TWO CASES OF PERFORATING GUNSHOT WOUND OF THE SKULL.

By Lieut.-Colonel S. F. Lougheed, C.M.G.

Royal Army Medical Corps.

As illustrative of some of the difficulties, disappointments and encouragements associated with the treatment of extensive injuries to the head, I submit the following notes of two severe cases which were under my care during the recent war.

Case No. 1.—Private C. H., aged 32, belonging to a local corps, was accidentally shot by a comrade with a revolver bullet (lead), 0.450 calibre, at a range of about one yard, near Phillipolis, on August 16, 1901. He fell immediately, and remembered nothing for three days. On the 19th it is reported that he was then sensible, had no paralysis or epileptiform seizures, but his wounds were septic.

Admitted to No. 12 General Hospital, Springfontein, under my care on September 8. He was found to have a small entrance wound in the centre of the left upper eyelid, granulating and oozing pus from its centre. The exit wound, about the size of a penny and irregular, was over the frontal bone, four inches above the level of the supraorbital margin and half an inch to the right of the median line; there was also a point of broken skin midway between these wounds. The granulations covering the exit wound were pulsating from pressure beneath. A gutter could be felt in the bone between the wounds which pulsated visibly. The exit wound was very septic. He had no paralysis. Temperature normal. Clear fluid (cerebrospinal) oozed in quantities from all three wounds, but mostly from that of entrance. Crepitus could be felt between the wounds, large pieces of bone being evidently separated along the line of flight of the bullet. The scalp was shaved, cleaned with carbolic solution and ether, and boric acid fomentations applied. Four grains of calomel were given.

On September 9, under chloroform, I made an incision from the entrance wound upwards and inwards along the line of the gutter to within one and three-quarter inches of the exit wound, and on reflecting the scalp removed many small pieces of bone. The cranium was perforated for about three and a half inches.
The dura mater was much torn, and several large pieces of bone embedded in the frontal lobe; these were all removed; the brain was much pulped. I then enlarged the exit wound and removed two large pieces of bone, one about one and a half inches square, from the margin of the exit perforation, separating them carefully from the pericranium with a rugine. Most of these pieces consisted of the whole thickness of the vault. A fungating mass of pulped brain tissue protruded through the exit aperture, in which a few small bone spiculae were found and removed. Many fissures were found radiating from the exit opening, but as none of the pieces were loose or depressed, they were not removed. There were many sharp points of bone along the edges of the notch, which were removed by means of a pair of Hoffmann's gouge forceps. I then passed an index finger of either hand into the openings, and made them meet beneath the cranial vault, which was extensively fractured, but none of the pieces were loose, and I assured myself that no more pieces remained embedded. A medium drainage tube was then passed along the track, making the ends emerge from the original wounds, and the incision wounds closed with silkworm gut and dressed.

On the next day the patient was comfortable and had slept well, but there was much oozing of cerebrospinal fluid without blood-stain. I then removed the tube, and placed iodoform gauze drains in both wounds quite loosely. Temperature normal. A few convulsive twitches of the right leg and arm occurred six hours after the operation, but not afterwards. On September 11 there was much saturation of the dressings with cerebrospinal fluid; the gauze drains were removed, and fresh ones inserted. Wounds looking much cleaner, no purulent discharge. September 12: The patient passed urine in bed during the night, and has had persistent hicoucough since midday yesterday. Slept little, and was very restless. Much fluid in the dressings, which were changed, and fresh gauze drains inserted. Wounds look clean. September 13: Temperature 103·4° F. last evening, and 101·6° F. this morning. Slept better; not so much oozing of cerebrospinal fluid; brain now rising to level of the skull vault and pulsating. The patient is still unable to control his bladder, but will not permit catheterism. Hiucoucough present at times, but is relieved by food. No vomiting. September 14: Temperature, 103·4° F. last evening, and 103·0° F.
this morning. Slept well during the night, and is drowsy to-day. Takes food well. Much oozing; dressings changed, and loose packing inserted. September 15: Some delirium during the night, sensible this morning. Temperature 102° F. last evening, and 102° F. this morning. Dressed wounds, and found them quite clean. Brain not filling up the cavity. Much oozing of cerebrospinal fluid. September 16: Temperature, 103°0° F. last evening, and 101°6° F. this morning. Patient had a restless night, and although he had twenty grains of bromide of potassium, slept little. Removed all stitches from scalp, the incision wounds being quite healed. Not so much oozing. Cavity in frontal lobe still large, and not filling up. Brain pulsation not visible to-day; no suppuration can be seen. Passes urine under him, but takes food well, and answers questions slowly. September 17: Temperature, 102°2° F. last evening, and 103°6° F. this morning. Had "Cheyne-Stokes" respiration very well marked yesterday afternoon, but this has gone to-day. Is very drowsy, no hiccough, and answers questions at times. Profuse discharge of cerebrospinal fluid. Dressings changed, appearance of wounds the same. September 18: Temperature last evening 103° F., and 103°4° F. this morning. Is quite unconscious. Respirations, 36; pulse, 124. Head dressed, cavity quite clean. The patient gradually became worse and died at 6.30 p.m., his temperature going up to 105°6° F. shortly before death.

Post-mortem examination, made on September 19, revealed the following: Entrance and exit wounds were as already described, looking perfectly clean. Late incisions quite healed up. When the body was turned into the prone position much pus poured from the wounds, especially the entrance one, quite five fluid ounces in all, and of a greenish colour. The scalp was dissected off, and the vault sawn through from ear to ear, and also from the two points backwards over the occiput. The posterior part of vault was then removed. The anterior parts of both frontal lobes were found to be quite broken down into the pus already mentioned, leaving a deficiency quite the size of a child's closed fist at the anterior and inferior parts. No other damage to brain, or any abscess in its deeper parts were present, neither was there any trace of meningitis anywhere.

No fracture of the base of the skull could be found, except the orbital plate of the frontal bone on both sides, which was much
fissured and the pieces loose. The fissures communicated with the entrance opening in the vertical plate of the frontal bone. The fissuring of vertical bone was most extensive. The nasal process was completely separated from the superior portion by a fissure half an inch in width. A large notch existed in the left supra-orbital arch.

The coronal suture was separated along its whole extent, and on the left side of the median line a large square fragment of frontal bone was over-riding the anterior border of the left parietal bone. A large opening existed where the bullet made its exit, and where two large pieces of bone had been removed by operation. Along most of the lines of fracture attempts at repair had commenced, semi-organised lymph being present, glueing the edges together.

Case No. 2.—Corporal F. M., aged 22, was wounded near Edinburg, Orange River Colony, on October 26, 1901, at a range of about 1,500 yards. Was mounted when hit; remembered little of what happened till admitted to Springfontein General Hospital on the 28th. On admission the patient was conscious, but very drowsy, answered questions, complained of headache, and sighed frequently. Had complete motor paralysis of left arm and leg, but no loss of sensation. Knee-jerk on left side much diminished. Right arm and leg normal. No apparent difference in the two sides of his face. No loss of motor power in the facial muscles on left side. Tongue protruded straight. Pupils equal, dilated, but responding to light. Bladder and rectum under control of the will. Passed urine freely. He had two small wounds of the scalp, apparently caused by a Mauser bullet, which perforated the cranium. The aperture of entrance was circular, and had slightly inverted edges, being situated in the occipital region, one and a half inches to the left of the median line and two and a quarter inches above the external occipital protuberance. The exit wound was somewhat larger, rather irregular, and with everted edges, exuding some dark blood clot mixed with brain substance. It was situated in the right parietal region, two inches from the median line, and exactly over the fissure of Rolando. On palpation, a patch of crepitus, one and a half inches long by about one inch wide, could be made out running upwards and backwards from the exit wound. There was considerable oedema of the scalp around and between both wounds. The head was shaved at once, and the scalp cleansed (fig. 1).
Perforating Gunshot Wounds of the Skull

On the next day, under chloroform, a semicircular division of all the tissues of the scalp and periosteum around the exit wound (base of flap downwards) was made, and after reflection of the parts the exit perforation in the bone fully exposed. This aperture was found to be surrounded by three or four fragments, which were both loose and depressed. These were removed; they are roughly figured in the accompanying drawing (fig. 2).

The opening was then enlarged with Hoffmann's gouge forceps, and about five smaller pieces of bone removed from between the vault and the dura. There was a small perforation of the dura, which was filled with blood and pulped brain substance. The dura around the perforation looked quite blue, as if from subdural clot, and as the brain pulsation was barely visible the dura was freely incised and some small clots removed. Only a little brain substance came away. A fracture extended downwards and outwards for one
and a quarter inches, from the lower margin of the opening, but no depression could be found there. After cleansing the parts the edges of the dura incision were united by means of a few fine silk stitches, and the flap replaced in position and stitched along its edge with silkworm gut. No drainage tube was put in, but the margins of the scalp exit wound, which were much contused, were pared with scissors to allow for drainage, and a temporary dressing applied. Next, incisions radiating from the entrance wound in the occipital region were made, and two flaps turned back, exposing a small perforation of the bone, with some débris lying in it. These were removed, and as a piece of the inner table had been fractured, and was pressing on the dura, that was removed, together with many small bone pieces which were embedded in the track of the bullet. The brain was considerably lacerated. The reflected pericranium was now replaced, and the edges of the scalp incisions united by means of silkworm gut sutures. Both wounds were dressed with cyanide gauze and wool, but no drainage inserted.

The patient quickly recovered from the chloroform, and was free from pain. His temperature remained normal. November 1: No sign of oozing through the dressings; doing well. No movement of left leg or arm. The patellar tendon reflex in left leg has quite disappeared to-day. November 2: The wounds, on being dressed, were both clean. November 9: All stitches were removed; the wound soundly healed; bullet holes in scalp quite dry. November 11: This morning the patient suddenly

![Fig. 2](image-url)
discovered that he could draw up his left knee, but was unable to move the toes of the same foot. The next day he moved his left elbow, but was quite unable to move the fingers. November 14: Improving every day. Visible brain pulsation at the entrance and exit scars. No return of reflexes in left knee or elbow. November 19: Reflex in right knee manifest to-day for first time.

The man’s subsequent progress was entirely favourable. On November 27 he was allowed to sit up in a chair, and the power in the arm and leg rapidly improved. On December 10 he was able to walk about with the aid of a stick; while a fortnight later he could get about without any aid. He was invalided to England on December 21, and soon left for home, having recovered most of the power in the left hand, but his leg still dragged in walking.

I received a letter from this patient dated April 27, 1902, stating he was very well, had full power in his left hand, and could lift a chair with it over his head. His leg was quite strong, too, except that the toes felt cramped, and he did not suffer from any headache, except under excitement. During 1902 I had many letters from him, stating that under the influence of excitement or dietetic errors he had one or two epileptiform seizures. In the early part of this year I asked Mr. Keetley, of the West London Hospital, if he would kindly see the patient and do anything he thought necessary for him. Mr. Keetley was good enough to see him, and wrote to me on April 28 of this year: “He has had a few fits, it is true, but I do not think he will keep on having them. He has still a trace of loss of power in his left leg, and is a little neurasthenic, but requires, I think, no other treatment than country air, quiet, &c., and these he is getting.”