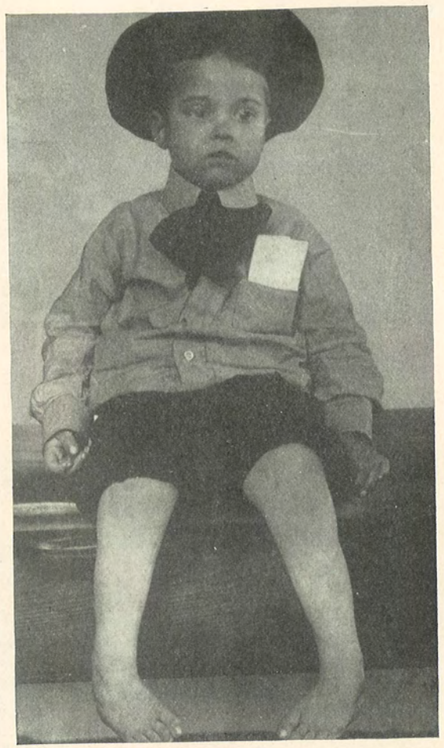
STATED MEETING, HELD OCTOBER 7, 1907.

The President, Dr. John B. Roberts, in the Chair.

TENDON TRANSPLANTATION FOR CONGENITAL CLUB FOOT.

Dr. Richard H. Harte presented a boy, born in February, 1901, with double congenital equino-varus. He came under the care of Dr. G. G. Davis at the Orthopædic Hospital, when 3 months of age. Dr. Davis did tenotomy of the tendo-Achillis of both feet, and partially corrected the deformity. The child was then sent to his home in Hazleton, Pa., and next applied to the Orthopædic Hospital in December, 1903, when he was under the care of Dr. Barton Hopkins, who found such a recurrence of the deformity that he did a cuneiform tarsectomy on both feet. He resorted to this operation only after failing to maintain a good position by the use of forcible manipulations and the use of plaster casts. The patient was sent home two months later, February, 1904, wearing braces. He was readmitted, coming under Dr. Harte's care March 17, 1905, with recurrence of the varus deformity in both feet. Without his braces he could not walk at all. On April 6, 1905, Dr. Harte did astragalectomy on the left foot, combined with tenotomy of the plantar fascia and the tendo-Achillis. On May 18, 1905, the same operations were repeated on the right foot. By these second bone operations it was hoped that a recurrence of the deformity would be prevented, as the foot came into very good position. The patient was again sent home wearing braces. Six months later, January 11, 1906, he was again admitted to Dr. Harte's service at the Orthopædic Hospital, with recurrence of the varus deformity. Both feet were forcibly stretched, the patient being etherized, on January 12, 1906. The plaster casts were finally removed March 15, 1906, and the feet treated by massage and overcorrection (without ether) daily for two months. New braces were applied in May, 1906, and the boy was again sent back to his home June 19, 1906, with his feet in very good position. Six months later, in January, 1907, he was again re-

Fig. 1.



Before tendon transplantation; congenital equino-varus, second relapse after cuneiform tarsectomy and astragalectomy.

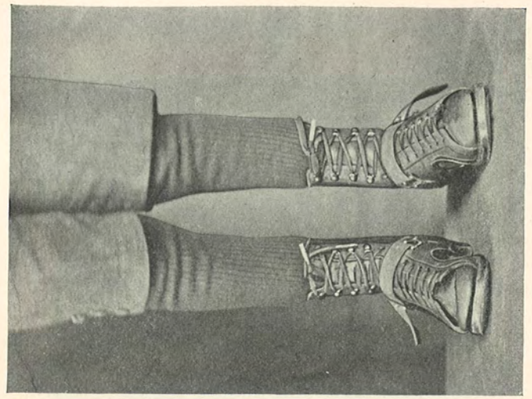


FIG. 3. Shoes with soles extended and raised on outer side; also instep strap.

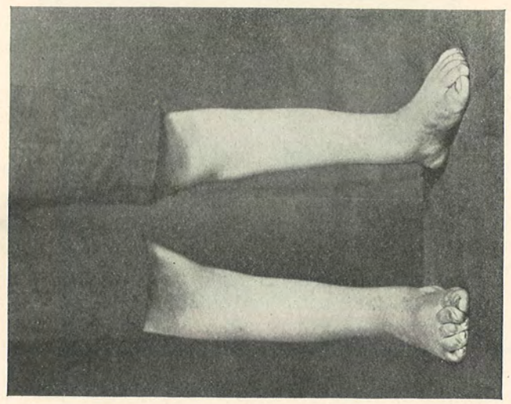


FIG. 2. After tendon transplantation; tibialis anticus transplanted to insertion of peroneus brevis.

admitted, the varus deformity having recurred to the extent shown in Fig. 1. On January 16, 1907, Dr. Harte did open tenotomy of all structures in the contracted soles of both feet, dividing tendons and fascia down to the bones. These wounds were left unsutured, and plaster casts applied. On February 18, 1907, both feet were stretched (ether) manually, and again put up in plaster. On March 9, and again on April 13, 1907, both feet were forcibly overcorrected by means of Hopkin's osteoclast, and Davis's tarsoclast. The feet now could easily be maintained in the overcorrected position by the pressure of one finger. On May 23, 1907, tendon transplantation was done, the tibialis anticus being separated from its attachment in each foot, and sutured to the tendon of the peroneus brevis at its insertion into the tuberosity of the fifth metatarsal bone. On July 10, seven weeks after this operation, the casts were removed, but as a matter of precaution new casts were applied for several weeks longer.

The boy now wears shoes with the sole extended and raised on the outer side, to throw the foot into a position of overcorrection (slight valgus), and with stout instep straps, to keep the heel of the foot well down in the shoe. The transplanted tendons by their action effectually prevent any tendency to the reproduction of the varus deformity, and it is hoped that at last the patient is permanently relieved of his deformity, as well as of the necessity for wearing ponderous and cumbersome braces. Figs. 2 and 3 show the present appearance of the feet, as well as the style of shoes worn.

DR. GWYLYM G. DAVIS said that the main interest in this class of cases to him was the question of the transplantation of tendons for congenital club-foot. The transplantation of tendons for paralytic deformities is well known, but for congenital deformities it is not so much practiced. The cause of congenital deformity is unknown; the cause of paralytic deformity is of course the paralysis, and if this paralysis is not recovered from it produces an obstinate laming which is permanent. Therefore, if one transplants an active tendon to the opposite side and judges correctly the relative amount of strength of the two sides, then there results a balanced foot. But in a congenital case an entirely different thing is to be dealt with. There is contraction of tendons on one side and a lengthening of tendons on the other side, but the muscles of the lengthened tendons do not give the reaction

of degeneration. They are not paralyzed tendons; therefore, if one can succeed in straightening the foot and keeping it straight with massage, electricity and exercise, then one gradually gets a restoration of function, and, theoretically, one should have the foot well balanced, and have an apparently normal foot as a result.

In his experience every now and then a case comes up, such as this boy, in which, even though the foot be kept in good position, the lengthened muscles do not contract and regain the tonicity and strength and power of the muscles on the contracted side. Therefore, in certain cases, even of congenital club-foot, surgeons are fully justified in transplanting the tibialis anticus muscle from the inner towards the outer side of the foot, and then allowing the child to get around. If, as the child grows older, it is found the transplanted anterior tibial and the peroneal muscles produce a preponderance of power on that side, one can put the anterior tibial back again. Therefore as a sort of temporary expedient he believed in a certain few selected cases in the transplantation of tendons even for congenital deformities.

LUXATION OF SPINAL VERTEBRÆ.—GUNSHOT WOUND OF BRAIN.

Dr. Joseph M. Spellissy reported four cases of vertebral luxation; and one of gunshot wound of the brain, as follows:

Case I.—(*G. B.*) *Luxation of Last Thoracic Vertebra, Kyphotic Deformity, Slight Paralysis; Recovery with Apparatus in Seven Weeks.*

The injury was received March 10, 1907, while working beneath a roof, the supports of which gave way, thus permitting the weight of the structure to come suddenly upon the patient's head and back. He was removed to the Methodist Hospital, where examination discovered posterior deformity, extreme tenderness, and complaint of pain at the junction of the thoracic and lumbar vertebræ. Pain was also referred to the abdomen and posterior regions of both thighs. X-ray examination showed separation of the posterior margins of the vertebræ involved. Examination by Dr. James Hendrie Lloyd found slight paralysis of the lower limbs and diminished knee jerks. These conditions were still present two weeks after the injury.

The condition was treated as is a case of spinal caries, with

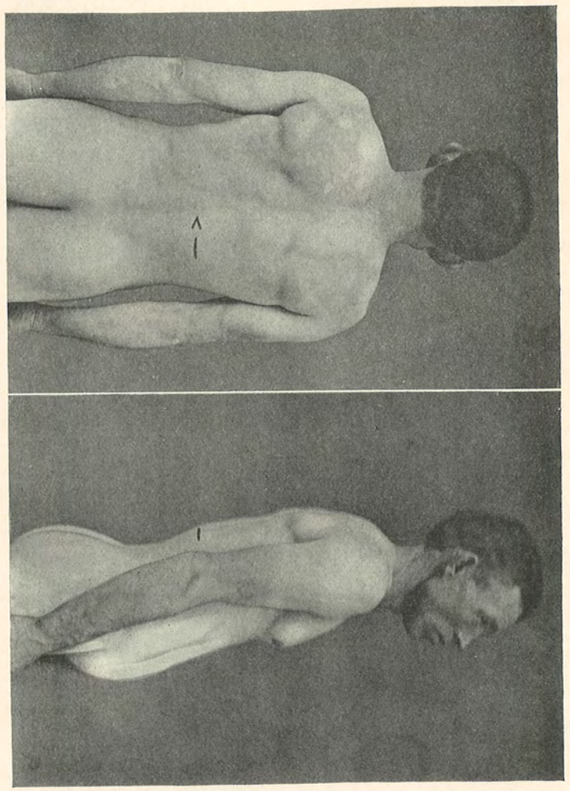
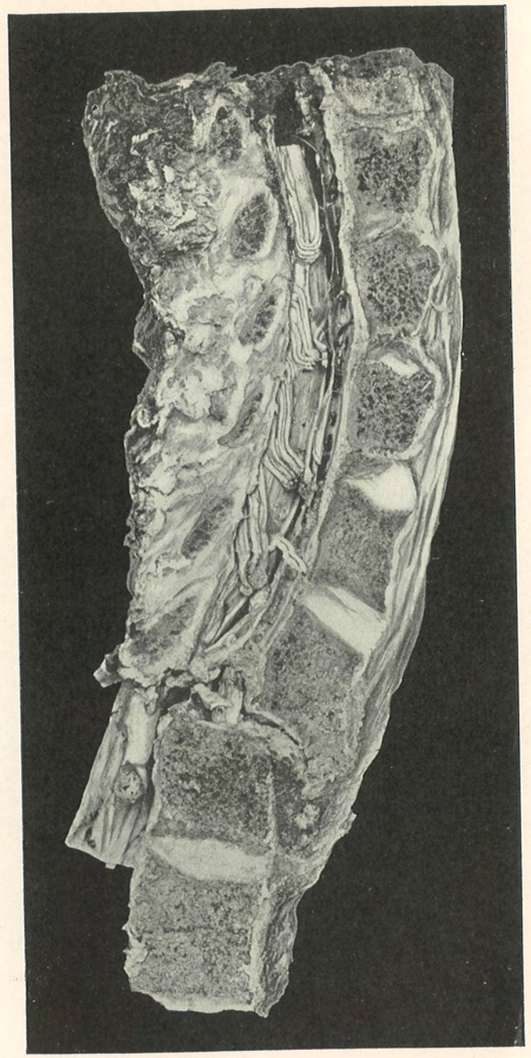


Fig. 1.—Luxation of last thoracic vertebra.

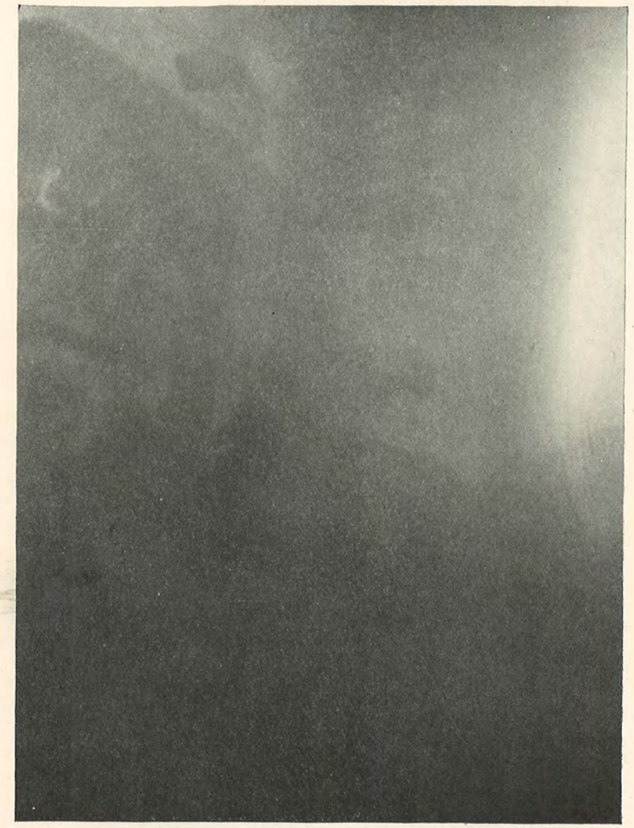
Case I.



(Photograph by A. R. Allen, M.D.)

Fig. 2.—Anterior luxation of upper thoracic vertebra.

CASE IV-A.



(Radiograph by F. O. Allen, M.D.)

FIG. 3.—Luxation of second cervical vertebra.

extension and counter-extension in the supine position, and with a pad beneath the kyphos for six weeks, at the end of which the patient became ambulant with a Taylor spine brace, and was discharged from the hospital at the end of the seventh week with complete recovery of the use of his lower limbs. Three and a half months after the injury he had discarded his brace and resumed his occupation. Slight posterior deformity remains, as shown in the accompanying photograph. (Fig. 1.)

CASE II.—(*H. M.*) *Rupture of the Common Spinal Ligament, Luxation of the Third Dorsal Vertebra, Laminectomy on the Fifth Day After the Injury, Delirium Tremens on the Sixth Day, Death on the Nineteenth Day.*

The injury resulted from a fall of thirty feet from a scaffold, on October 14, 1906. The victim did not lose consciousness, but suffered immediate paralysis of his lower limbs, was unable to flex his fingers, and experienced, through his arms and upper back, pain likened to the passage of a red hot iron. He was removed to St. Joseph's Hospital.

The pupils were normal, there was retention of urine and loss of knee and plantar reflexes. There was total anesthesia up to the level of the second rib, and there was slight evidence of posterior deformity in the upper thoracic vertebræ.

Surgical intervention was delayed until the fifth day after injury, at the suggestion of Dr. Charles K. Mills, who saw the case in consultation.

The posterior common spinal ligament was found ruptured at what appeared to be the joint of the third and fourth dorsal vertebræ, suggesting that the cord lesion had resulted from forced spinal flexion and anterior luxation of the third dorsal vertebra. (Fig. 2.). The lamina of the third and fourth dorsal vertebræ were removed, and the wound closed with drainage.

Following the operation, sensation descended to the level of the third sterno-costal junction. Delirium tremens appeared upon the following day, and was followed by rectal incontinence, trophic sores, and on the nineteenth day by death.

For the thorough and interesting study and for the excellent photographs of the spinal cord in this case, he was indebted to Dr. Alfred Reginald Allen.

CASE III.—(*J. L.*) *Dislocation of the Sixth Cervical Vertebra; Death in Twenty Hours.*

While driving a wagon rapidly under a doorway, on November 1, 1906, the patient's forehead struck a beam and he was bent backward and immediately paralyzed, being unable to move his limbs or his left arm. He had to be lifted from his driver's seat. He was taken to St. Joseph's Hospital.

Examination showed complete motor paralysis of the lower limbs and inability to draw either hand to the head. There was total anesthesia below the junction of the second rib with the sternum, and in both arms posteriorly.

Consultation with Dr. Charles K. Mills deferred surgical intervention. Sixteen hours after admission the temperature had risen continuously from 94° F. to 103°. Twenty and one-half hours after admission it had declined to 101°, the respiratory rate having advanced from 16 on admission to 36, when death took place suddenly.

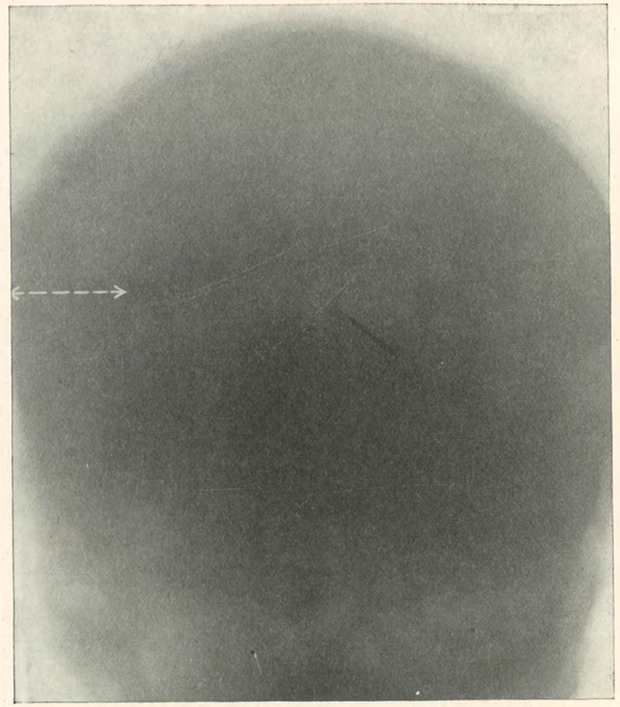
The character of the injury was established by autopsy, but careful study of the interesting specimen was prevented by its loss. Its gross examination showed rupture of the posterior common ligament, stripping of the anterior ligament from the vertebral bodies, posterior luxation of the sixth and upper cervical vertebræ en masse, with resultant laceration of the cervical spinal cord, which was nearly completely severed, and the presence of free hemorrhage as evidenced by a clot between the surfaces of the partially divided cord, and down the side of the cord to the level of the fifth thoracic vertebra.

CASE IV.—(J. D.) *Luxation of the Second Cervical Vertebra. Patient Ambulant from Time of Injury. Mechanical Cure of Traumatism, Followed by Surgical Neurosis.*

A crane for lifting beeves broke and fell on the patient's head in May, 1906. Two days later, examination in the out-patient service of the Pennsylvania Hospital discovered luxation of the second cervical vertebra. X-ray examination corroborated the clinical opinion. (Fig. 3.) The patient, who was unwilling to remain recumbent, was treated with a fixed dressing of plaster, until the completion of the brace exhibited. (Figs. 6, 7, and 8.).

While the surgical condition is now cured, and the brace could be dispensed with, the patient for several months has exhibited various hysterical symptoms, including convulsions, and is now attending the nervous dispensary of the University Hospital.

CASE V.



(Radiograph by J. E. Roberts, M.D.)

FIG. 4.—Bullet 1⅝′ internal to left margin of skull. View in *vertical* transverse plane.

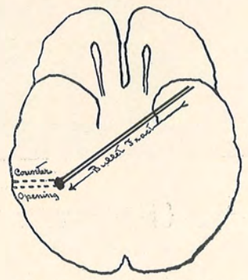
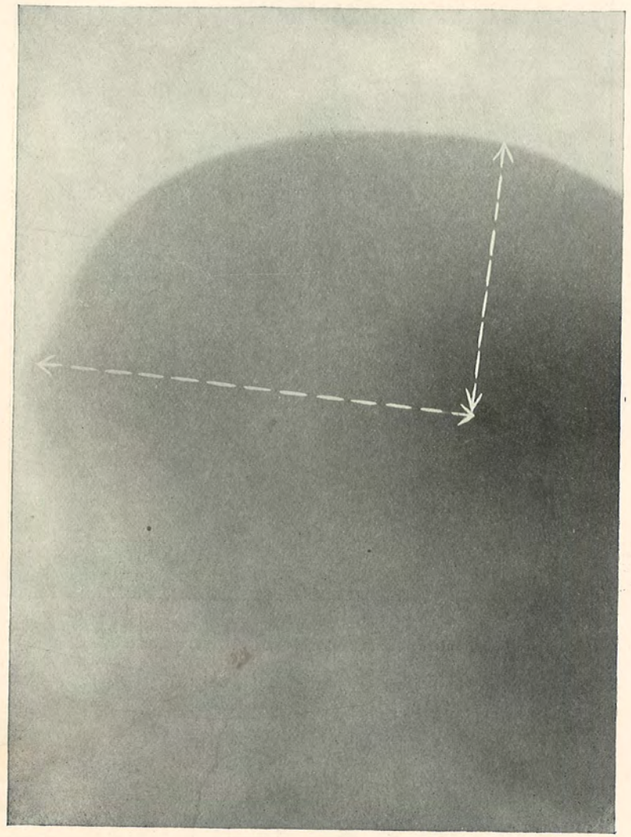


Diagram in *horizontal* transverse plane of bullet tract and of counter-opening.

Case V.



(Radiograph by J. E. Roberts, M.D.)

Fig. 5.—Bullet. $\left\{\begin{matrix}5\frac{1}{4}'' \\ 3\frac{7}{8}''\end{matrix}\right.$ posterior to frontal eminence. below the vertex.

GUNSHOT WOUND OF BRAIN.

Case V.—(*A. G.*) *Location of Bullet in Brain by X-ray Verified at Operation. Death on the Ninth Day. Autopsy Discovers Bullet One-Eighth Inch from Operative Counter-Opening.*

The injury was self-inflicted, terminating a debauch. The wound of entrance was at the angle of the right eye. The patient was unable to speak, though there was a little evidence of his understanding some of what was said to him. The right arm was paralyzed, and there was deviation of the tongue.

The X-ray plates printed in the illustrations were made on the admission of the patient to St. Joseph's Hospital within a couple of hours after the shooting. They confirmed the indications of injury to the left side of the brain, and located the bullet in a plane 1⅝ inches internal to the left side of the skull (Fig. 4), and 3⅛ inches below the vertex of the skull, and 5¼ inches posterior to the frontal eminence. (Fig. 5). The patient being prepared for operation, a trephine button was removed from the left side of the skull in accordance with these measurements, and a probe passed inward encountered the bullet on three different occasions. Attempted extraction by forceps proving futile, a little finger was inserted, but failed to recognize the bullet's presence. The patient was then turned over so that the operative wound was below, and an attempt was made to shake the bullet out. This was also ineffectual. The patient lived for nine days, being restless, but on no occasion having a convulsion; the temperature keeping between 97° and 99°, with the exception of one day, on which it mounted to 101°. The pulse was generally rapid and the respiratory rate was but slightly increased. The path of the bullet nearly traversed the brain. The operative wound for its removal completed the pathway, making an obtuse angle at the location of the bullet. Had the patient's head been turned with the counter-opening wound downward as soon as the latter was made, the prospects of the bullet's removal would have been increased. As it was, the bullet was sustained in the jelly-like consistency of the brain, and was easily dislocated and lost by the instrumental attempts at its removal.

At the suggestion of Dr. Addinell Hewson, the post-mortem examination of the pathway of the bullet was made by vertical transverse sections of the brain from before backwards.

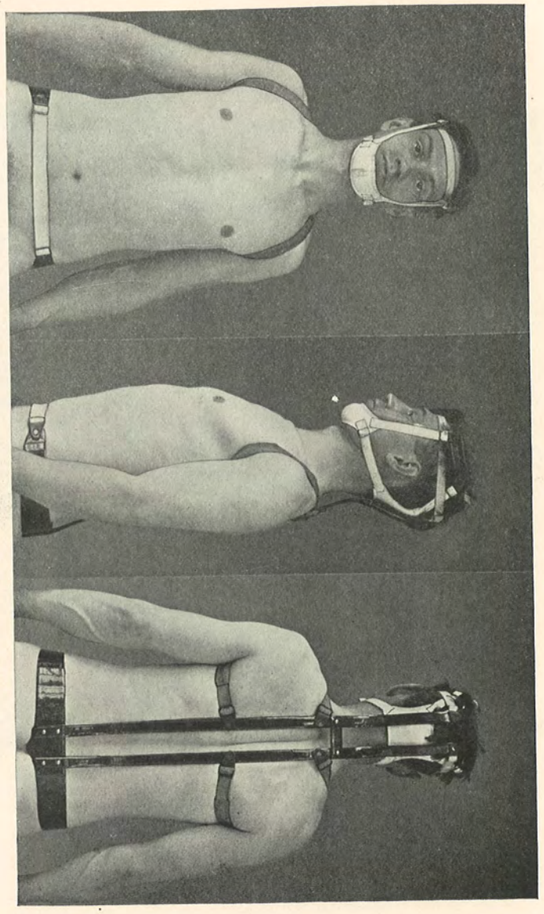
The bullet after passing through the skull just outside the

external angle of the orbit, immediately above the zygoma, entered the brain on the basal surface of the right frontal lobe, just in front of the temporo-sphenoidal lobe, two inches anterior to the central fissure, and one and one-quarter inches from the mesial surface of the right hemisphere, passing upward, backward, and to the left through the right lenticular nucleus, the anterior segment of the internal capsule, the caudate nucleus, the lateral ventricle of the right side, the septum lucidum, and the corpus callosum on the left side and then in to the left lateral ventricle, lodging at a site the plane of which was two inches posterior to the plane of the point of entrance. The position of the exploratory counter-opening, through which the bullet was touched at operation, was one inch posterior to the central fissure, and one inch above the plane of the fissure of Sylvius, in the lower post central convolution.

At autopsy, the bullet was removed from the site to which it had been dislodged in attempts at extraction. It was one-half inch posterior to the central fissure and one-half inch above the fissure of Sylvius; that is, one-half inch above the trephine opening, one-quarter inch posterior to it and one-quarter inch internal to the dura-mater. The original site of the bullet having been one and five-eighths inches internal to the skull.

Dr. Spellissy remarked that in the four cases of spinal luxation the injury resulted from great weight or force being suddenly applied to the head. The character of the injury was verified in the first and fourth cases by X-ray examination, and in the second and third by autopsy, the sites of injury being: in Case I, the lumbar-thoracic junction; in Case II, the third and fourth thoracic junction; in Case III, the sixth and seventh cervical junction; and in Case IV, the second and third cervical. In Cases II and III, there was gross injury to the cord, and death followed. Case II operated upon on the fifth day, became complicated by delirium-tremens and terminated on the nineteenth day, in no way improved by the operation.

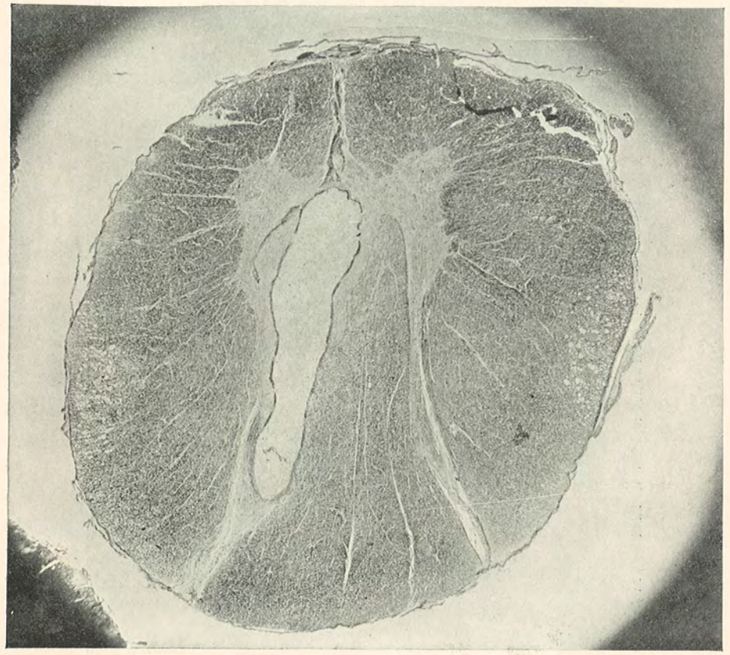
Might immediate intervention have accomplished any more either for Case II or III? In Cases I and IV there was complete recovery. In Case I there were symptoms of cord injury, which disappeared with fixation and extension. In Case IV, there was only pain and muscular rigidity. He had successfully used the appliance employed in it in a case of cervical caries.



Figs. 6, 7, 8.—Front, side and back of cervical spine extension, steel and hard rubber brace.

Case IV.

CASE II.



(Photomicrograph by A. R. Allen, M.D.)

FIG. 9.—A section of the spinal cord in the thoracic region showing an area of softening in the gray matter, as well as an area of traumatic myelitis on each side in the anterior part of the direct cerebellar tract. Section stained by Weigert method.

The apparatus (Figs. 6, 7 and 8) consists essentially of a pelvic band, united in front by a webbing strap. From the back of the band two uprights, equally distant from the median line, follow the contour of the back, neck and head to the level of the parietal eminences, where they turn at right angles and laterally embrace the head, terminating on a line with the external angle of the eye. An occipito-mental headpiece is buckled with webbing straps fore and aft, on each side, to the horizontal arms of the uprights and affords effective extension of head and spine, when sufficient traction is made. A webbing band passing round the brow and buckling to the uprights of this bifurcated jury-mast just below their horizontal turn, fixes the head and prevents lateral movement. The use of webbing straps permits easier gradation of the degree of extension employed.

There is no doubt that some cases of cord injury can be benefited by immediate operation and that in others it is at least an unnecessary hardship if not an absolute injury. But whether as a routine practice in severe cases it is the most conservative measure to at once make an inspection of brain and cord is a question that is worthy of study by trial.

The report of the gunshot wound of the brain instances the accuracy of X-ray localization in these cases, a nine days survival of through and through brain injury, and the advisability of turning the counter-opening downward when probing and attempting extraction of bullets from the brain.

DR. ALFRED R. ALLEN said that he had studied microscopically the case (Harry M.) of spinal fracture dislocation.

The line of fracture was from above and posteriorly downward and anteriorly, the luxated vertebra tearing away the anterior superior lip of the body of the vertebra next below. The pathological material which he received was a part of the vertebral column, comprising six vertebræ above the fracture-dislocation and two vertebræ below.

A section of the spinal cord at the highest level of that particular specimen indicated from the relationship of gray and white matter that it was a thoracic segment. Now if it be allowed by way of argument, that the highest level of the specimen was the first thoracic segment—and that is the highest it could possibly be—then the fracture-dislocation involved most probably the fifth and sixth thoracic vertebra, crushing thereby the lower

part of the seventh and upper part of the eighth thoracic segments of the spinal cord. This is a little lower than Dr. Spellissy thought at the time.

There was one interesting finding in this cord: an area of central softening (Fig. 9) extending from about 2 to 6 cm. below the level of fracture. That central area of softening, had he been able to examine every section serially, would probably have revealed a damaged blood vessel, possibly two or three, in relation to it. Traumatic hematomyelia is due to a purely hydraulic action in one or more of the branches from the anterior spinal artery within the anterior median fissure.

The question that Dr. Spellissy brought up as regards operation in these cases is one on which neurologists and surgeons will never agree, until some means is discovered by which the surgeon can say with a reasonable amount of assurance, "I can, by this method, so successfully bridge over the injured portion of the spinal cord that there will be functional continuity." That of course is a perfect impossibility as yet. In the first place there is an absence of neurilemma nuclei in the spinal cord and on these neurilemma nuclei is regeneration supposed to depend. In going over records of hundreds of cases he had been impressed by the fact that those cases which have had expectant treatment have had as high a percentage of would-be cures as those operated upon.

Dr. Richard H. Harte said that the manner of dealing with these cases of spinal injury is the point which interests surgeons. A man falls from a roof, or something falls on him, and he is forcibly bent forward, the vertebra gives way at the vulnerable point, the juncture of the first lumbar and last dorsal, and as a result there is in all probability a partial dislocation, and a fracture possibly of the lip of the upper or lower portion of the body of the vertebra. Now the question comes up, what are we going to do with these cases? As a rule they are fatal. If there is a certain amount of pressure on the cord without any destruction of the cord substance the sooner that pressure is removed the better the chances of recovery. On the other hand, if there is a certain amount of pressure on the cord, and it is not relieved, the patient being treated expectantly, the cord will in a short time degenerate, and then there is very little to be expected in the way of recovery. It seemed to him if he were in a position where he had a fracture of the spinal column and had to decide the question whether he would rather lie on a water bed for a time and then die as the result of bedsores, cystitis, etc., or have his neural canal opened and dealt with, he should certainly take the chances and have his canal opened. He thought that on the whole, if one gets one per cent. of recoveries one is fortunate.

He recalled one case where he did an operation for this condition. The man had a fracture of the lower portion of his spinal column and he is now putting up gutters and tin roofs through the country!

He had opened many canals with indifferent results, but on the whole he thought this procedure offers to the majority of cases the best chance of recovery. He could not see, in these cases, what was to be gained by treating them expectantly. By waiting a degeneration of the cord is likely to occur, and when that occurs, as the result of pressure, little can be later accomplished by going into the neural canal. He had tried both ways, and while the results are not brilliant in either, he had obtained better results by promptly relieving the pressure.

Dr. Alfred R. Allen said that it was doubtful whether in fracture-dislocation of the spinal column, the degeneration of the cord which is found in cases which have lived some time after the accident, is due to unrelieved pressure. He mentioned a case of gunshot wound where the bullet impinged instantaneously on the dura, not enough to even ruffle the surface. A laminectomy revealed the cord apparently normal. The case died, and the cord at autopsy was found to be just like jelly for at least three centimeters. In this case there was a pressure which had been brought to bear and then instantly removed, and yet there was complete degeneration.

PUNCTURED FRACTURE OF THE SKULL.

BY GEORGE G. ROSS, M.D.,

OF PHILADELPHIA, PA.,

Assistant Surgeon to the German Hospital; Surgeon to the Germantown Hospital.

THE case herewith reported, as the basis of this paper, is unusual in many ways. It offered diagnostic difficulties which were completely solved only at the post mortem table, and has many points of interest, clinically, pathologically and in a legal way.

ADOLPH H. Age 21.—On October 4, 1906, patient was seen by Dr. L. Demme Bauer. He gave a history of having been struck about the right eye with an umbrella, five days previously, on September 30th. The patient complained of a great deal of pain over the right temporal region, and of general malaise. He was entirely rational and answered questions intelligently. Physical examination showed that the right eye was the seat of a conjunctivitis, and the eyelids were puffy. There was no discoloration, ecchymosis or external evidence of any abrasion, in or about the eye. Both eyes reacted normally to light and accommodation, and the pupils were equal. The tongue protruded in the median line, and the naso-labial fold on either side unaffected. The temperature was 102° F., pulse 90, respiration 18. In spite of the fever there was an unusual coldness of the body. A boric acid lotion was ordered for the eye.

On October 5, 1906, the patient was again seen. His mental condition was still good, but the malaise was more marked. There was no paralysis of the extremities. The temperature was 102°. He was removed to the German Hospital in the afternoon.

Patient is a well-nourished and well-developed German lad. He is in a stuporous condition, and answers questions slowly and incoherently. He lies upon his back, with his eyelids closed, and desires not to be disturbed, but occasionally tosses his head from side to side. He complains of chilliness, and a great deal of tenderness over the right temporal region. There was no evidence of alcoholism or uremia.

The head was carefully examined, and no evidence of fracture was detected. There were no cuts or bruises on the scalp. There was no discharge from the nares or from either external auditory meatus. There was no œdema over either mastoid. The tongue was protruded in the median line, without tremor. There was no facial paralysis. There was no cyanosis of visible mucous membrane on the lips, or of the finger tips. The right eye showed slight injection of the bulbar conjunctiva, but there was no evidence of injury to the eye. Both eyes reacted normally to light and accommodation and there was no irregularity of the pupils. The sclera was not icteroid.

The chest, heart and lungs were negative. The pulse was slow and regular. The abdomen was negative. The patient having been sent in with a suspicion of enteric fever, was examined very carefully for enlarged spleen and spots, and for a history of nose bleed, all of which were negative. The extremities could all be moved. The superficial and deep reflexes so far as examined were unaffected. Temperature, 99 2–5°; pulse, 64; respiration, 22.

A catheterized specimen of urine, 570 c.c., had a reddish-yellow color, acid reaction, specific gravity 1038, faint trace of albumin and many amorphous urates, but no tube casts.

At 12 o'clock midnight, October 5, 1906, the temperature was 102 2–5°, respiration 24, pulse 64. During the night the patient was very restless, talking constantly and complaining of a great deal of pain in the head. He passed 1060 c.c. (35 ounces) of urine during the first twenty-four hours in the hospital. October 6, 1906. Leucocyte count 15,900.

October 7, 1906. About 10 A.M. it was noticed that the right pupil was more widely dilated than the left but still reacted to light and accommodation. No evidences of paralysis were yet found, but a tentative diagnosis of cerebral pressure was made, the possible causes considered being either depressed fracture, a clot from rupture of some portion of the meningeal artery or its branches, or a collection of pus. The diagnosis of cerebral abscess was suggested by the intermittent temperature, leucocytosis, and the chilly feeling of the patient.

The X-ray of the skull showed a shadow which was interpreted as a fissured fracture of the vertical plate of the frontal. This opinion was not positive. The patient grew worse, and on

the night of October 7th, became very delirious, and tried to get out of bed. Morphia ⅛ gr. was given and quieted the patient.

October 8, 1906. Patient had become quite comatose and the right pupil was widely dilated. There was no paralysis of either arm or leg. The patient's condition in other ways was as twenty-four hours before.

An eye examination was made by Dr. Wm. T. Shoemaker. O.D. and O.S. react to light and accommodation. O.D., dilated pupil. O.S., normal pupil. Ophthalmic examination. O.D. shows slight obscuration of disc. No hemorrhage into retina.

Soon after this examination was made it was noted, that while the patient was moving his right arm and leg, the left arm and leg were limp by his side. One hour before this, however, the resident physician saw the patient move his left arm and leg, and a patient in the adjoining bed saw him attempt to get out of bed, using his left arm and leg in doing so. An examination showed a complete left-sided hemiplegia. The indications of intracranial pressure were now unmistakable, and operation for relief was decided upon and performed about 5 P.M., October 8th.

Operation.—October 8, 1907. Ether anæsthesia. A curved incision, with its center over the most prominent part of the parietal eminence, was made. It started some distance behind the right ear, and was carried upward and forward. The tissues were divided down to the bone. A one-inch trephine opening was made over the most prominent part of the parietal eminence, and was enlarged with a rongeur forceps. The dura bulged into the wound. It was opaque, non-pulsatile, and dark underneath. The dura was incised, and a large abscess of 150 to 200 c.c. of dark, foul-smelling pus evacuated. The brain then came down into the opening and pulsation became evident. The abscess cavity was carefully and thoroughly wiped out with gauze sponges.

Three pieces of iodoform gauze were placed in the abscess cavity for drainage, the ends being brought out of the opening. The skin wound was closed with interrupted sutures of silk-worm gut, room being left for gauze drainage to come out. An antiseptic dressing was applied.

After coming out of the ether the patient was semi-conscious, could be aroused with little difficulty, and had periods of restlessness alternating with stupor. Such was his condition all of the next day, October 9. The right pupil was dilated and did not

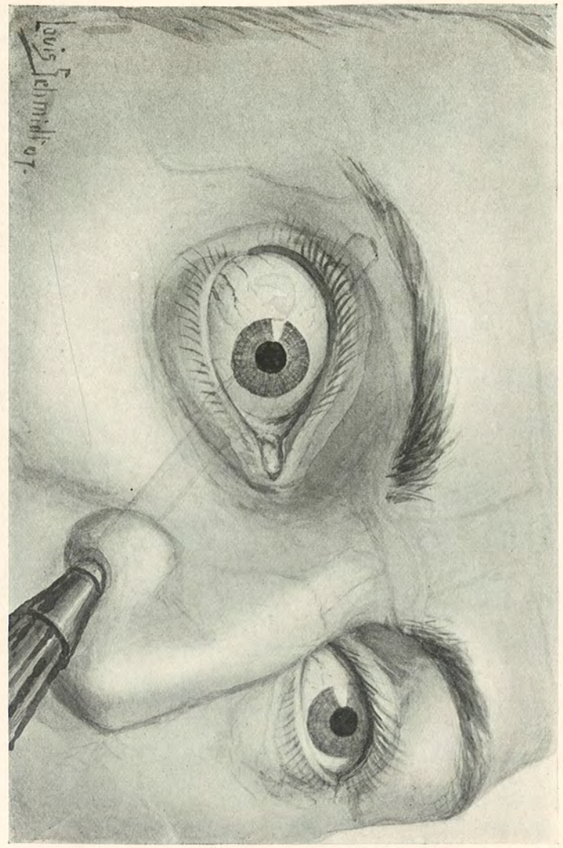


FIG. 1.

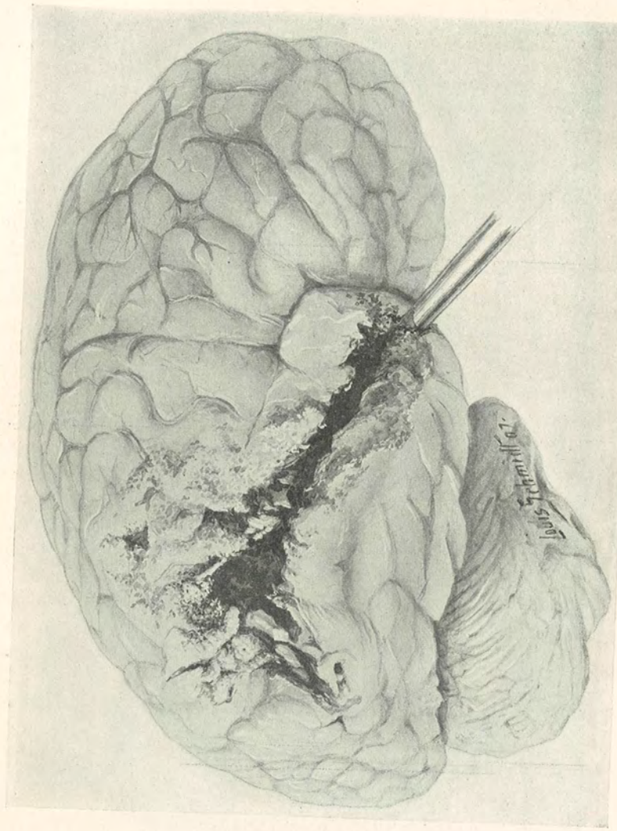


FIG 2

respond to light. The left side still paralyzed. The outer dressing was changed and the wound was found to be discharging freely.

October 10th. In the morning the patient was improved. He answered questions in a fairly rational way; his pupils were equal and reacted to light and the paralysis of the left arm was not so profound.

At 10.25 A.M. the patient suddenly stopped breathing and became deeply cyanosed. The pulse remained full and strong for two or three minutes after breathing ceased. Artificial respiration was performed without avail and the pulse gradually weakened and stopped.

Post-Mortem Examination.—The face and head presented no external evidences of injury. There was no ecchymosis or swelling about the eyes or forehead.

The skull cap was removed and the brain exposed. A large abscess cavity, about the size of a large orange, was found in the right temporo-sphenoidal lobe. An investigation of the middle fossa showed a fracture of the greater wing of the sphenoid, a little below and to the outer side of the outer end of the sphenoidal fissure. Several loose spicules of bone were removed and the fracture opening was found to be nearly circular. The right eye was removed, exposing the floor of the orbit. A fissured fracture, with a loose fragment of the bone, was found opening the roof of the antrum of Highmore. The antrum was full of pus, and showed a fracture of the inner wall into the nose. The line of penetration was then from before backward, from nose to antrum, antrum to orbital cavity, and thence to the middle fossa of the skull, thus furnishing an avenue of infection direct from the nasal cavity to the temporo-sphenoidal lobe of the brain. A straight probe could be made to traverse the entire tract without obstruction.

The instrument of penetration had traversed the fatty bed of the eyeball and had not infringed upon or in any way injured the eyeball, its vessels or nerves, thus accounting for the lack of ecchymosis or permanent swelling. (Figs. 1 and 2.)

A septic embolus having the appearance of a chicken fat clot, and about the size of a small bean, was discovered in the floor of the fourth ventricle. This explains the sudden death from respiratory failure. There was no evidence of any intracranial hemorrhage, either extradural or subdural. The inner

wall of the mastoid cells seemed normal and intact. The rest of the body was normal in every respect.

In looking over the literature of Punctured Fractures of the Skull I have failed to find a similar case. The vast majority of punctured fractures of the skull are, as would be expected, the result of bullet wounds received in battle, and come under the hands of military surgeons. The majority of these cases are instantly fatal or live so short a time that secondary results do not supervene. This is particularly true of wounds caused by the modern high velocity bullets, the injury to the brain in these cases being highly destructive. In civil life the wounds are caused generally by other instruments or by low velocity fire-arms. Here the skull offers enough resistance to take up most of the energy, with the consequent low grade of injury to the intracranial organs, and hence these cases often survive the injury long enough to permit of the development of hæmorrhage and infection. These are the two great dangers of punctured fractures in those cases which do not succumb at once. The hæmorrhage is most often subdural. The infection may involve the cerebrum, the meninges or both, and any portion of the brain may be the seat of an abscess.

In a series of 316 cases of foreign bodies in the brain analyzed by Dr. Henry Wharton in 1879 [1] a number of cases of punctures by objects other than bullets are recorded. Gunshot wounds of the skull and brain I have not attempted to include in this summary of the literature. In Dr. Wharton's series there were stab wounds by swords and bayonets, and wounds caused by the ferrules of canes and umbrellas. Five cases of penetration of the sphenoid bone are recorded, and 18 of wounds of the orbit.

Since that time numerous cases have been reported.

Brown and Birch,[9] Ferguson,[10] Lemonnier,[28] Fisher,[11] H. M. Holmes,[13] MacKellar,[16] Wilson,[18] Beckwith,[19] Taylor,[20] D'Cruz,[22] Schmid,[24] Odell,[25] Batut,[28] and Kennedy,[29] have reported cases of simple puncture of the skull, not followed by abscess.

Felty,[2] Rehm,[5] Glasgow,[33] Mandel,[23] and P. Ross,[21] have reported punctured fractures of the skull followed by cerebral abscess.

Griffith [30] has reported a case of cerebellar abscess following puncture of the skull and brain.

Dutra,[6] Laplace,[7] A. S. Holmes,[12] Jewett,[14] Lusk,[15] Prideau,[17] and Grekoff,[27] have reported punctured fractures through the orbit with brain injury but not followed by infection, while Builer,[8] and Lee,[4] reported similar injuries followed by abscess and meningitis.

Randall has reported a case (quoted by Spiller) of perforation of the ethmoid through the nose by the rib of an umbrella, with secondary cerebral abscess. I reported a case to this academy last year, of a puncture of the vertex of the skull in which the superior longitudinal sinus was opened. The case recovered, and there was no infection. I also know of another case in which the olfactory plate of the frontal was perforated by the rib of an umbrella which entered the nose. This case was fatal.

In practically all of these cases the diagnosis of the primary and secondary conditions was made easy by a knowledge of the injury and local evidences of trauma. In the case here reported, however, we did not have these facts to guide us. The history, in itself meagre, was misleading, as no indication of an injury to the nares was present on superficial examination. The diagnosis of a cerebral abscess could not be made with certainty. At best the recognition of this condition is a matter of difficulty.

There is no symptom or combination of symptoms pathognomonic of brain abscess, therefore in the absence of a recognized fracture, middle ear infection or suppuration elsewhere in the body, its diagnosis must be doubtful.

Spiller, Penn. Med. Jour., Oct., 1906, P. 30. says: "The diagnosis of cerebral abscess depends chiefly upon the signs of some more or less rapidly developing lesion of the brain, with the discovery of a purulent process somewhere else in the body or of a wound of the head." Note the qualifying clause.

Von Bergman states that marked symptoms of localization, provided they are accompanied by headache and fever, constitute the most important signs of cerebral abscess. He also lays great stress upon the condition of the skull wound, when one is present, and upon the flow of the pus from the fissure in the skull or from between the fragments of a comminuted fracture.

Leucocytosis of course may aid us in the diagnosis of abscess, as may also at times the presence of choked disc—not found, however, in the case I here report. The main features upon which we had to form our opinion in this case were:

1. Pain in the right temporal region. 2. Tenderness in the right temporal region. 3. Leucocytosis. 4. A persistent feeling of cold. 5. The intermittent temperature. 6. Persistent slow pulse.

The factors which operated against the establishment of a positive diagnosis were: 1. Existence of fracture without external evidence of injury. 2. Delay of paralysis until the abscess was large enough to cause pressure on the motor area. 3. Absence of choked disc.

The diagnosis was not made definitely and this is not surprising in view of the facts. The operation was undertaken primarily for the relief of intracranial pressure.

Granting that the existence of an abscess or of other serious intracranial complications can be established, operation is of course indicated, and indeed operation offers us a better chance in punctured fracture of the skull when the signs of intracranial lesion are not well marked, or even absent. In making this statement, I am taking into consideration the great mortality in fractures of this kind especially when they traverse the orbit. In Dr. Wharton's series, 17 of the 18 cases of orbital penetration died, although it is stated by him that "in many cases the persons were unconscious of the injury and the unfavorable symptoms developed suddenly."

Therefore it is a wise procedure to open the skull at the wound of entrance at the earliest possible moment after the

accident, irrespective of symptoms or lack of symptoms. The fatality of brain abscess or septic meningitis is so great that any procedure looking toward prevention is imperative. When as in this case, the history of the injury is vague and no wound of entrance can be found, the indications for early operation are not so positive.

In conclusion, I would call attention to the wisdom of nose examination in any case of traumatism about the head when the history is at all doubtful or undetermined.

REFERENCES.

[1] Phila. Med. Times, July 19, 1879.
[2] Med. News, Phila., 1894, lxv, 710.
[3] Greifswald University Clinic Rep., 1889–90.
[4] Homeop. Eye, Ear and Throat Journ., 1897.
[5] Aerztlichs Int. Blatt. Munich, 1881, xxviii, 451.
[6] Brazil Med. Rec., Jan., 1890, v, 109.
[7] Med. News, Philada., 1891, lix, 657.
[8] Arch. de Med. et Pharm., Paris, xviii, 63.
[9] Philada. County Med., 1889, x, 395–415.
[10] N. Y. Med. Journ., 1896, lxiv, 360.
[11] Deutsche Zeitschr. für Chir., 1882–3, xviii, 411–13.
[12] Med. Herald Louisville, 1882–3, ii, 482.
[13] Trans. S. Car. Med. Assc. 1882, xxxii, 111.
[14] N. Car. Med. Journ., 1893, xxxi, 91.
[15] Trans. N. J. Med. Assc., 1893, x, 395–400.
[16] Lancet, London, 1886, ii, 846.
[17] Lancet, London, 1886, ii, 846.
[18] Brit. Med. Journal, 1887, i, 278.
[19] Gaillard's Med. Journ. N. Y., 1882, xxxv, 120.
[20] International Med. Mag., 1898, viii, 87–101.
[21] Brit. Guian. Med. Annal., 1897, p. xxix.
[22] Ind. Med. Rec. Calcutta, 1900, xix, 160.
[23] Med. Rec. N. Y., 1900, lviii, 435.
[24] Med. Corresp. Blatt für Württemberg Aerzte, 1900.
[25] Brit. Med. Journ., 1900, i, 700.
[26] Annals Med. Med. De Caen., 1902.
[27] A Russian Med. Journal, 1903.
[28] Bull. Soc. Med. et Chir. de la Drone, 1904.
[29] Glasgow Med. Journ., 1905, lxiii, 394.
[30] Scot. Med. & Surg. Journ., Edinburgh, 1905, xvi, 412.
[31] Academy of Surgery Transactions, 1906.
[32] Quoted by Spiller, Penn. State Med. Journ., Oct., 1906.
[33] St. Louis Courier Med., 1884, xi, 75.

Dr. Addinell Hewson said that in view of the statement made by Dr. Ross that the cerebral abscess is often not recognized, he would report a case which in the last few days came under his observation. A man died in one of the hospitals in Philadelphia from pulmonary tuberculosis with intestinal involvement. The body was unclaimed and came to the Anatomical Board and was distributed to one of the colleges. After the injection of the body the brain was removed, and there was found a nail nearly 2½ inches in length which had perforated the sagittal suture near the bregma, and an abscess was found about this nail probably holding as much as an egg. He questioned the resident of the hospital—he did not even know that there was any wound about the man's head. The nail did not penetrate the brain, it was between the longitudinal sinus and the brain substance involving the dura and the arachnoid.

He mentioned this case here as one where there were no symptoms of any kind, and the resident who attended the man for six months knew nothing whatever about this condition.

Dr. G. G. Davis said that he had seen a couple of cases of these punctured wounds, one a man who received a punctured wound of the orbit by a metal hook which penetrated the brain, going upwards and backwards. The point of the hook struck the dura in the upper posterior portion of the vault of the skull. This case occurred while he was a resident at the Pennsylvania Hospital. The man died from septic cerebritis. A second case was under his care some fourteen years ago for the first time. The patient, a young man, was riding on a bicycle and was struck by a wagon, and something penetrated his eye. The left eye was lacerated and the wound entered through the top of the orbit and went some distance into the brain. The eye was removed, as well as some pieces of glass, and for several days thereafter there was quite an amount of brain matter discharged. He introduced a drainage tube and simply washed the part out with boracic solution. That young man recovered, and he heard nothing from him until within a few months ago, when he came back with the report that he had attacks, which he took to be epileptic, which were preceded by a very offensive subjective odor, and he likewise complained of a headache. For this he was placed on bromides, and he has had no attacks since, although he only takes ten grains of bromide of sodium once a day. This is an example of the fact that if the brain is injured very markedly, and if recovery ensues, the patient later shows some nervous trouble.

HERNIA CEREBRI.

Dr. Macy Brooks reported a case of recovery from hernia cerebri involving the frontal lobe, resulting from extensive fracture, as follows: A boy of 11 years, rather low order of intellect, was kicked in the head by a horse.

When first seen there was a large gaping wound over the left brow from which blood and brain matter were oozing.

An incision was made from the glabella, inclining upwards towards the upper temporal region, exposing a compound comminuted fracture. Fragments of bone were removed which included the crista galli and a large portion of the frontal bone of that side; this exposed an opening in the dura three-fourths of an inch in diameter; the dura had been punched out over this opening and driven into the gray matter. Upon probing this cavity with the little finger he felt something hard in the brain substance about an inch in from the cortex, parallel with the base of the brain. Upon introducing a pair of forceps he extracted a fragment of bone and a matted lock of hair. The boy being very dirty, the accident having happened in a stable, and there being extensive laceration of brain matter, he did not close the opening in the membranes with a pericranial flap. After removing all loose fragments of bone and trimming up the edges, the wound was well irrigated with hot saline solution, a strip of iodoform gauze was introduced and the wound dressed with gauze and a firm bandage.

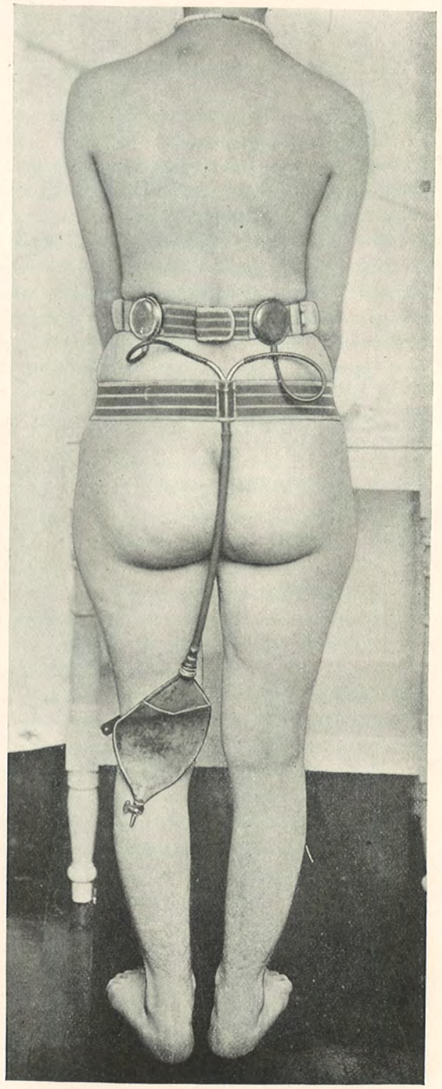
The patient was not unconscious at any time. He recovered nicely from the operation. On the third day the gauze was removed from the cavity. Its removal was followed by a flow of a considerable quantity of disorganized brain matter. A small drain was reintroduced; this was removed in twenty-four hours. By this time the brain had started to protrude. There was a hernia about the size of a pigeon egg. This upon the advice of Dr. W. J. Taylor was dressed with a ring of gauze to avoid pressure and dry gauze over the ring. The skin edges were touched at each dressing with silver stick and as the skin grew in around the hernia, the protruding gray matter was gradually cut off until the opening was entirely closed. Apparently the

boy's mental condition has not changed in any way since the accident. The wound healed in forty-eight days.

Dr. G. G. Davis said that this case is simply another which shows that it is apparently unnecessary to operate for the cure of hernia cerebri, and in substantiation of that position he mentioned a case somewhat similar to this, in which he saw a hernia cerebri on the vault of a skull from a fracture in which the protrusion of the brain was approximately 1½ inches long and oval in shape. Gauze was placed around it very much as in Dr. Brook's case, only it was wet with alcohol. He thought that the alcohol tends to tan and shrivel and dessicate the hernia cerebri. In a few weeks contraction took place and the skin covered it. Unfortunately the child, which was quite young, was said later to be completely blind. In the majority of these cases some decrease in the mentality of the patient is later to be expected.

Dr. John H. Gibbon called attention to the portion of bone which had been driven in. This recalled to his mind a case he had assisted Dr. Keen operate upon. The patient was a soldier who had been shot in Cuba. He was trephined shortly after his injury; he then developed epileptic attacks and was operated upon again in Cuba. He then came back to this country, was admitted to one of the large hospitals and operated upon again, an osteoplastic flap being turned back. He was then sent home as apparently incurable. He continued to have his attacks and got into pretty wretched condition. He applied for admission to the Jefferson Hospital, and through certain influences, although it was thought there was little to be done for him, he came down to be examined. It seemed that there was some pressure which might be relieved. Dr. Keen operated upon him, and about an inch and a half below the brain surface, near the median line, in the parietal region, he found a piece of bone as large as the first joint of the thumb, with about an ounce of pus around it. The patient had been trephined three times, once immediately after the injury and twice subsequently, without this bone being discovered. The necessity for exploring the brain thoroughly where there is a comminution of the skull, is most important.

Dr. Richard H. Harte said that Dr. Gibbon's remarks recalled to his mind a case at the Pennsylvania Hospital where a boy was injured, being hit over the brow with a brick, resulting in a large scalp wound. There was also a distinct transverse



linear fracture with slight depression in one spot, but without any symptoms. The tendency in many cases would have been to let it take its course, but for some reason or other he felt suspicious about it. He therefore explored it and found some gritty substance, raised up part of the anterior lobe and worked back into the anterior fossa, and took out about a teaspoonful of plaster. The boy was evidently struck with a brick which had plaster on it, and this plaster had been scraped from the brick by the receding skull and deposited in the cranial cavity.

This only goes to prove that many times a fracture may be carefully explored and nothing found, while at other times something is found, and he therefore agreed with Dr. Gibbon that it is best to make a thorough exploration of these cavities.

PERMANENT DRAINAGE OF BOTH KIDNEYS THROUGH LUMBAR OPENING.

Dr. Hiram R. Loux described a case of permanent drainage of both kidneys, and exhibited the apparatus used for the collection of the urine.

Dr. John B. Roberts asked whether this apparatus would answer satisfactorily in cases of tuberculosis, extirpation of the bladder, or other conditions of the bladder where some such measure is necessary?

Dr. Hiram R. Loux said that the apparatus shown would answer very well for tuberculosis, especially where the condition of the bladder was such that it made the patient a great sufferer. In extirpation of the bladder it would hardly do, unless the ureters were removed at the same time.

This patient was instructed about the care of this apparatus, and she boils the catheters fifteen minutes and takes the utmost care with the urinal so that there is no odor attached to its use.