and Coplin (W. M. L.)
SCHAUL (O. D.)

EXTENSIVE FRACTURE OF THE SKULL FROM AN UNUSUAL CAUSE.

BY

W. M. L. COPLIN, M.D.,

ONE OF THE VISITING SURGEONS TO ST. MARY'S HOSPITAL,

AND

O. D. SCHAUL, M.D.,

RESIDENT SURGEON TO ST. MARY'S HOSPITAL.

FROM

THE MEDICAL NEWS,

July 8, 1893.

[Reprinted from THE MEDICAL NEWS, July 8, 1893.]

EXTENSIVE FRACTURE OF THE SKULL FROM AN UNUSUAL CAUSE.

BY W. M. L. COPLIN, M.D.,
ONE OF THE VISITING SURGEONS TO ST. MARY'S HOSPITAL,
AND
O. D. SCHAUL, M.D.,
RESIDENT SURGEON TO ST. MARY'S HOSPITAL

H. M., twenty-five years old, a laborer, was brought to St. Mary's Hospital by the patrol wagon, on February 20, 1893. Accompanied by a friend, the patient had been carrying a keg of beer, when he slipped, and his head was caught between the keg and the pavement. When brought to the hospital he was conscious, but could not open his eyes on account of the swelling of the lids and an extravasation of blood into the loose cellular tissue of the upper eyelids. There was a steady oozing of blood from the nose and from the left ear; sub-conjunctival hemorrhage was also present.

Upon examination, the right side of the head seemed very much flattened anteriorly, the flattening including the right frontal eminence, the upper portion of the temporal bone, and the lower angle of the parietal. In contrast, the left side of the head, more particularly the external angular process, and in a line directly upward from the anterior angle of the frontal bone, projected forward and toward the left. There was no evidence of fracture upon the back portion of the head on either side, and no indication of contusion was noted at the time.

The patient talked rationally, and gave fairly sensible

answers to all questions. There were no manifestations of motor lesions, no difficulty in coördination. The patient was not severely shocked, and did not show any pathognomonic symptom of cerebral injury.

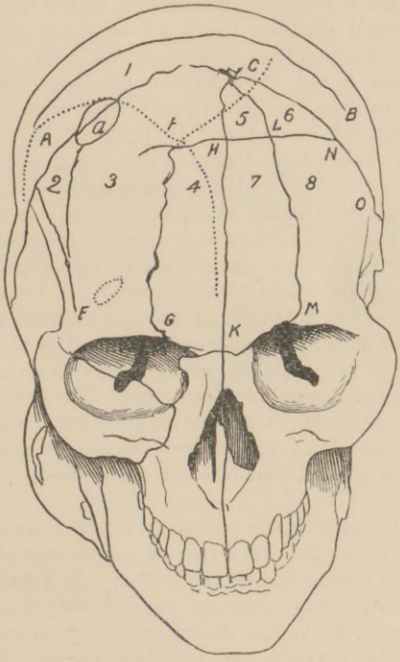
Over the right frontal eminence was a small lacerated wound, which presented some of the characteristics of a punctured wound. It could not, however, be traced to the bone, and apparently extended only through the skin and superficial fascia. The patient vomited, the ejected matter looking like tobacco, with possibly some blood that had been acted upon by the gastric juice.

A line of fracture was found extending in the median line just above the forehead, and laterally down beneath the zygomatic arch. There were several areas over the depressed portion of the frontal bone, and one slightly back of the point of depression, that, to the finger, felt like wire under the tissues. These were, probably, the linear fractures to be described later on.

The head was shaved, and preparations made for an aseptic operation. An incision was carried over the median line of the anterior margin of the scalp, outward, backward, and outward over the apparent line of depression. All of the tissues were turned back, revealing a comminution of the anterior portion of the skull, as shown in the accompanying illustration. The trephine was inserted at the point shown in the illustration, and a small button of bone was removed. The rongeur forceps was then used to free the lines of fracture on either side, so as to permit of elevation. This was only partially successful. The fracture extending downward toward the base in the zygomatic fossa, and across to the orbital plate, could then be made out. From the anterior fossa several pieces of the base were removed. The accompanying illustrations show the lines of fracture.

There was no subdural clot, but there were several points of hemorrhage. Those in the dura were ligated, while those at the margin of the bone were arrested by

FIG. 1.



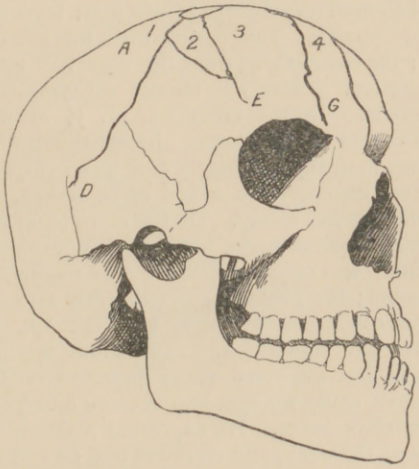
plugging with threads of aseptic gauze. The latter procedure can easily be carried out by means of a needle, and is very efficient for the arrest of hemorrhage from vessels in bone. Quite a number of pieces of bone were removed from the orbital plate of the frontal bone, and a few that impinged on the cerebrum itself.

The dura was markedly lacerated at the base and in the temporal region. From all of these portions of laceration fragments of bone were removed. Little difficulty was found in arrresting the hemorrhage. A drainage-tube and some horsehair were passed down to the base, and carried out to the opening over the zygoma. The wound was then dressed.

There were no evidences of fracture posteriorily, or on the opposite side of the skull, except the line that continued across, and as there was very little depression, and the patient was becoming considerably shocked, the wound was closed. Before it was closed, however, the finger passed under the dura showed that the points of depression were rather in the external plate than in the internal. The left ear was washed out with an antiseptic solution, and packed with mercuric-chlorid gauze. An attempt was made to treat the nose likewise, but was not fully successful, as the patient would not permit the packing to remain, and resisted every attempt at washing the nose out.

Immediately after the operation, which was completed at 2.30 A.M., on February 21, the patient was placed in a bed, and surrounded by hot bottles. At 3 A.M. he was resting comfortably, although he had not yet recovered from the ether. When consciousness returned he was restless and peevish, and readily annoyed. He complained of being sore wherever he was touched, and repeatedly asked to be waked up. Even when he was answering questions intelligently he seemed to adhere to the fact that he was asleep. Immediately after the operation he was given gr. $\frac{1}{20}$ of strychnine, which

FIG. 2.

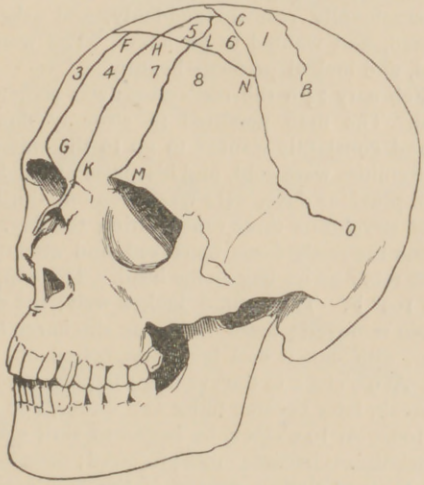


*

was repeated three times during the day. He complained of moderate pain in the head. For the restlessness potassium bromid was offered, but refused. Once or twice during the day the man vomited. The vomited matter looked like tobacco-juice mixed with blood. The man could be induced to swallow but little nourishment—a little beef-tea and some milk.

The wound was dressed on the morning of February 21, and showed no evidence of infection; there had been but little oozing. The oozing from the left ear continued; the hemorrhage from the nose had apparently been arrested. There was intense ecchymosis around both orbits. In the afternoon, gr. ⅛ of morphine sulphate was administered hypodermatically, after which the man enjoyed nearly four hours of quiet sleep. Whenever disturbed, he asked to be waked, and persisted that he was asleep. On the morning of February 22d, after a restless night, uneventful in any particular, the wound was dressed. There was no evidence of suppuration; the gauze was pretty freely saturated with serous oozing, and the flow from the left ear had been free and continuous. The patient was not fully conscious, but answered many questions intelligently. He seemed easily worried, and became annoyed by the slightest disturbance. He expressed a desire to know the day of the week, and regretted that he had not been able to vote. He also expressed a desire to go home, and told his mother that he would "be up right away." He continued to believe that he was asleep, and would not permit his eyes to be opened, as he believed that the opening of the lids would lead to blindness. He complained slightly of fulness and pain in the head. He made several attempts to rise from bed, and expressed a desire to go home, stating that if those about him did not stop resisting his movements he would "holler murder." He was restless, and rolled uneasily

FIG. 3.



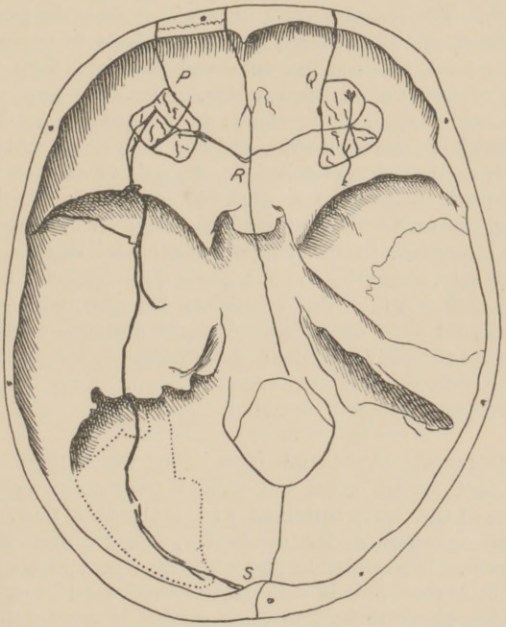
from side to side, and made numerous attempts to remove the bandage from his head.

On February 23d the symptoms had not materially altered; the man still answered questions rationally, his delirium partaking of the desire to be waked up. His pulse was fairly good. He complained of pain and aching all over, without being able to definitely locate any point of pain of greater intensity. He was restless, and occasionally rose up suddenly, and asked to be awakened, and wanted to go home. The wound was dressed, and looked perfectly healthy.

On February 24th the restlessness was somewhat increased. The man persisted in strongly blowing his nose, and constantly wanted to go to the water-closet. His extremities were cold, and his pulse seemed weaker than on previous days. He was given one-thirtieth of a grain of strychnine three times during the day. In the afternoon the restlessness increased, and attempts were made to retain an ice-bag on his head. The temperature rose to 102° F. The wound looked well; the drainage had been removed; there was some discharge from the left ear, although it had been suppressed on the day before. At 9 o'clock in the evening the pulse rose to 136; it was weak, later became fuller and slower, and reached about 100. At 10 o'clock he began to sink gradually; unconsciousness became more profound; there was picking at the bed-clothes, tremor of the hands and legs, and general cyanosis; restlessness ceased with the development of coma, and death occurred at 1 o'clock on the following morning, without any material alteration in the symptoms, except a progressive increase in severity.

On the first day the temperature rose from 98° F. to 100.6° F.; on the following morning it was 98.2° F., on the evening of the second day 99 4° F., on the morning of the third day 99° F., in the evening 99.2° F.; on the morning of the fourth day the temperature had dropped

FIG 4.



4° F., to 98.8 F.; in the evening it was 99° F.; on the morning of the fifth day the temperature was 99.2° F., but by evening it had risen to 102.6° F., and at the time of death, on the morning of the sixth, the temperature had fallen two degrees.

The post-mortem examination was made six hours after death. The accompanying illustrations show the extent of the fractures. A large clot was present in the posterior fossa, between the dura and the skull, from the line of fracture on the left side. The right temporo-sphenoidal lobe was lacerated in an area one and one-half inches long, one inch wide, and one inch deep. At the lower portion of the left inferior frontal convolution the brain was lacerated in an area one and one-half inches long, one inch wide, and one inch deep. A little above the laceration, in the temporo-sphenoidal lobe, was a large vein, about the size of a goose-quill, occluded by a thrombus. All of the vessels of the pia mater and arachnoid were distended. A slight fibrinous exudate covered the convolutions in different areas, but was not universally disseminated upon the brain. Examination of the trunk was not permitted.

Remarks.—An examination of the illustrations and the post-mortem notes will indicate the extensive character of the injury sustained, and, at the same time, the small number of the cerebral symptoms that were present. It is probable that when vital centers are not involved the brain is competent to withstand most extensive traumatisms, and when asepsis is secured there is reason to believe that recovery will take place in a large percentage of cases. From the second to the fifth day after the accident there were no symptoms attributable to any grave lesion or inflammatory process within the cranium. This is well shown by the temperature curve, and is probably to be explained by the avoidance of infection. On the fourth or fifth day, by

reason of defective asepsis, infection took place through the nasal cavity. It is probable that the Eustachian tube is always infected, and when the fracture passes, as this did, through the middle ear, it affords a seat for infective processes even better than does the passage of infective matter up through the fissured ethmoid. It is probable also that packing of the nasal cavities will more efficiently prevent infection through the superior nasal orifices than through the Eustachian tube. In a similar case we would be tempted to plug the posterior nares thoroughly, and treat the nose as a closed cavity, applying antiseptic solutions freely. We do not think that asepsis can be secured in the nasal cavities by washing out and packing, without at the same time plugging the posterior nares. While it is probable that the elevation of temperature is to be ascribed to infection, it is not impossible that this may have been due to the process of repair and an exudation of serum; but the lateness of the rise rather indicates that infection occurred, and to this death is to be attributed.

Explanation of Illustrations.

A B, linear fracture, posterior to the coronal suture at A slightly anterior to the coronal suture at B. C, point of union directly over the longitudinal sinus. Q, on the interior of the skull, marks the point where the linear fracture, F G, continues through the orbital plate, and terminates in the comminuted mass in the orbital plate of the frontal bone. It will be seen that the two comminuted areas, P and Q, communicate with each other through the linear fracture that crosses the median line at R, and is there continuous with the linear fracture, C H K, on the external surface, the line of fracture stopping at R. From the comminuted area P we have a linear fracture extending backward through the semicircular canals, possibly involving the cochlea, and terminating at S, slightly above the torcular Herophili.

It will thus be seen that every bone in the cranium was fractured, and all in most unfavorable situations, except the right

temporal bone, which only had the upper angle of the squamous portion fractured to an extent of about one inch.

a marks the area from which the trephine button was removed. 1 is intended to label the area that might be called a fragment, except that it is not detached at either end of the linear fracture A B. Fragment 2 was removed. The irregular-shaped fragment 3 was depressed at its superior angle, and caught by fragment 1. In order to be able to raise 3, the rongeur forceps was used in making a line from the trephine point to F, and then the upper fragment of 3 could easily be raised; the lower fragment was raised with more difficulty, and less successfully. Fragment 4 was raised, Fragment 5 was also raised. Fragment 6 did not seem to be depressed. Fragment 7 and 8 could not be readily raised. Through the opening made by the rongeur forceps and the removal of fragment 2, many pieces were removed from the comminuted mass situated on the right orbital plate of the frontal bone. The oval dotted line above E marks the point of the punctured wound in the scalp, already referred to, there being no injury to the skull proper at that point. The dotted line just above K marks the site of the skin-flap first made. It was afterward found necessary to make a branch cut-off from F, in order to expose fragments 5, 6, 7, and 8. A drainage-tube was brought out below A, having its exit through the skull, where fragment 2 had been situated. The dotted lines in the posterior fossa mark the area in which a subdural clot was found after death.

The method by which these lines were obtained is, so far as known, original with Dr. Coplin. The skull photographed in the drawing is a French preparation, having the internal ear dissected out, and is easily separated into pieces. It was coated over with mucilage and, while moist, black silk was used to mark the lines of fracture. This was done by the resident physicians following the lines discovered at the post-mortem. The result was then photographed, and reproduced as shown. If No. 8 black silk is used, beautiful lines can be made by this method. The vertical section of the skull occupies the line shown in the linear fracture at K, which, in the case reported, terminated at the articulation with the nasal bone, extending from this backward, as shown in the interior of the skull as far as R.