

## TWO CASES OF TRAUMATIC INJURY OF THE BRAIN.\*

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*I. Fatal case of penetration of left motor cortex of cerebrum by a nail, with consequent paralysis. Extensive meningitis of left side; apparently from blow in frontal region and not connected with nail wound. Trephining at point of nail wound.*

C. C., male, single, aged 20, farmer, register No. 3,892. Admitted to State Insane Hospital at Kankakee, December 11th, 1889. Duration of insanity three weeks. No information as to heredity neuroses. Habits of occasional alcoholic excesses probable.

This patient was brought to the hospital by his brothers who stated that they believed him to be suffering from some injury of the head, as he had four weeks previously on one occasion, while playing with children, started to run rapidly through a door with a low lintel, and had struck his head violently against it in the frontal region. They thought his skull might have been injured and wished him examined in this respect. The patient was therefore carefully examined but no injury of the head discovered in the region indicated, or elsewhere. He was at this time in good physical condition, tongue clean, appetite capricious, bowels constipated, sleep much disturbed, sight and hearing normal, reaction to light normal, cutaneous sensibility normal. Tendon reflexes less marked than average but otherwise normal, lungs and heart normal, pulse regular, 96.

Nothing of note was learned with reference to the previous history of the patient until appearance of mental disorder, except that, as above stated, four weeks previous to coming to the hospital he had struck his head violently against the door lintel. At that time he immediately turned pale, but when asked if he was hurt said, "Not a bit." He shortly after left home and went

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to work on his land some distance away, where he lived alone, and nothing further is known of him until ten days later, when his brother visited him and found him very depressed and troubled unnecessarily in mind, among other things with the idea that he "had sold his corn too cheap." He would cry and moan, and has acted in the same way ever since, being very low spirited and delusional. At one time he said to his brother, "You don't know what I have done to myself."

Upon admission very quiet for a few days. Seemed to have lucid intervals and talked rationally at times. At other times restless and attempting to injure himself by bumping his head on the floor and walls.

December 15th. Transferred to the "Infirmary" or hospital ward on account of refusing food. Conduct quiet and inoffensive. Mental depression great.

December 23d. Has taken food regularly and willingly at Infirmary, and is physically improved. To-day was observed to stand on a chair, place his mouth at the gas jet and turn on the gas. He was removed to another room, but there obtained access to a gas stove used for cooking for the sick, removed the rubber tube and placed it in his mouth and inhaled enough gas to render him partially insensible, so that he fell over and was found by attendant partially suffocated, but quickly revived.

December 28th. Removed from hospital ward to another building on account of suicidal tendencies. Hair was here cut quite short, and on December 31st, while patient was being bathed, attendants noticed that he flinched when the top of his head was touched, and on examination found a small sore in the scalp at the vertex. Attention of assistant physician was called to the matter at evening round, and he having a poor light said he would examine it next day. But the next day, (New Year's) his round was made by another member of the staff for him, so that examination was not made until January 2d. On examination of the head January 2d, in a good light, a small circular opening through the scalp about  $\frac{1}{8}$  inch in diameter was discovered. Apparently a scab had recently separated which covered the opening.

A probe was introduced and gave a metallic sound and feeling. Dr. Dewey was called to examine the case and on getting a good view of the bottom of the opening a metallic surface could be seen which had the appearance of a galvanized tack or nail. An

ordinary forceps was applied to this, but the body was too firmly fixed and did not yield.

The patient was then sent to the hospital ward again, the head shaved and washed with carbolic solution, the opening further enlarged and a powerful tooth forceps adapted for seizing the foreign body was fastened upon it and with a considerable amount of force—as much as would ordinarily be required for the extraction of a tooth,—there was withdrawn from the skull a body which proved to be a wire nail of galvanized iron, the dimensions of which were  $2\frac{1}{8}$  inches in length,  $\frac{1}{8}$  in diameter and the head  $\frac{1}{4}$  inch in diameter.

The point at which the nail entered the cranium was almost in the median line, perhaps  $\frac{1}{8}$  inch to the left and  $1\frac{1}{4}$  inches anteriorly to the lambdoidal suture, and three inches posteriorly to coronal suture. The angle of inclination of the nail from the perpendicular was 40 or 45 degrees downward and forward. A few drops of pus followed the extraction of the nail, and the wound was then irrigated with a solution of bichloride, 1 to 1,500.

Up to the time of the extraction of the nail, the patient had spoken, (or rather articulated,) intelligibly; although he either could not or would not answer questions or talk coherently.

He articulated plainly before the nail was removed and in reply to questions, (though his answers were not intelligent.) He moaned and resisted slightly the extraction of the nail, but from the time the nail was removed, was not heard to speak or articulate distinctly again. The wound was then slightly enlarged by crucial incision to secure better drainage.

The fluid in the wound was observed at this time to rise and fall with the inspiration and expiration of the patient. The wound was dressed with iodoform and carbolic acid gauze.

Some helplessness was noticeable of the right arm immediately after extraction of nail. The patient was put to bed and given a special attendant. He was also suffering from the prevailing "grippe" with much cough and discharge from the nasal mucous membrane. He was in a state of considerable agitation, moaning inarticulately and at times attempting to speak, but unable to utter anything intelligible. The stuporous melancholy renders it difficult to determine to what extent speech was affected, but aphasic symptoms were plainly present. Temperature in axilla at 4 P. M. on the day of the extraction of the nail, (which was removed about 11 A. M.) 105.8 degrees, pulse, 75. At 7 P. M. ad-

ministered 10 grains quinine and 7 grains antipyrine. Wound irrigated with one gallon of warm water. While dressing the wound the respiration suddenly went up to 72 a minute, and the pulse 84. Five minutes later, after the patient was put back to bed pulse was 76, respiration, 12. Patient seemed at this time to understand what was said to him, but to be unable to speak. At 8 P. M., slightly delirious. Slept till 12 midnight. Temperature at that time was 102.4. Pulse feeble and 93. Very restless and requiring attendant to watch constantly.

It was considered desirable to trephine at the point of the nail wound in order that if there were any accumulation of pus, and pressure from this, it might be relieved, or if there were any splintering of the inner table of bone and depression or irritation from this cause it might be removed, but as consent of friends was important, a dispatch was sent stating briefly and asking permission to operate.

January 3d, 4 A. M. Temperature 101.2. Pulse 71 and soft. Patient slept quite soundly latter part of night. Took liquid nourishment. 9 A. M. T. 104.4, R. 22. Urine drawn with catheter. Right arm and leg somewhat extended and a little rigid. Patient lies with right arm behind him in an unnatural position, but as though not experiencing any discomfort from it, showing some impairment of muscular sense. Some ptosis of right eyelid. Pupils react slightly and equally. Sense of touch and of pain on right side decidedly impaired. Unable to project tongue beyond lips. In attempting this, tongue tends toward the right side. When asked to move right arm does it slowly. Moves left preferably. Appears to understand but cannot articulate intelligibly. At 12 Noon, irrigated wound and a few drops of pus escaped. P. 78, T. in axilla 104, R. 32. No use of right arm or leg. Ptosis more marked. Facial muscles, right side paralyzed. Very restless. Gave 10 grains quinine and 7 of antipyrine and one-half pint of milk. 4 P. M. T. 104.2, R. 26, P. 76. Sleeping. Catheterized. Took milk in sufficient quantity. 7 P. M., enema of warm soap suds retained. Repeated and still retained. Urine analysis gives sp. gr. 1.022. Otherwise normal. 8 P. M. T. 103.8, P. 76, R. 30,—irregular. Irrigated wound and probed carefully. When probe was withdrawn a few drops of pus escaped. Repeated quinine and antipyrine. 12 Midnight. T. 102.8, P. 77, R. 23. Restless and delirious.

January 4th, 4 A. M. T. 103.2, P. 75. Would not swallow milk punch. Slept in a restless way three or four hours. 7 A. M.

sleeping. 8 A. M. T. 103.2, P. 64 and irregular. Took liquid nourishment frequently. 9 A. M. Rectal injection of warm water,—retained. 12 A. M. T. 103.8, P. 70. Restless, moans, and is delirious. Has had continuously much cough and nasal catarrh. 2 P. M. More control of right leg noticeable. Right arm still helpless. 3 P. M. Having secured consent of friends, operation of trephining was performed by Dr. Dewey, Dr. Riese assisting. The patient took ether, which was well borne. Antiseptic measures were carefully taken, scalp being shaved and washed with 1 to 1,000 solution of bichloride. Crescent shaped flap made to uncover the cranium. Button of bone one-half inch in diameter was taken out, the circle of the trephine being so located that the nail hole was upon the inner and forward circumference. The location chosen to avoid the longitudinal sinus. When button was taken out the wound of the nail was shown to have made a clean cut upon the inner table. There was no depression or splitting of the bone. The dura mater underneath the button looked entirely normal, except immediately around the nail hole there was some dark discoloration. A few drops of pus oozed out. Probe introduced and by its own gravity passed downward and forward at an angle of 45 degrees, between  $2\frac{1}{2}$  and 3 inches. There was no evidence of any confined pus or pressure from within, when probe was withdrawn. Irrigated wound with bichloride solution, 1 to 4,000. The flap returned to its place without replacing button of bone, the scalp stitched up, leaving a fenestrated drainage tube at the most dependent angle. Wound was dusted with iodoform and dressed with bichloride gauze. Patient bore the operation well. No struggling or vomiting. T. 100.4, P. 75. Put to bed with ice cap to head. 7 P. M. Reaction good. Moaning and restless. Tries to press against the top of head. Very thirsty. T. in rectum 105.4, P. 105, R. 23. (From this time temperature taken in rectum on account of restlessness of patient.) 8 P. M. T. 104, R. 26. Thirsty, restless. Catheterized. 9 P. M. Rectal injection of warm water without result. Gave quinine, 10 grs. and antipyrine, 7 grs. 10 P. M. Very restless. One-fourth gr. morphine hypodermically. 12 Midnight. P. 88, T. 103, R. 26. Sleeping.

January 5th, 3 A. M. T. 103, P. 68, R. 26. Sleeping from 10 last night till 5.30 this morning. At 5.30 pulse 66, T. 103, R. 30. Restless since 3 A. M. Has taken a pint of milk with lime water during the night. 8 A. M. T. 103, P. 110, R. 28. 10 A. M. P. 75,

T. 103.2, R. 32. 3 P. M. P. 76, T. 103.6, R. 32. Had drop of croton oil placed on tongue. Takes milk and eggs sufficiently. About 5 P. M. Dressing removed and wound irrigated. Position of flap and drainage tube right. No tendency to union. No supuration. A few drops of pus escaped while irrigating from within cranium. New dressings applied. 7 P. M. P. 76, T. 102.6, R. 34. Restless all day. Lies on right side. Left side of body in constant restless action. 8 P. M. P. 76, T. 102, R. 40. 8.35 P. M. Loss of motion noticeable in right lower extremity. Some sensation evinced by patient trying to push hand away when pinching right foot, with the left foot. Tickling sole of right foot not felt, but quickly responded to by left foot when tickled in the same way. Patellar tendon reflex slight on right side. Patient in continual agitation of left arm and leg. P. 76 to 80, R. 40. Patient has vision and consciousness to some extent. Reaches out after chair or bedpost, and covers himself with bed clothing. Articulation thick and words unintelligible. Tries to speak in answer to questions. Left pupil responds to light and is moderately dilated. Much sensitiveness about the eye and resistance to manipulation. Right pupil more dilated than left. Involuntary movements of eye ball, which rolls about during manipulation. Divergent and moving up and down, but not convergent. No sensitiveness about right eye or resistance to movements. Some little response to light in right pupil. All facial muscles of right side partially or totally paralyzed. No movement of bowels as yet. Half ounce of sulphate of magnesia given. 11 P. M. T. 103, P. 80, R. 40.

January 6th, 1.30 A. M. Patient has taken a few ounces of milk but deglutition has gradually become more difficult. No movements of arms or legs either side. P. 94, T. 104, R. 28. 2. A. M. Catheterization followed by what attendant described as a "convulsive chill." 4.30 A. M. P. 100, T. 105.5, R. 50. Respiration much embarrassed. 6 A. M. P. 138, T. 106, R. 60. Bowels moved slightly. 7 A. M. P. 104, T. 105, R. 58. 8 A. M. P. 150, R. 65. Pulse full and bounding, inflammatory. Respiration steady, but two or three times interrupted for one or two seconds. Larynx moves with each respiratory effort. Right pupil much contracted. Left much dilated. No reaction to light. Slight twitching of left upper lid after raising; twitches on touching eye ball. A little water placed on tongue produced an effort to swallow, not very successful. 8.30. Breathing stertorous for a few moments.

Depressing inferior maxilla or interfering with the movement of the larynx causes the stoppage of the respiration. Respiration becoming more irregular. 9 A. M. R. 64, P. 150. Respiration somewhat rhythmically irregular. About every five minutes stoppage and acceleration for ten seconds. 10 A. M. P. 135, somewhat irregular in force and speed. Quite full. At times bounding. T. 106 in rectum. R. 67. Pupils same as at 8 A. M. 11 A. M. R. 62, P. 145. 12 Noon. T. 104.4, P. 160, R. 68, stoppages of respiration more frequent but of shorter duration. 1 P. M. P. 140, R. 64. 2.30 P. M. T. 104, P. 140, R. 64, a little frothing at the mouth. 3 P. M. pulse rather small, less bounding, easily compressible and dicrotic,—152; P. 62. 4.30 P. M. Left pupil slightly smaller, right larger. Respiration 62,—has been regular for three hours. 5 P. M. R. 58, pulse 180,—almost impossible to count. Moved upon right side, giving greater ease in breathing. Left eyelid twitches on touching conjunctiva. Moved left arm slightly. 5.45 P. M. R. 60, P. 185. Urine, sp. gr. 1.019—a little pus, otherwise normal. 8 P. M. Applied new dressing and used irrigation under antiseptic precautions. Considerable pus of light color and thin, squeezed out from under the scalp in superficial wound. The wound gapes, no disposition to heal. 9 P. M. Enema of warm water,—retained. 10 P. M. Enema of peptonoids, 2 drachms in 2 ounces of water at 100° temperature. 11 P. M. T. 105, P. 112, R. 52.

January 7th, 1 A. M. Nutrient enema repeated. 5 A. M. T. 107, P. 140, R. 50. 7 A. M. Died.

*Post Mortem.*—One hour after death. Brain only, on account of objections of friends. Removed the skull cap, which was thinner than the average.—6½ ounces of dark, bloody serum escaped. Dura mater changed in appearance around point of trephining, since operation has a mottled look, and is somewhat inflamed and adherent to parietal bone over a half circle of perhaps 1½ inches in diameter on left hemisphere with nail wound for a centre; dura mater also discolored and markedly inflamed over posterior half of frontal lobe, this is the area of highest inflammation. Weight of brain, 53½ ounces. Nail wound on anterior surface of cranium almost in middle line, perhaps ⅛ inch to the left. Meningeal vessels highly injected over entire vertex. Appearance of dura over right vertex otherwise normal.

Brain after removal presents moderate congestion over base, more marked on base of left frontal lobe.

The superior surface of left hemisphere from post-central convolution anteriorly was covered with an exudation of thick, yellow pus of an exceedingly foul and offensive odor. The most marked points showing inflammation of highest grade are the posterior one-half or one-third of the first, second and third frontal convolutions, and especially on the third, and extending across the fissure of Sylvius to the anterior extremities of the first and second temporal convolutions where considerable softening was noticeable. The right hemisphere showed only congestion.

The left occipital lobe was congested, the right uninvolved.

The course of the nail through the brain substance was as follows: Entering the post-central convolution almost upon the border of the median fissure, it passed downward, forward and somewhat outward nearly parallel with the median fissure. Its presence had resulted in the destruction of gray and white tissue, forming an irregular cavity over two inches in length by about one-half in diameter, extending obliquely downward and forward, leaving one-half inch of sound tissue at the lower end of the nail cavity between the median fissure and the cavity. There was a tendency for the cavity to extend outward laterally toward the surface of the hemisphere.

Upon opening the cavity formed by the nail a quantity of black necrosed brain tissue in a liquid condition escaped.

The white matter forming the anterior portion of the quadrate lobe was involved and the region anteriorly of white substance passing to the gyrus fornicatus in its posterior portion. Some slight softening was present at the anterior end of the superior vermiform process of the cerebellum. Otherwise the cerebellum appeared normal unless possibly a little softened.

#### REMARKS.

The question presents itself in this case whether the injury produced by the nail was or was not the cause of the extensive meningeal and cortical inflammation existing over the left frontal and parietal lobes. The point of most active inflammation was not directly connected with the nail wound,—was indeed separated from it by considerable tract of tissue only moderately inflamed. There was in this case a history of severe independent injury at the point where the greatest inflammation existed, namely, over the left frontal region, and it is possible that the two centres of injury were each independent of the other. Either one would



have been sufficient to produce the fatal result. The paralysis and helplessness of the right side of the body were undoubtedly traceable to the nail wound, and yet the point where the nail entered was the centre for control of the leg, while the arm was more decidedly paralyzed. This is perhaps accounted for by the fact that the nail in its very oblique course forward reached, and perhaps produced most disturbance at a point just underneath the centre for the arm and shoulder.

The other symptoms were those often met with in meningeal inflammation, and the difficulties of speech and articulation indicate that the third frontal convolution was disturbed by the extensive inflammatory process producing motor aphasia, but the sudden failure of power of speech at moment of extraction of nail remains difficult of explanation. The stupid and inactive condition of the patient mentally, however, was such as to obscure in a certain degree these symptoms.

Certain questions are presented by the peculiarities of this case as to the nail wound.

- 1st. When was the nail driven in?
- 2d. How was the nail driven in?
- 3d. Why was its pressure not discovered earlier?

1st. As to the time when the nail wound was inflicted. It would seem that this must have been after the patient had become insane, and during the time he was alone at his farm. It is difficult to conceive of his driving it into his own head, but even more so to think of any other person driving it in for him.

2d. As to how the nail was driven in. It would appear possible that after the patient had become insane and partially delirious with intense pain in his head he may have imagined he could relieve the pain and pressure by making a hole in his head, and perhaps knocking powerfully against the wall and holding the nail so as to penetrate the skull, and yet this would not have sufficed to carry the nail head through the scalp and fix it against the bone where it rested as firmly as if it had been driven into a board. It is perhaps no more difficult to conceive of his even using a hammer and a nail punch than to credit the case which has been reported of the insane convict in the Kansas prison, who drilled several holes through his skull and riddled his brain with wires, living in that condition for some time I believe. It is to be remembered the patient said to his brother, "You don't know what I have done to myself."

Finally, as to the delay in discovering the nail, which was in the patient's head three weeks in the hospital and probably two weeks before his admission.

I think that this delay was due to the fact that after the introduction of the nail the scalp healed up over it entirely, or formed a small scab. It was a perfectly clean galvanized nail, and the well known readiness of scalp wounds to heal led to the closing up of the wound made by the nail and to its remaining closed until irritating matter was formed in the deeper-seated tissues.

The patient's head was examined with, if anything, more than usual care when he was admitted, owing to the friends stating they thought his head was injured, but nothing was found, and if a small scab had been noticed, no physician would have thought of removing it in order to look for the head of a nail underneath.

Finally, when the patient's hair was clipped and a small sinus opened, the discovery was made.

Another noteworthy fact in this case was that no marked symptoms of motor paralysis were present until after the removal of the nail.

*II. Case of J. J. Division of occipital bone by a butcher's cleaver, exposing occipital lobes of brain and uncovering a portion of brain surface measuring three inches transversely by two vertically. Parts restored, wound dressed antiseptically and healing by first intention secured. Recovery without motor or sensory disturbance.*

Case of J. J. Occupation, butcher; age, 32; married. Physically robust. Habits good except formerly accustomed to go on sprees. Father died by an accident at thirty. Mother living at fifty-six, and in good health.

This man had been employed as butcher at the State Insane Hospital at Kankakee for about one and a half years, and had working with him a patient, John Hoffman, who had assisted in work at the slaughter house for about three years. This patient had never committed any act of violence, though it was subsequently learned he had at times been threatening in language and demeanor, which facts however had unfortunately never been reported at the office. His assault upon the butcher was therefore a surprise, and the man assaulted himself stated that he had never supposed "Hoffy" would do anything to hurt anyone, although

he talked a good deal. On the 19th day of February, while the butcher was slaughtering cattle, assisted by Hoffman, the former leaning over at his work, suddenly noticed that Hoffman had the cleaver raised in the air to strike him. He quickly raised his own head, by so doing probably escaped an instantly fatal wound. The cleaver was an eight pound one, and when brought down struck the butcher on the top of the head, about three-fourths of an inch above the occipital protuberance, cleaving off the posterior portion of the cranium a piece of bone three inches in width by two and one-half inches in vertical measurement. The wound included both the scalp and bone and had perfectly clean cut edges, except that the lower border of the bone was fractured across and remained hanging with the soft parts at the back of the neck. A hinged shaped flap was therefore produced with a crescent shaped wound which measured  $7\frac{3}{4}$  inches in circumference from angle to angle, and  $4\frac{3}{4}$  inches in a direct line, and left both occipital lobes of the brain wholly exposed and in full view. The dura mater fortunately, remained intact. The butcher on receiving the blow was momentarily stunned, but instantly recovered himself and walked to the elevator which was being lowered. He jumped upon this, a distance of about four feet, and descended to the basement floor, and started to walk to the farm house, a distance of over an eighth of a mile. He made more than half the distance alone, then became dizzy and reeled and fell, but was found and helped up by two men and with their assistance he walked the rest of the way. When Dr. Riese arrived he was sitting in a chair in the basement room of the farm house, showing no bad symptoms, but a little faint. He was placed in a recumbent posture and given blankets and hot applications with stimulants. He was conscious and talked clearly to Dr. Dewey when he arrived a few minutes later and said he never thought Hoffman would hurt anyone, and preferred him to another patient who had formerly worked there. His pulse was weak, as he had lost much blood, was still bleeding heavily from the occipital artery on left side and from several smaller vessels. These were taken up and controlled, and digitalis and brandy were given. There was considerable necessary delay in getting instruments, dressings and antiseptic precautions attended to, but the wound was finally carefully cleansed of dirt, hairs and small spiculæ of bone; lint sponges were soaked in five per cent carbolic solution. A finger was passed in under the lower border of occipital lobes and

several accumulated clots removed, there was no opposition to passage of finger an inch or more inward.

Hemorrhage being controlled and oozing having ceased, and the scalp having been shaved, (a difficult operation on the loose flap,) and washed with sol. bichlor.  $\frac{1}{100}$  the bone and scalp were replaced with all the antiseptic precautions; the flap was sewed up putting in seven deep sutures including one-half inch of scalp on each border but not drawing stitches tight. A fenestrated drainage tube was also sewed in at each end of the wound. The patient endured the operation well. There was much pain from needle on upper border of wound, but no feeling whatever on lower border. After wound was closed and before dressing was applied there was some gaping between stitches and every movement, or incipient movement of the head made the flap move spasmodically.

A compress covered with iodoform was applied along the wound and the head was carefully bandaged with bichloride gauze. All this time the pulse had been fairly regular and had improved in strength under stimulants and there was no marked appearance of shock.

The patient was now carried up two flights of stairs and placed in bed in the best front chamber of the farm house which was a new building just occupied, and two of the best trained attendants detailed to look after him, one for night and one for day duty. He was given a hypodermic injection of morphine and became soon comparatively comfortable.

From this time on there is not a great deal to report, except that he remained free from all serious symptoms. His temperature never went above 101. He slept well that night. We had to contend with obstinate constipation, and he had to be catheterized for two or three days, and he complained of pains in his back and stomach, but never of his head. On the third day the wound was examined and found to have healed by first intention, except at angles where drainage tubes had been left. There had been scarcely any discharge from these and they were removed and the wound carefully dressed antiseptically under carbolic spray. On the sixth day the stitches were taken out. The patient was daily examined as to the state of special senses and general sensation and motion, and never at any time was any sensory or motor abnormality discovered. His mind and perceptions remained clear and natural throughout. Sleep generally good and appetite so

good that he rebelled against the dietary precautions taken. His recovery was gradually established.

The injury was received on February 19th, and on April 14th the patient went to work again at his old position in the slaughter house of the hospital and is there to-day, (August, 1890,) as well as he ever was and is doing his work with entire satisfaction,\* but without the assistance of the patient Hoffman, it is perhaps needless to say.

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\* Patient remained as above until October 15, 1890, when he left the employ of the Hospital.