lower than normal. The diagnosis reached was that the case was one of gastric dilatation, probably due to a non-malignant contraction of the pyloric orifice. The other organs of the patient seemed to be normal.

On April 4, 1899, a section was made through the abdominal wall, by which the pyloric end of the stomach was brought into view; a longitudinal incision through the anterior wall of the pylorus was then made. No tumor was found, but the muscular tissue surrounding the pylorus seemed to have become to a large extent fibrous. There was no distinct evidence of a cicatrix from previous ulceration, and no irregular puckering of the tissues. The longitudinal incision was sutured, as in the well-known operation of pyloroplasty, at right angles to the line of incision so as to increase the calibre of the orifice. The stomach seemed dilated, but there was no special evidence of it being displaced downwards.

The man promptly recovered from the operation, has gained many pounds in weight, and when seen a few weeks ago said that he could eat anything and digest it without difficulty.

Dr. Roberts added that in 1896 he operated upon a man who was thought to have a slowly growing infiltrating carcinoma of the pylorus. The patient had violent attacks of pain in the gastric region, and was willing to submit to operation because of his suffering. When the abdomen was opened and the stomach explored with the finger, no tumor was found and no contraction of the pyloric orifice. The patient made a prompt recovery from the operative procedure, and subsequently was greatly improved in his symptoms. He later, however, had some return of pain. The further history of the case is unknown. It was probably a case of gastralgia.

These two cases are of interest, as showing the ease and simplicity with which aseptic exploration of the stomach can be done, and emphasize further the fact that obscure cases are with propriety subjected to exploratory incision. The second case shows the difficulty of making the diagnosis even with the advantages now possessed by the profession in investigation of disorders of the stomach.

GASTRO-JEJUNOSTOMY.

Dr. Roberts reported the following case: R. F., a man aged thirty-five years, who had had symptoms of pyloric obstruction for three or four years, was operated upon by him at the Polyclinic Hospital in November, 1895. He made an anastomosis by linear incision and suturing between the stomach and the jejunum. The patient died on the second day after operation after having had a temperature reaching 104°. An examination of the abdomen and seat of operation after death showed, however, no special evidence of septic inflammation.

INTESTINAL ANASTOMOSIS.

Dr. Roberts presented a specimen showing a lateral anastomosis of the colon and sigmoid flexure made with the Murphy button three months previous to death. The patient was operated upon because of a spontaneous fæcal fistule in the left lumbar region resulting from malignant disease of the sigmoid flexure causing stricture. As the connection made by intestinal anastomosis did not divert the entire stream of fæces from the fistula in the loin, he re-opened the abdomen, and three months after the original operation extracted a portion of

sigmoid flexure containing the malignant growth and the fæcal fistula. The intestine above and below the excised portion was then united end-to-end by means of a Murphy button. Death occurred from sepsis the day after the operation. The specimen showed the lateral anastomosis three months old with an opening not much contracted, and at the same time exhibits the second end-to-end anastomosis, which, however, has not had time to become united.

EXTIRPATION OF GASSERIAN GANGLION.

DR. JOSEPH M. SPELLISSY reported two cases of Gasserian ganglion extirpation.

EXCISION OF THE EXTERNAL TWO-THIRDS OF A GASSERIAN GANGLION, BY THE HARTLEY-KRAUSE METHOD, AFTER PRELIMINARY LIGATION OF THE EXTERNAL CAROTID ARTERY.

By JOSEPH M. SPELLISSY, M.D.,

OF PHILADELPHIA.

It is due to the courtesy of Dr. Thomas G. Morton that it has been my privilege to operate on this case and to report it. By several years, it is yet too early to announce it as a cured case of trifacial neuralgia. It is, therefore, only published now to add to the scant existing testimony concerning the utility or fatuity of ligating the external carotid artery as a step preliminary to the Hartley-Krause method of excising the Gasserian ganglion.

Case of H. S., fifty-five years of age, a blacksmith, who was admitted to the Orthopædic Hospital, of Philadelphia, on July 11, 1899.

The family history is negative. The past history: He does not use tobacco, takes alcohol moderately, and denies specific disease. During the past few months he has occasionally taken small amounts of laudanum to relieve the extreme pain of a right trifacial neuralgia. Excepting neuralgia, he has always enjoyed good health.

The present complaint is that of a right-sided facial neuralgia which began nine years ago. It followed sudden chilling immediately after hard work at blacksmithing. The pain at this time resembled toothache, and several teeth on the right, the affected side, were removed, but without relief.

Four years ago, April 22, 1895, the attacks of pain had become so severe, frequent, and of such duration that Dr. T. G. Morton ex-

cised the right infra-orbital nerve. Eight months' relief from pain followed this operation.

February, 1896.—Nine months after the infra-orbital operation the right inferior dental nerve was excised by Dr. T. G. Morton. Eighteen months' relief from pain resulted.

July 11, 1899.—During the past two years the attacks of pain have increased in frequency, severity and duration. The acts of swallowing, of eating, and of washing the face provoke paroxysms of pain which are agonizing. Temporary relief is sometimes obtained by hard pressure against the cheek. He has been unable to work for some months. He suffers most at night, and cannot sleep till morning.

The physical examination found the heart, lungs, urine, muscular power and action and the sense of taste normal.

The nasal passages exhibited structural deformities and evidences of chronic disease, but not of sufficient degree to cause pressure and excite pain. The presence of pharyngitis and thickened vocal cords were also observed. The hearing is impaired.

The examination of the eyes, kindly made by Dr. A. G. Thomson, discovered in the left fundus a patch of choroiditis that suggested a specific history. The eyes were otherwise normal. The first, the infra-orbital, operation was followed by closure of the right lachrymal duct, and constant watering of the right eye.

The reflexes were normal, with the exception of the knee-jerks, which were impaired.

Sensation was hyperæsthetic in four areas of the right face: First, under the right eye; second, at the angle of the mouth; third, in the vicinity of the infra-orbital scar; and fourth, about the external auditory meatus.

The electrical reactions of the muscles of the face and head, for which I am indebted to Dr. Boyer, were of equal character. The weakest current was used to elicit the response, and even it caused much pain.

The patient was informed that the mortality of Gasserian ganglion removed was about 20 per cent., and he was advised not to run the grave risks of operation unless he considered that life, in his present condition, had become intolerable and not too dear to risk for the sake of at least temporary relief. He elected the operation; a date was set for it and the details of procedure considered.

The reports of operators and the memory of a Gasserian ganglion operation that I had witnessed gave me a wholesome respect for

middle meningeal hæmorrhage, and a readiness to try the effect of a preliminary ligation of the external carotid, as successfully practised by Fowler in his second Gasserian ganglion operation, for which he prepared, and was the first one to prepare, by an external carotid ligation. In his third operation he did his second preliminary ligation of the external carotid,—but this time, on raising the dura from the base of the skull he was so embarrassed by hæmorrhage that he had to pack with gauze and attempt the completion of the operation later, when he was again met by hæmorrhage, which prevented removal of the ganglion. The vessels from which the hæmorrhage came were not named.

The favorable results of L. McL. Tiffany, of Baltimore, obtained by excising the trunks of the second and third branches of the fifth nerve, and of the external two-thirds of the ganglion, that is,—the part of it that is in continuity with the trunks of the second and third branches,—led me to prefer this conservative procedure. It, from reported results, seemed to be sufficiently radical while being free from a history of subsequent loss of the eye on the affected side, such as has followed complete ganglion removal, with the division of the first or ophthalmic branch of the nerve in patients of Rose, Krause, Keen and also of Tiffany.

The day before the operation the carotid ligation and ganglion excision were rehearsed, respectively, on both sides of the head and neck of a cadaver. This proved a most valuable preparation and brought home the necessity, in cutting the bone flaps, to carry the bone cutting fully down to the level of the upper border of the zygoma, to insure a flap that hinges on a level with the floor of the skull. Failure to secure this much embarrasses the operation. The difficulty experienced and the care required for the separation of the dura from the floor of the skull, and from the ganglion itself, was a very necessary training.

July 19, 1899.—The operation was performed with the invaluable assistance of Dr. T. S. K. Morton. The external carotid was ligated near the angle of the jaw and above the hypoglossal nerve.[1] The aim was to tie above the facial and occipital arteries.

A Hartley-Krause flap was cut, chiselled and turned down on a level with the floor of the skull, and though the middle meningeal artery tunneled the bone of the flap and was cut transversely, there was no hæmorrhage. The dura was separated from the base of the

[1] Subsequent reference to dissections leaves me without doubt that I did tie above the arteries.

skull and then slightly slit, as recommended by Tiffany, to get rid of the cerebro-spinal fluid. An excellent view of the field of operation was thus obtained, there being no need of artificial light.

The second branch of the nerve, at the foramen rotundum, was secured by a ligature passed beneath it by a small aneurism needle. The third branch was seized at the foramen ovale by forceps. The two trunks were severed by a cutting hook and the distal ends tucked into the foramina. With the ligature and the forceps as a hold the external two-thirds of the ganglion was now dissected, cut, torn, and curetted away. It was most adherent and was removed in fragments too small to promise results from microscopic study.

A little venous oozing drained continually into the field of operation, which was, as it were, the bottom of a well, but kept in easy view by sponging, and there was at no time a flow of blood that could be called active hæmorrhage.

A gauze drain was left at the base of the brain and brought out at the posterior angle of the wound. The pericranium was sutured independently from the scalp so as to prevent depression of the bone flaps. Where the path of the bone cutting has been broad, depression of the bone flap may be prevented by inserting in each of its angles and in its summit a sterilized peg, to be received in a slot in the skull border opposite.

The eye was closed with adhesive plaster. The double operation occupied nearly two hours. The anæsthetic was ether.

The night of the day of operation the patient suffered from violent ether delirium. He was perfectly rational on the following morning, when the hyperæsthetic areas were found to have become anæsthetic. On account of the flow of cerebro-spinal fluid the dressings were twice reinforced in the first twenty-four hours, at the end of which some of the gauze packing was removed, and it was all out on the second day. The bowels were opened on the second day. On the third day a stitch that had slipped was re-introduced, after slight curetting of the neighboring edges of the wound. The temperature on this day reached its highest point, which was 100°. The convalescence was uneventful. The extremes of pulse rate were 110 and and 65, and of respiration, 24 and 17. The stitches were out on the seventh and the patient in his chair on the eleventh day. He went to a shop to be fitted for goggles on the tenth, and was discharged on the thirty-first day.

For the care of the eye I am much indebted to the kind suggestion of Dr. William J. Taylor. It was washed several times a day

with boric acid solution and kept closed till fitted with goggles, which were worn as a protection for several weeks and gradually abandoned. Examination of the eye by Dr. Thomson at the time of the patient's discharge discovered no change resulting from the operation.

On examining the electrical reactions Dr. Boyer reported no change resulting from the operation, except that whereas before the muscles had responded to three and one-half milliampères, which had caused pain, it took eight and one-half milliampères after the operation to elicit muscular contraction, and it was unattended by pain.

Exhibition of Patient.—It is now two and a half months since the operation, and, excepting one momentary twinge, there has been no return of pain, but there is unequal action of the lower jaw and a dribbling of saliva, which in this instance are the price paid for release from neuralgic pain and for section of the motor fibres of the third branch of the fifth nerve. It was intended, as advised by Tiffany, to attempt the isolation and conservation of these fibres and so avoid this loss of jaw and cheek control, but the time occupied by the essential steps in this operation did not permit it. If the circumstances are favorable I think the effort should be made to save these fibres, and if I were again operating for Gasserian ganglion removal, my present experience would lead me to again, as a preliminary step, tie the external carotid.

DISCUSSION.

Dr. Gwilym G. Davis remarked as to the nutrition of the flap, that he had heard of a case sometime ago in which following the ligation of the external carotid artery the flap sloughed. The flap is cut with its base downwards; therefore, that cuts the vessels coming from above, and, ligating the external carotid, deprives it of blood from below. It is evident that in this case the nutrition of the flap was preserved, but it seems that it is not always so. A method of avoiding the possible occurrence of this disturbance of circulation would be by cutting the flap with its base upwards, instead of its base downwards. Then the circulation of the flap would continue through the blood-vessels, across the scalp, for the circulation in the scalp is very free and extensive.

Dr. Addinell Hewson said that the deep temporal artery comes from the internal maxillary and not from the temporal,—the terminal of the external carotid. The flap can be nourished from the branches of the internal maxillary artery. There are several temporal branches

from that, and it does not require the temporal branches of the external carotid to nourish it, so that in performing the operation, as Dr. Spellissy did, he did the proper thing. He cut into the artery before he got to the portion of the internal maxillary. If he ligated below he would cut off the meningeal branches, of course, but if he ligated above, his object was to preserve the facial, so that he might get anastomosis with the flap through the facial artery and through the occipital. If he ligates below the internal maxillary artery he stops his middle meningeal, but if he ligates in the position he did, he allows the anastomosis to take place between the occipital and the superficial branches of the facial with anastomosis of the temporal.

DR. DAVIS rejoined that as he understood it, this ligation occurred below the internal maxillary. The internal maxillary is given off quite high up. The ligation in this case, he believed Dr. Spellissy said, was behind the angle of the jaw, that is, considerably below the internal maxillary. Therefore, no blood could have been supplied from the deep temporal arteries, nor the meningeal, nor the tympanic, small meningeal, or other various muscular branches. It was probably nourished from the facial.

DR. JOSEPH M. SPELLISSY said that the life of the flap was to be credited much to its good care by Dr. T. S. K. Morton. When its circulation was most in danger, when it was turned down during the operation and subjected to pressure, he gave it substantial help by keeping it warm with moist gauze. At the time of the operation, and for several days after, Dr. Spellissy was ignorant of the terminal history of the case to which Dr. Davis alluded. That the artery had been tied as a preliminary step and had been followed by immunity from middle meningeal hæmorrhage was known; but it was not known that the flap in this case had afterwards sloughed. Had Dr. Spellissy been aware of this he might not have dared to tie the external carotid artery, and had he learned it immediately after operating he would then have kept warm, moist dressings on the flap for a couple of days subsequent to the operation. The event, however, shows that such extraordinary precaution was unnecessary in the case reported.

CASES OF ANOMALOUS SPINOUS PROCESS OF THE SEVENTH CERVICAL VERTEBRA ARTICULATING WITH THE SCAPULA.

DR. H. AUGUSTUS WILSON presented two patients and read the histories connected therewith.

TWO CASES OF ANOMALOUS SPINOUS PROCESS OF SEVENTH CERVICAL VERTEBRA ARTICULATING WITH THE SCAPULA.

By H. AUGUSTUS WILSON, M.D.,

CLINICAL PROFESSOR OF ORTHOPÆDIC SURGERY IN THE JEFFERSON MEDICAL COLLEGE; ORTHOPÆDIC SURGEON TO THE PHILADELPHIA HOSPITAL,

AND

J. TORRANCE RUGH, M.D.,

OF PHILADELPHIA,

DEMONSTRATOR OF ORTHOPÆDIC SURGERY IN THE JEFFERSON MEDICAL COLLEGE.

WITHIN a period of two weeks two patients were brought to the Orthopædic Department of the Jefferson Medical College Hospital, with conditions about the same.

The first patient was sent by Dr. W. F. Morrison, of this city, to determine what could be done for her shoulder, which was supposed to have been injured at birth. The child was seven years of age, of very slender build, and enjoyed excellent health. The history of perfectly normal birth was obtained, also that the condition was noticed soon after she was born and was thought to be a pressure paralysis occasioned in some way at the time of delivery.

Her general appearance was that of one affected with torticollis. The head seemed markedly drawn to the left side, and attempted movement to the right showed the cervical muscles on the left side to be much shortened and quite tense. (Fig. 1.) After being stripped, the seeming lateral turning of the head was found to depend upon the elevation of the shoulder (Fig. 2), and this in turn was readily observed to be firmly ankylosed to the spine. The spare condition of the child favored a very satisfactory examination, and permitted the outlining of all the spinous processes excepting that of the first dorsal.

Movement at the scapulo-humeral joint was free and normal in all directions. When, however, both hands were put forward, the left was found about one and one-half inches shorter than the right;

FIG. 1.—Case I.

also there was noted inability to stretch the arm directly upward (Figs. 3 and 4) when these movements were attempted; the scapula was seen to move about a point at its posterior superior angle as a

centre, and could not be raised and lowered, moved forward or backward, or rotated as could the other one. The diagnosis of "anchoring of the scapula to the spine" was then made, and the case held under advisement.

FIG. 2.—Case I.

In two weeks the second case, a patient of Dr. L. E. Taubel, of this city, presented herself and was operated upon, as detailed later, and the uniformly good results obtained indicated a similar procedure

in the younger girl. The X-ray was used prior to operation, but for some undetermined reason a satisfactory negative was not obtained. The operation was performed on July 13, 1899, by Dr. Rugh, assisted by Dr. H. M. Righter and Dr. T. H. McGhee. The incision was

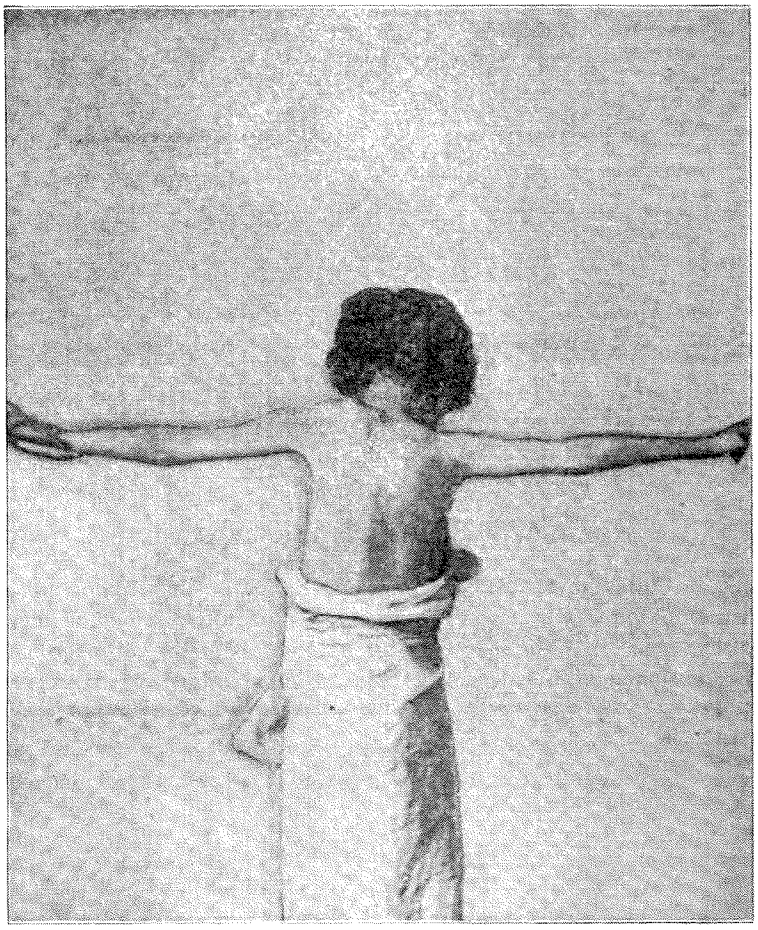

FIG. 3.—Case I.

made directly over the vertebro-scapular articulation, and the interposed bone readily exposed. The scapular end was first separated, the bone seized with strong forceps and cut off about one and one-half inches higher up. The scapula was then found freely movable.

The wound was dried and closed without drainage, and a large wedge-shaped pad, base upwards, placed in the axilla and the arm firmly bandaged to the side. Union by first intention occurred, and free gymnastic exercises were given to increase the mobility of the

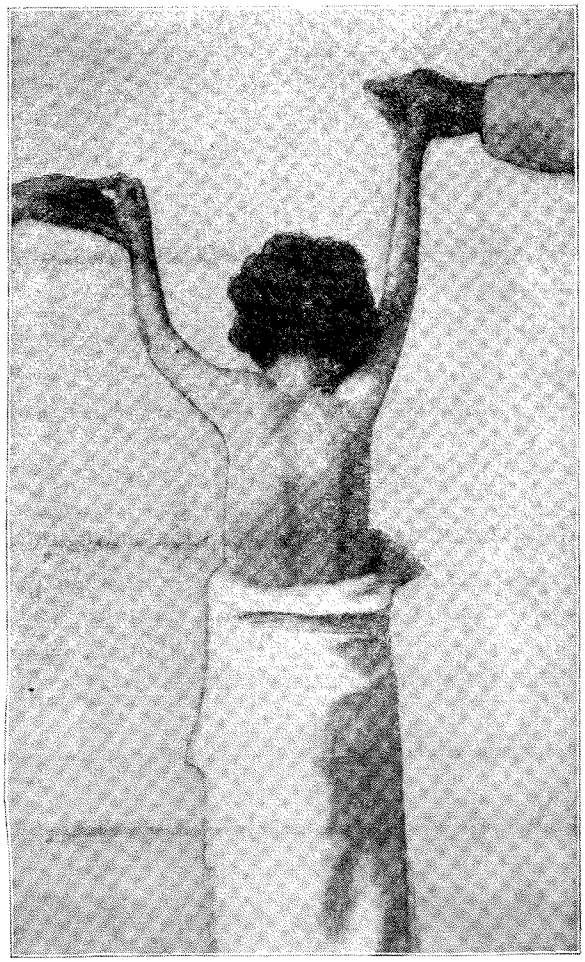

FIG. 4.—Case I.

scapula. No pain or other unpleasant symptoms have followed the operation; the two shoulders are now the same length, and there is every reason to believe that when she has attained her growth there will be present no trace of her former condition.

The elder girl, aged sixteen, when seen by Dr. Wilson, who had not seen the first case, complained of limitation of motion of left shoulder, stating that the left shoulder blade was higher than the right, and had always been so.

FIG. 5.—Case II.

The statements were so similar to those made by patients with rotary-lateral curvature, except as to duration, that no further inquiry was made at that time, and inspection was made at once with the

shoulders and trunk bare above the waist. While standing at ease the left shoulder and scapula occupied a conspicuously higher position than normal, as shown in Fig. 5. With the index and next fingers placed upon either side of the spinous processes, the prominent process of the seventh cervical vertebra was taken as a starting-point to observe any deviation of the spinal column. At once there was observed to be some apparent irregularity, for instead of the usual ease of following the spines of the dorsal vertebræ, something seemed to divert the fingers to the left, which at first appeared to be a divergence of the entire spinal column.

This divergence appeared to be slight bending of the cervical and dorsal vertebræ, with the convexity to the left and with a very considerable amount of rotation, throwing the spinous processes in the line of the conspicuous irregularity above referred to. In bending forward to the extreme limit, the spinal column appeared to arch forward normally, and each of the methods usually resorted to for determination of rotary-lateral curvature demonstrated absence of that deformity.

Attention was now directed to the movements of the shoulders, and the patient was directed to raise both arms from the sides to above the head. In attempting this movement, as the arms reached a point of extension at the sides on a level with the shoulders, it was found that the left shoulder was markedly elevated and occupied a position nearer to the spinal column than the right. (Fig. 6.) The left arm could be raised high above the shoulders when the head was thrown to the right side, for which there was then no apparent explanation, but which, in the light of subsequent events, was clearly due to the ossific connection between the scapula and cervical vertebra.

The left shoulder was not only higher than the right, but was also nearer to the spinal column by one-half inch, which condition was associated with a marked increase in the curves of the left scapula.

Recourse was now had to the X-ray for information as to the condition of the bones, which could not be definitely ascertained by manual manipulative methods. The patient was placed upon her back upon a board table, and the Crooks tube placed directly over the median line of the neck at a height of twelve inches, and Mr. L. H. Prince obtained the photograph (Fig. 7). This showed the presence of an unnatural substance, having about the same density as the ribs in the same subject, and occupying an oblique position, which in

the photograph appeared to start from the cervical vertebræ somewhere below the skull and to extend to the left scapula. The spinal column was shown to be curved with concavity to the left, which is

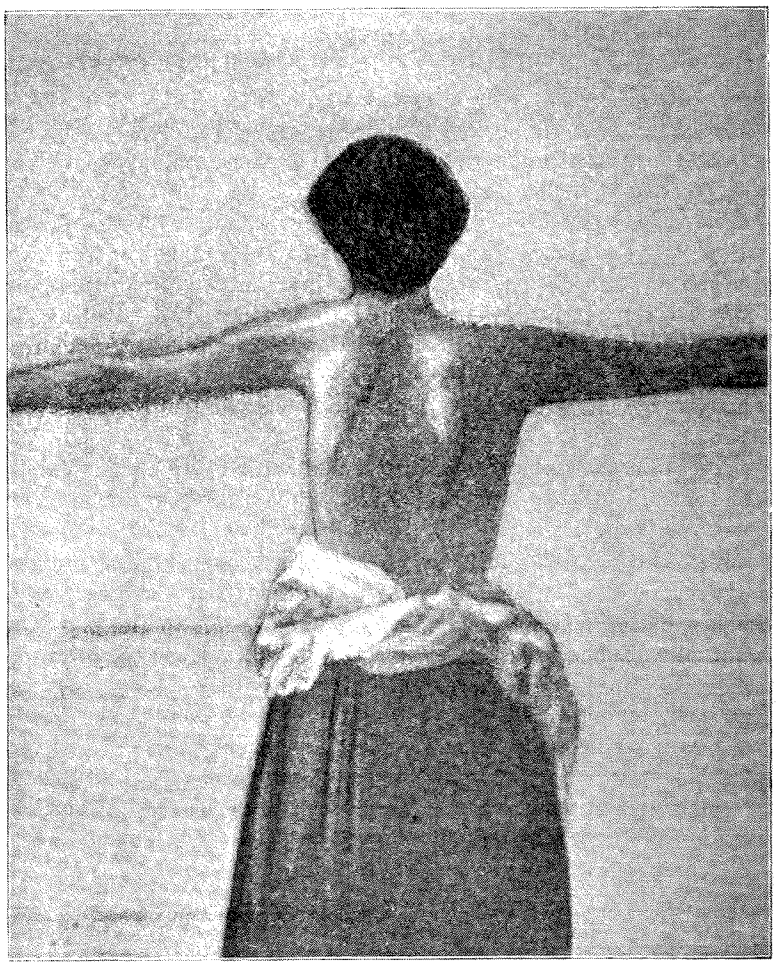

FIG. 6.—Case II.

not in accord with cases of rotary-lateral curvature where the left scapula is higher. This observation entirely disproved the impressions gained by the previous manual examination. A second X-ray was taken with the patient in the same position as in the first, the Crooks

FIG. 7.—Skiagraph showing patient in the directly antero-posterior position.

FIG. 8.—Skiagraph obliquely from left front, patient on back.

tube, however, being placed about eight inches to the left of the median line of the neck, and the resulting photograph (Fig. 8) is shown, confirming in every respect the conditions found in the first one.

It was now apparent that further and definite information could only be obtained by an exploratory incision, at which time this apparently supernumerary bone could be excised, if practicable. The conditions being explained to the patient and her family, and their full consent being obtained, the patient, on June 15, 1899, was etherized by Dr. H. M. Righter and operated upon by Dr. Wilson, assisted by Dr. Rugh. An incision was made in a line with the supernumerary bone, which was found to be placed superficially, having only a few muscular fibres between it and the skin. As soon as the bone was isolated throughout its length, its fibrous connection with the scapula was severed, and it was found that its upper end was firmly attached to the spinal column, for any motion in manipulation caused a corresponding motion of the head. The upper end was found to have an osseous union with the seventh cervical vertebra, and it was cut by bone forceps quite close thereto. There was no other spinous process for the seventh cervical vertebra. The wound was closed and the patient made an uninterrupted recovery.

The patient was drilled in a few gymnastic movements, which resulted in increased freedom of motion, and very little evidence of the former disability now remains. This patient was at various times taken to several hospitals in this city, but apparently without a correct diagnosis having been made, which is easily accounted for, inasmuch as she was subjected to the X-rays for the first time after she came to the Jefferson Hospital.

Prior to the time of the operation upon the elder girl, and with the X-ray pictures in hand, she was seen at our request by Dr. Harry M. Sherman, of San Francisco, Dr. J. Chalmers Da Costa, Dr. W. J. Hearn and many others, but no positive explanation of this growth was obtained, other than that it was a congenital anomaly of unique form. Dr. Sherman thought it might be an ossified rhomboid muscle; Drs. Da Costa, Hearn, and Wilson were non-committal; while Dr. Rugh, who alone had the advantage of carefully studying the case of the younger girl, believed that an elongated spinous process caused the condition present in both cases.

The bone removed from the elder girl (Fig. 9) was two inches long and one and three-quarters inches in circumference, being firmly attached at its spinal end by bony union, yet showing signs of having

had other form of attachment in early life. At the scapular end there was a well-rounded articulating surface where it was in contact with the edge of the scapula. The bone is in shape, size, and general appearance an enlarged spinous process, having a very dense outer layer and reticulated inner part, and tapering from the base to the apex. It is not so flat as a rib, and shows no evidence of a groove on its under surface.

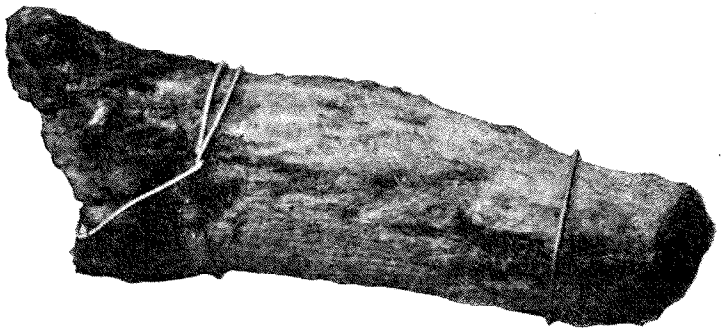

FIG. 9.

The bone removed from the younger girl (Fig. 10) was one and a quarter inches long and one and an eighth inches in circumference. At the spinal end there appears two small tuberosities, which, together with the space between them, were covered with articular cartilage, as was also the scapular end. These tuberosities gave the specimen the

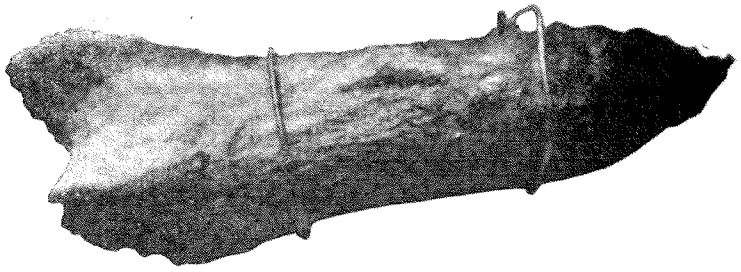

FIG. 10.

appearance of a spinous process, they being the parts which have attachment with the laminæ of the arch.

Francis L. Parker, in "Observations on Some Osteological Anomalies of the Vertebral Column" (*American Journal of the Medical Sciences*, 1869, n. s., lviii, p. 93), says that "unless associ-

ated with some variety of cranial deficiency, the cervical region is less involved than any of the others."

In searching for an explanation of these unique cases, no similar cases could be found in English, French, or German literature, the nearest approach thereto being found in what is termed cervical ribs.

John Struthers, in his paper "On Variations of the Vertebræ and Ribs in Man" (*Journal of Anatomy and Physiology*, London, 1874, ix, p. 17), says: "It is, however, common among quadrupeds to have the first rib articulating with the seventh cervical vertebra as well as with the first dorsal." He describes eleven specimens of cervical ribs attached to cervical vertebræ found in his dissecting-room in the University of Aberdeen. Nothing to correspond with these two cases now reported were referred to, and we believe them to be unique.

The characteristics of both specimens render justifiable the theory that there has been an extra centre of ossification for a spinous process, and this has been pushed or placed beyond the normal centre for the process of the seventh cervical vertebra, though this does not account for the fact that in both cases there was firm articulation with the scapula.

DISCUSSION.

Dr. De Forest Willard said, that from personal experience he should say that these cases were absolutely unique. If he had ever seen such a condition, he had never recognized it. He could realize that such a condition might exist and on casual examination be taken for a lateral curvature or torticollis. He could not understand how a false rib could arise from the spinous process,—it would more probably spring from the lateral process—neither could he understand how the spinous process could become attached to the internal upper angle of the scapula, for in embryonic life the scapula in its natural condition is a considerable distance from the spinous process. There must have been some developmental fault with abnormal bone growth to have produced this condition which has been heretofore unrecognized.

So far as he could understand from the history, this was not an outgrowth or a prolongation from the spinous process, but was a bone

articulated to it, and also to the scapula, extending directly across and adjoining the two. It would seem to be one of those congenital conditions of development that sometimes occur, but which are exceedingly rare. If this is an exostosis it is certainly in a very peculiar position. He saw a girl last week who had from fifteen to twenty of these exostoses, the tendency to proliferation being very marked in her case, but none of the growths resembling either of these specimens.

DR. ADDINELL HEWSON remarked that there might possibly be some explanation, judging from the formation of the supernumerary ribs as given in some of the works on anatomy on the subject. In the supernumerary rib we are told that the formation of that rib grows from the lower portion of that rib above and from the interarticular cartilage, and it seemed to him that there might have been a prolongation of this outwards along the body of the vertebra, and thence out along the canal to the spinous process. It is merely a surmise.

Then another point of explanation might come into this, in that the projection of the spinous process, as was hinted at by Dr. Willard, the spinous process might have been greatly enlarged and abnormally developed.

His idea was, on first seeing the case, instead of the spinous process being a simple knob, as it should be in the upper thoracic region, it has obtained more of the view of the spinous process in the cervical region which, above the seventh, ought to be bifid. It seemed to him, from the nature of the spinous process in the negro, that such a condition as this would be absolutely impossible, because the works speak of the deformity, knob-like and not bifid condition, of the lower part of the cervical region and the upper part of the thoracic region, although the knob of the spinous process in the thoracic region has been or is being seen not bifid. In these cases they might have been in a bifid condition. Dr. Wilson did not mention clearly in his paper that he saw any bifid condition of the spinous process.

The other point mentioned by Dr. Wilson is that it might have been a rhomboid muscle. This bone may be an hypertrophy of the lateral bony projections on the seventh cervical vertebra.

DR. WILSON said that the removed bone in each case appeared to be attached to the vertebral column as a spinous process is normally attached and then deflected to the left, and articulating with the scapula. It resembled a large spinous process and seemed to take the place of the seventh cervical vertebra.

DR. DE FOREST WILLARD said that on examination of the bones

removed the one from the smaller child has apparently not been cut away from the spinous process of the vertebra, but there is a true articulation. If this was an elongated spinous process there would be no such articulation. Dr. Wilson says there was not an articulation or joint at the scapular extremity. In the second case there also seems to be no articulation with the spinous process of the vertebra, and it bears evidence of having been cut away from the spinous process. Certainly the theory of a supernumerary rib would not be carried out.

DR. H. AUGUSTUS WILSON said that with reference to Dr. Hewson's remarks about a bifid specimen, in describing the smaller specimen, attention was called to its having two distinct tuberosities at the vertebra, and in the smaller specimen Dr. Rugh found distinctly a separate articulation, not alone with the scapula, but as well with the vertebra. In the larger specimen Dr. Wilson found a distinct articulation with the scapula, and evidence of there having been previously a fibrous or distinct articulation with the spinal column.

With reference to Dr. Hewson's question as to muscles, it was difficult to definitely determine the exact anatomical positions and relations of muscles, as it was recognized that the presence of this supernumerary bone must alter any such relations.

THE USE OF FIXATION PLATES IN THE TREATMENT OF FRACTURES OF THE LEG.

DR. LEWIS W. STEINBACH read a paper with the above title.

ON THE USE OF FIXATION PLATES IN THE TREATMENT OF FRACTURES OF THE LEG.

By LEWIS W. STEINBACH, M.D.,

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THE universal recognition of the principle of antisepsis has brought about so great a change in the treatment of fractures of the leg, that, excepting for injuries of the severest type, primary amputation is no longer resorted to, and is rarely practised even in hospitals with a large accident service.

This spirit of conservatism has brought into general practice methods formerly employed by the boldest only, and in our day every effort is made to save a leg, no matter how severely it may be crushed, as long as the important blood-vessels and nerves remain intact to nourish the injured limb.

We are prepared to enlarge existing wounds or to make free incisions in order to gain access to the broken ends of the bones, remove fragments, blood clots, bundles of soft tissues which by their interposition prevent coaptation. Sutures, pegs, screws and staples are employed to retain the fragments in apposition to secure union of bone and usefulness of the injured leg.

The application of the Röntgen discovery to the uses of surgery has further expanded the field of conservatism in supplementing the known diagnostic signs by furnishing the means for direct inspection of the broken bones; it enables us to obtain far more reliable information about the direction and the character of the fracture, as well as the position of the fragments than is possible by surface inspection and palpation alone. We can turn the information thus obtained to the purpose of securing greater perfection in the result of the treatment.

It seems that this marvellous discovery has not been accorded its full merit, and it is yet contended that it usually affords

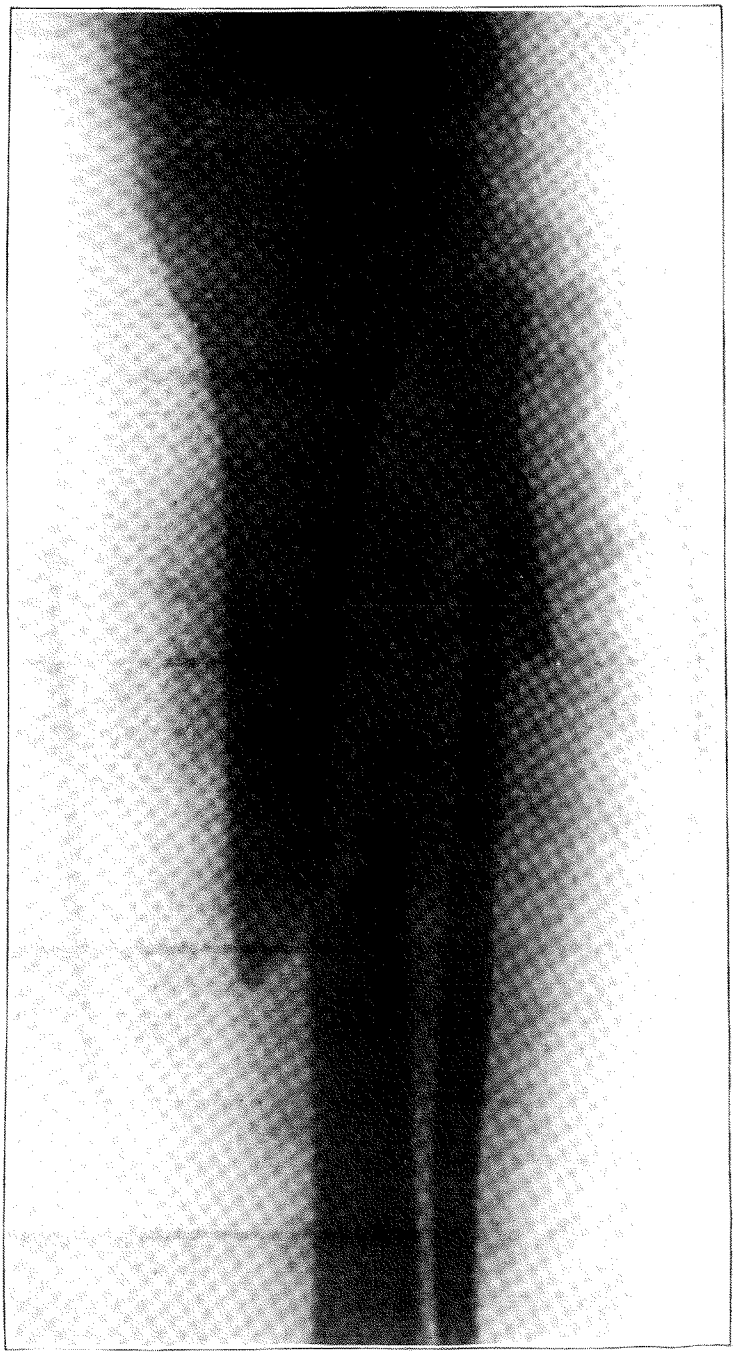

FIG. 1.—Showing broken tibia and fibula at different levels.

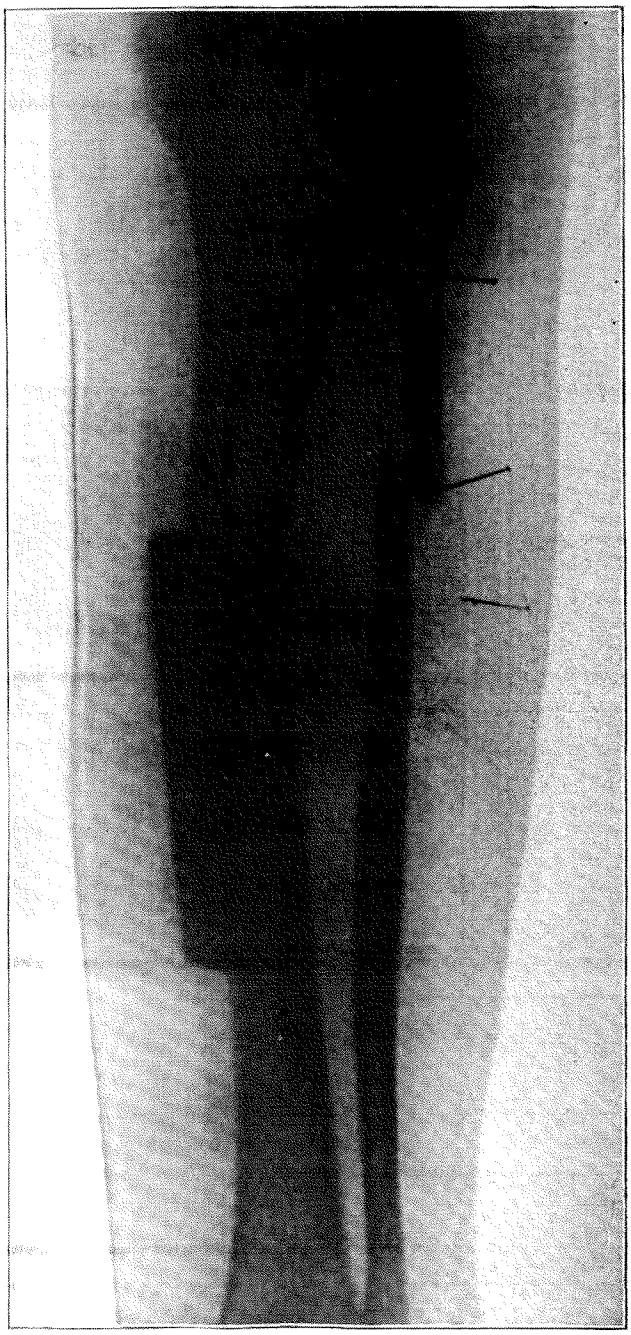

FIG. 2.—Showing good approximation and absence of firm callus.

no better information than can be obtained by inspection and touch. Our own experience, limited though it be, bids us to place the highest estimate upon the value of the skiagram. Even if owing to the direction from which the shadow is cast upon the plate, it at times fails to indicate the line of simple fracture without displacement, on the other hand it does not picture to us fractures, fragments and displacements unless these exist; and instances are not rare where the Röntgen rays have revealed conditions that were not previously recognized.

The danger of the mere possibility of failing to recognize improper apposition of the ends of a broken bone, ought itself make the employment of the Röntgen rays imperative. Viewed from this stand-point, the Röntgen rays become a vital factor in preventing deformity and in securing undiminished usefulness in cases of even severe and complicated fractures of one or both bones of the leg. The result of the treatment, based upon the well-known symptoms alone, and consisting of reduction, application of splints, pads, casts and the like, is generally satisfactory; exceptionally, however, deformity of various degrees with attendant impairment of usefulness of the limb ensues, and the sensation experienced by the surgeon when he views the skiagraphic picture of the malunited tibia, and the consciousness that the deformity might have been prevented if the exact condition had been recognized at the proper time, convert him to the belief held by those who appreciate that the Röntgen discovery has extended the field wherein active surgical interference in cases of fractures of the leg is indicated.

Whenever it is decided to cut down upon a broken tibia for the purpose of securing apposition of the fragments, various methods are available. Among these are,—wire sutures, ivory pegs, steel screws and staples. Our own experience has formerly been limited to the employment of silver wire, variously applied, and whilst it requires considerable disturbance of the soft tissues in drilling through both surfaces of the bone for introduction of the suture, the wire often becomes loose and fails to maintain the fragments in apposition.

Better success has been obtained by the application of a silver plate in the form of a cleat to the flat subcutaneous surface of the tibia secured by small galvanized steel screws. The method is simple in its execution, does not complicate the treatment, is capable of maintaining the fragments in unyielding apposition, and thereby shortens the time required for bony union. Its employment has served to restore broken legs to unimpaired function without shortening. The plate which is designed to meet the indications of any fracture of the diaphysis of the tibia, transverse or oblique, single or multiple, is made of silver one-sixteenth of an inch in thickness, three and one-half inches in length, and three-fourths of an inch wide with perforations for the screws one-half inch apart. The patient being anæsthetized, an incision slightly exceeding the length of the plate is made through the integument along the median line of the inner surface of the tibia, its centre corresponding to the line of fracture when the bone is broken in one place only, or corresponding to the centre of an additional fragment. The integument is loosened laterally, the periosteum not being disturbed. After removal of serrations, spicules of bone, blood clots, soft tissue and other interposed or extraneous substances, the fragments are moulded into position, the plate adjusted, and the drill applied through such of the perforations as are selected for the reception of screws. The drill, slightly smaller than the diameter of the screws to be employed, is carried through the compact structure of the bone till cessation of resistance indicates that the medullary cavity has been reached.

Two screws are usually employed at each end and are secured by means of an ordinary screw-driver. Considerable force is occasionally required to overcome the tendency to displacement of one of the fragments, and has to be applied by the hands of an assistant.

In cases where infection exists or may be expected to supervene, a counter-opening on the posterior surface of the leg must be made and a drainage-tube inserted. Coexisting fracture of the fibula may exceptionally require attention; ordinarily it adjusts itself fairly well when the tibia is properly set. The integument is united over the plate by means of three or

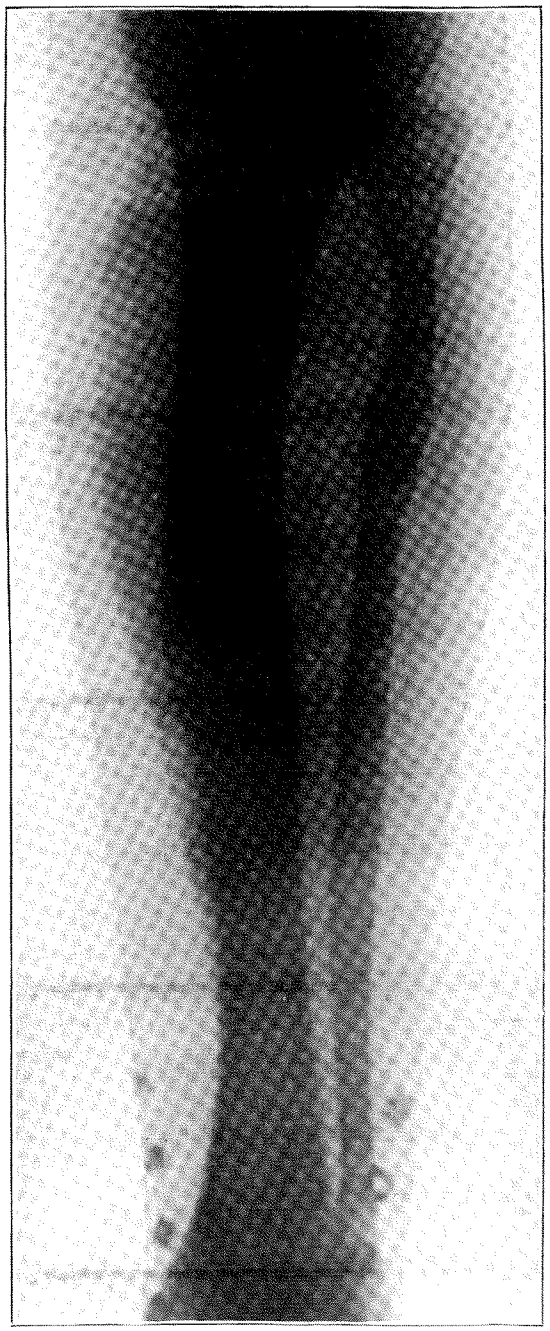

FIG. 3.—Perfect union, lines of tibial fracture obliterated.

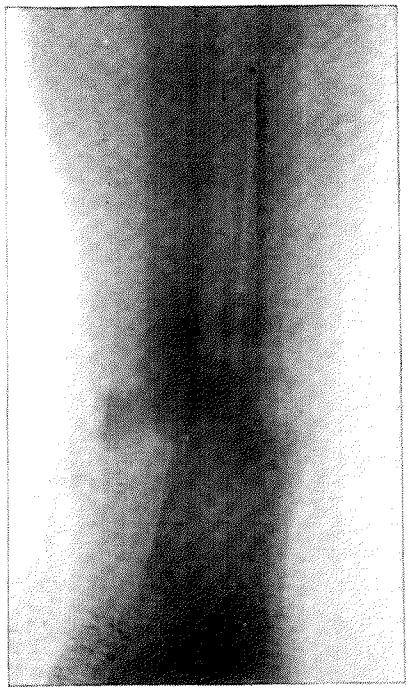

FIG. 4.—Showing lateral displacement and loose fragments.

FIG. 5.—Fragment replaced and silver plate secured with two screws in the upper and two into the lower fragment.

four interrupted silkworm-gut sutures. The leg is now placed in a fracture-box or a posterior splint of metal or felt.

After the expiration of about one week the limb may be placed in a silicate of soda case, fenestrated over the position of the plate and over the drainage-tube if one has been inserted, and it may be safe to permit the patient to sit up in a rolling-chair or to be about on crutches. In the simpler cases the wound is apt to unite by first intention, although there is secretion of sanguinolent pus between the plate and integument that may require an opening in the line of the incision for its escape, and can be maintained patulous by a small gauze or rubber drain. The cases of comminuted fracture and cases with infection may demand irrigation which cannot be readily employed when the limb is incased in a silicate case, and it may be preferable to employ a fracture box.

We have found it convenient to practice massage of the affected limb in the third week after the receipt of the injury to prevent the swelling so liable to ensue in these cases. The plate seems to be a harmless tenant in the leg, and is permitted to remain in position until bony union has taken place. Its removal is accomplished with the aid of local anæsthesia alone. The screws are found to sit firmly in the osseous tissue. The following four illustrative cases represent as many varieties of injury to the shaft of the tibia and fibula or tibia alone.

CASE I.—Miss M. L. K., aged thirty-two years, on May 27th, 1897, while riding a bicycle came in collision with a moving electrical street car and was dragged along for some distance. Admitted to the Polyclinic Hospital on the same day. On examination a fracture of the right tibia below its middle with the upper fragment slightly protruding through the skin was recognized. Marked loss of blood. Leg was washed, placed in a fracture box, and an ice cap applied over wet bichloride gauze. June 3, swelling and pain subsided, reduction by extension and counterextension, application of silicate of soda case. June 8, a Röntgen ray photograph was taken through the case and revealed an oblique fracture of the right tibia about its middle with serrations and projecting spicules of bone, the upper fragment projecting forward and inward, overlapping to the extent of three-fourths of an inch. Fibula broken at the junction of upper

and middle third, upper fragment displaced outward, likewise overlapping to the same extent. (Fig. 1.) The case was removed, the patient anæsthetized, and reduction attempted with the aid of the fluoroscope; the fragments could not be brought into accurate apposition.

On the following day the patient was anæsthetized with ether, an incision made over the seat of the fracture along the inner surface of the tibia, the ends of the bone exposed, serrations removed by means of bone forceps, and silver plate three and one-half inches long placed over the periosteum secured in place by two screws at each end, integument united with silkworm-gut sutures. June 25, a small sinus at upper end of the wound leads down to the plate, slight discharge of pus. June 26, silicate of soda case applied. June 28, patient left hospital. July 27, skiagraph taken through case shows good approximation of fragments and absence of firm callus. (Fig. 2.) August 17, plate removed under local ethyl chloride anæsthesia. Towards end of October discarded cane, is in excellent health. Two years later, October 28, 1899, skiagraph shows perfect union, lines of tibial fracture obliterated, that of fibula indicated by an oblique union of fragments. (Fig. 3.)

CASE II.—J. F., aged thirty-six years. Laborer in iron foundry. Admitted to the Polyclinic Hospital on June 25, 1898. While on an elevator this morning the sustaining rope broke, precipitating the cage in which he was standing to a distance of thirteen feet to the ground. The impact caused a fracture of both bones of the right leg about the junction of the middle with the lower third, a large irregular gaping wound, exposing the comminuted tibial fracture irregularly transverse, in direction with a square separate fragment driven into the soft tissues. The wound was irrigated, covered with wet bichloride gauze, the leg was placed in a fracture box and ice applied. Sedatives administered for relief of intense pain. Temperature on June 28, 99.2° F. June 29, temperature 102.6, morphine necessary. Good approximation impossible on account of comminution of bone, wound remains clean, constant irrigation with 1:4000 bichloride solution. Röntgen ray picture shows lateral displacement and loose fragments. (Fig. 4.) July 2, under ether anæsthesia a longitudinal incision over centre of inner surface of tibia down to the periosteum, the incision crosses the transverse wound of the leg, the broken ends of the tibia exposed. A large fragment replaced and a silver plate secured with two screws into the upper and two into the lower fragment (Fig. 5), suturing the incision and the wound in the integument over the plate

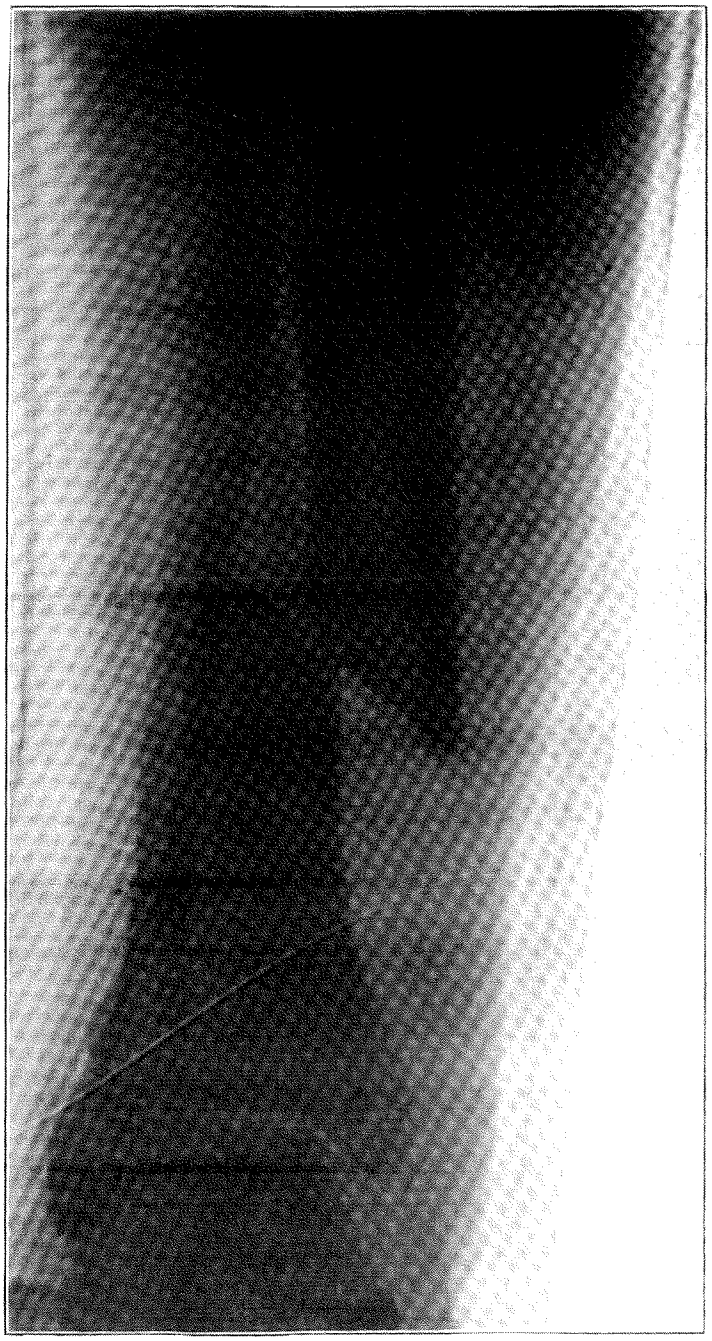

FIG. 6.—Showing fragments unapproximated.

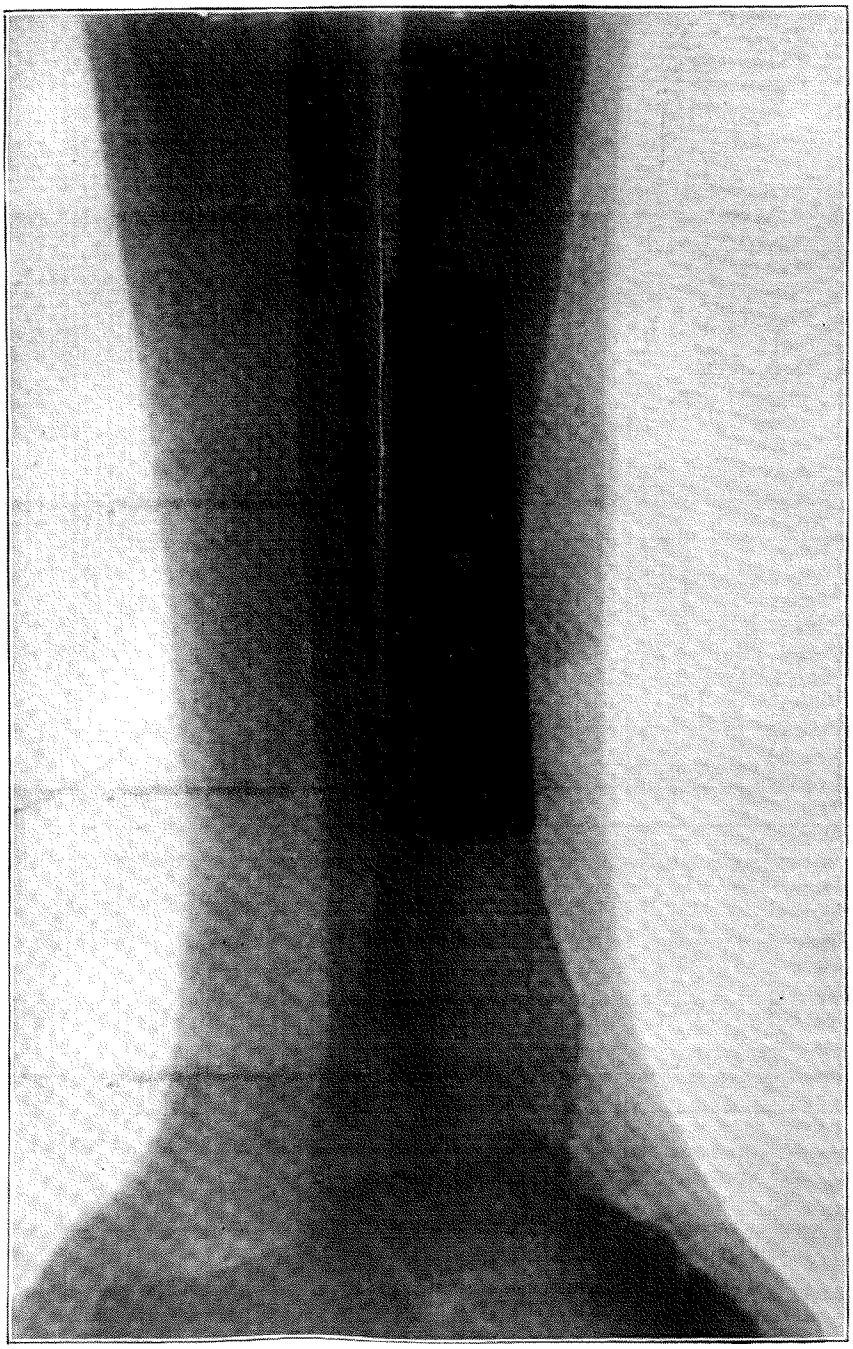

FIG. 7.—Showing fragments approximated and retained by silver plate.

with silkworm-gut. Wet bichloride gauze and a straight splint to inside of leg applied with gauze roller bandage. July 12, a small slough of integument at intersection of incision with wound, partly exposing the plate, offensive odor, slight œdema, appearance healthy, temperature normal. July 16, fenestrated plaster case applied. July 26, wound contracting, no union. Patient has delirium and hallucinations for past ten days, requiring sedatives and tying to bed. August 1, much improved, is about in a wheeling chair in daytime. August 6, rise of temperature, pus behind and below fracture, no delirium. August 22, some dark, foul pus discharging from wound, no union, fragment of necrosed bone removed, temperature of low degree, irregular, at times subnormal; incisions made postero-laterally to drain pus pockets, syringing with hydrogen dioxide and bichloride solution. September 5, no union, marked œdema of the foot, general condition good. September 19, less œdema of the foot. October 18, chill, wound discharges pus, temperature 105° F. October 31, temperature normal, some union, some purulent discharge. November 1, patient passed under the care of Dr. T. S. K. Morton. November 6, case removed, union sufficiently firm to justify it. November 22, the plate is loose from the bone, tenderness about seat of injury, temperature 102° F., several pieces of necrotic bone extracted in ether anæsthesia, removal of silver plate, curettage of exposed part of medullary cavity, an abscess cavity, not in direct communication with the wound, incised from behind, pus evacuated and drainage established. November 29, temperature normal, no pain. December 14, patient left for his home on crutches. Bones firm, no shortening of leg.

CASE III.—Mr. J. D. L., aged thirty-five years. May 14, 1899, was thrown from his carriage while driving in the park, sustained fracture of left tibia. Attended by Drs. H. and K. Fracture reduced and plaster case applied immediately. May 15, Röntgen ray photograph shows a spiral fracture of the tibia about the junction of the middle with the lower third. The case was removed, the fracture reduced, a plaster case with steel splints applied, but the fragments were found unapproximated in the skiagram which was taken. (Fig. 6.) May 18, under ether anæsthesia an incision was made over the seat of the fracture, blood clots were removed, the ends offered resistance to reduction, and forcible approximation was necessary. A silver plate was applied and secured in position with four screws. (Fig. 7.) The wound was thoroughly cleansed and closed over the plate. The leg was placed in a fracture box. May 24, the stitches were

removed, temperature was always normal. June 1, slight fluctuation above the plate, puncture and evacuation of a thin sanguinolent pus, a small gauze drainage was inserted. The plate was removed on July 6, and the patient's recovery by this time was complete.

CASE IV.—J. F. D., aged thirty-nine years. Laborer in iron works. Was admitted to the Polyclinic Hospital on July 17, 1899, suffering with a compound comminuted fracture of the tibia and fibula. On July 20, a silver plate was applied by Dr. Stern (Fig. 8), and removed on September 26, 1899. On October 18, 1899, the patient was discharged from the hospital cured.

FIG. 8.—Compound comminuted fracture of tibia and fibula, showing silver plate attached.

DISCUSSION.

DR. DE FOREST WILLARD said that the application of the plate in place of wire certainly stiffens the bone and holds it in better position. It is, however, only in selected cases in which the application of the plate can be intended, in comminution or in cases where there is great displacement. Surgeons are realizing more and more the necessity for fixation of the fragments, rather than trusting them to the uncertainties of the callus, which may or may not be properly encircling the bone in such manner as to secure good union. He had seen in the last three years many cases of non-union and mal-union which illustrated the necessity of absolute fixation. Great security and comfort is obtained by the use of a fixed gypsum dressing that will keep the fragments in thorough position. The old fracture box allows a certain amount of motion and is very likely to be followed by poor results or great overlapping. With the help of the Röntgen rays, for definitely outlining displacement, and when it is impossible to bring the bones into good position, some operative treatment, some form of positive fixation should certainly be tried, and if aseptically performed, suppuration is rarely present and recovery is greatly facilitated. Not only do we gain in time, but we also gain in ultimate strength of bone. A large amount of callus interferes seriously with the circulation of the parts, and we have stiffening from adhesions of the tendons. Nerve-pressure frequently causes suffering and interferes seriously with the use of the member. This question of nerve-pressure and its ultimate results is a consideration which we should always take into consideration in the treatment of fracture.

DR. GWILYM G. DAVIS said that in fractures of the leg, personally he was very loth to undertake operative measures. Take, for instance, in simple fractures, in which there is marked deformity, such as overlapping, as shown in one of the skiagraphs. The fracture almost always runs obliquely from below upwards and backwards, and the upper fragment is pushed forwards. That is almost the constant deformity, and it is increased by the tendo Achillis. Of course, the muscles which bridge the part naturally tend to increase the overlapping, so that whenever there is this troublesome deformity, the first thing to try is to put the leg in the Pott's position, which is bending the leg at right angles to the thigh and laying it on its outer surface, that is, relaxing the tendo Achillis. In some cases the fracture can be gotten into good position by that process. Should that fail, next try extension and counter-extension by means of a long fracture box

going somewhat above the knee. Apply adhesive plaster extension from near the site of the fracture down and from a short distance above the site of the fracture up, fastening the upper adhesive strips to the top of the box. The foot is placed away from the foot-piece and two to six pounds are placed on the lower extension, that will oftentimes bring down another proportion of these cases. Should these two means fail, then resort to the third, which is division of the tendo Achillis. By a combination of these means, he had been able to get the most of his fractures into a satisfactory position. When it comes to compound fractures, even there he would not advocate so radical measures as have been advocated by many surgeons. Almost all of the compound fractures which he had seen had been treated conservatively. There is always a small percentage of operative cases. Anybody who sees any number of these fractures will occasionally come across one in which the wound is so extensive that there is some, but comparatively little, cutting to be done, in order to obtain control of the fragments and institute such treatment as desired; but when we come to fractures with comparatively small openings,—openings from a quarter of an inch to an inch in length,—I think the Treves method of covering the opening with powdered iodoform and placing the limb in a fracture box is such an extremely successful and satisfactory one that he hesitates to resort to operative measures. If, however, operative measures were needed, then he would be inclined to use some method similar to that of Dr. Steinbach.

DR. J. T. RUGH described a case which came under his observation about a year and a half ago. A man had previously had the operation, described by Dr. Steinbach, done for an ununited fracture of the tibia. Suppuration followed and continued profuse until he came to the hospital. Being a laboring man and without means, he had become so discouraged over the loss of his time and means of living that he would consent to nothing but amputation. The surgeon strongly urged an attempt to save the leg, but as the man was determined upon amputation, the leg was amputated. It was his privilege to examine the specimen, and he found the silver plate blackened and lying loose upon the anterior surface of the tibia. The screws were corroded by the action of the pus and secretions of the wound. The ends of the tibia, which had been in apposition at the time of operation, were eroded and softened, so that a space of an inch or more existed between them. There were no spiculæ or sequestra present.

Another case of interest in connection with this subject was one

of non-union of the tibia following an osteotomy of both bones for an acute bow in the leg about five inches above the ankle-joint. The leg was opened in front, a section of bone removed from the fibula, the edges of the tibia freshened, and both bones secured by wire sutures. Suppuration ensued and in three months the wires were removed. The leg has been constantly kept in a plaster-of-Paris dressing and the wound has been dressed every other day. There is now firm union; but one or two small sinuses still persist. The boy is walking on the leg and will have a perfectly useful and straight member in spite of the unfavorable progress.

DR. ADDINELL HEWSON said that no allusion had been made to the adjustable screws of Clayton Parkhill. It seemed to him in cases where there is likely to be suppuration, the screws as advocated by Dr. Parkhill would come in very well, because they allow the proper amount of drainage to take place. He had recently had some experience with these,—not in the line of the cases presented by Dr. Steinbach, but in cases of fracture of the femur. Since then, however, the apparatus has been very much improved, so that now, instead of using that apparatus as it was then presented,—the nickelled steel,—now they give us a nickelled silver. Wessel's silver is the trade name for it. It is entirely a solid metal and non-corrosive. It seemed to him that in some cases which are bound to result in suppuration, the application of the Parkhill screws, where the plate is entirely outside and the screws themselves act as drains for the pus that may be present, would act very well.

DR. JOHN B. ROBERTS called attention to the use of the Röntgen ray for the purpose of diagnosis. While we may gain a great deal by using the Röntgen method, there is a possibility that it may lead some at least, if not all, into mistakes. He saw quite recently a case of ununited fracture of the radius, which was probably indirectly caused by a reliance on the skiagraphic picture. He thoroughly agreed with Dr. Steinbach that a considerable number of fractures should be cut down upon and examined. We make mistakes at times in not exploring fractures. He would be inclined to resort to the plate in ununited fractures to get perfect position and steadiness after resection of the ununited fracture. He would be rather inclined for the ordinary fracture, if it did not keep in good position, to cut the tendo Achillis, as Dr. Davis has suggested, or to apply extension, and to reserve the plate for ununited fractures which need resection. Closed fractures, or those not accompanied by a wound, which do not give good position under ordinary manipulations, he would be inclined to

nail together by some form of nails, box nails or a form of nail devised for that purpose.

DR. HENRY R. WHARTON said that he believed in the primary fixation of the fragments in many compound fractures. He had practised this method in many cases and had had satisfactory results. He had not had very great trouble with the removal of the means of fixation, whether it be heavy silver wire, which is used in certain cases, or whether it be the silver plate fastened by means of screws. In some cases he had had wounds undergo aseptic healing and had had no trouble with the plate afterwards. But in a great many cases the removal of the wire or plate will be indicated in a few months, even if there has been no suppuration immediately after the application. Sometimes it causes irritation and a slight amount of suppuration may develop.

In certain simple fractures exploratory incision and fixation are indicated. Occasionally one comes across a deformity that he has trouble in correcting and it is necessary to resort to operation and some method of primary fixation. In a case under his observation of a simple fracture of the internal malleolus, a fracture of the lower portion of the fibula, the deformity of the fibula was so great and so persistent that he finally had to cut down on the fibula and wire the fragments together. In this case he had perfect healing of the wound; and up to the present time the wire has caused no irritation.

DR. STEINBACH said that he was not inclined to make an operative case of one that could be treated by simpler means; the four cases quoted in his paper were illustrative of those which require a plate or other equally radical measures, and the results obtained not only justify the measure adopted but speak in favor of the plate.