PART I.

The following thirteen cases of gunshot injuries of the spine came under my observation and care in two General Hospitals during the late war, and give a fair idea of what may be expected when small bore hard-coated bullets, travelling at varying degrees of velocity, pass through, or in close proximity to, the spinal cord.

CASE 1.—Private F. P., Rimington's Guides, was wounded at Modder River on November 28th, 1899, at a long range, and admitted to No. 2 General Hospital, Wynberg, in a few days. The entrance wound was situated 1½ inches to the left of the 4th dorsal spinous process. The exit wound was over the centre of the right clavicle, 1½ inches in diameter, the bone being fractured. He had much pain in the back of his neck and head, loss of sensation up to the level of the 7th rib in front, and 8th rib behind, with complete paralysis of both lower limbs. The upper intercostal muscles were acting. The breathing was mostly diaphragmatic. Cremaster reflex was present, but patellar and plantar absent. No zone of hyperesthesia was complained of. His urine had to be drawn off; the bowels were not acting. The temperature varied, usually 101° F. night, and vomiting was frequent. On December 3rd he had shooting pains in the right leg, and urine was dribbling. On January 4th, 1900, bedsores were forming over the sacrum; and signs of fluid apparent in the base of the left pleural cavity. He was aspirated and 20 ozs. of blood-stained fluid removed. On February 10th there was no return of fluid, but the paralytic condition was the same; pains about neck and head had gone, and the bedsores were healing. On February 28th his general health was much improved. He was being wheeled about in a chair for some days. He was sent to England and subsequently heard of from Netley as getting about in a chair, but there was no improvement in his paralytic condition.

CASE 2.—Private J. M., 1st Argyll and Sutherland Highlanders, was wounded at Modder River at a long range on November 28th, 1899, by a Mauser bullet, and admitted to No. 2 General Hospital, Wynberg, on December 2nd, 1899. The entrance wound was 2 inches behind the posterior axillary line, right side, and over
Fig. 1.
To illustrate paper by Lieut.-Col. S. F. Loughhead, C.M.G.,
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Fig. 2.
the 7th rib. The exit wound was small, just below the centre of the spine of the left scapula. Patient had the usual paralytic symptoms following cord injury in this region. Operation by Civil Surgeon Hanwell, December 3rd, 1899. A median incision was made over the 1st, 2nd and 3rd dorsal spines and the muscles separated. The laminae and pedicles were quite intact, no depression existing. The bullet must have passed either through or just anterior to the cord. His condition did not improve and he died on January 17th, 1900.

Post mortem.—The cord was found partly divided and in a soft "custard condition" opposite the 3rd dorsal vertebra for nearly $1\frac{1}{4}$ inches; membranes were adherent to the cord at the site of injury. The bullet had tunnelled and grooved the back of this vertebra, but no bone was loose or pressing on the cord. Fluid blood was found in the extra-dural space in the whole of the dorsal and upper lumbar regions. A blood-clot, $\frac{2}{3}$ of an inch by $\frac{1}{3}$ of an inch, was found adherent to the inner surface of the dura mater at the level of the 1st lumbar vertebra. The cord was firm and normal-looking above and below the seat of injury. The dural sheath was torn by the passage of the bullet, which apparently entered and made exit between the laminae or pedicles.

Fig. 1 shows the extent of damage to the cord in this case. The dural sheath is slit up and turned outwards above and below the seat of injury.

Case 3.—Private J. M., 1st Argyll and Sutherland Highlanders, was wounded at Magersfontein on November 28th, 1899, at a range of 800 yards. The patient was lying prone when hit. He was admitted to No. 2 General Hospital, Wynberg, on December 2nd, in the following condition: entrance wound $1\frac{1}{4}$ inches below the right acromio-clavicular joint. No exit wound. No hae- mostasis. He had the usual paralytic symptoms of cord lesion from the navel downwards. The urine became blood-stained about December 8th from cystitis, and vomiting after food was present. The urine, which had to be drawn off, became very copious. Bedsores formed rapidly over the sacrum and on the legs, malleoli, &c. On December 15th he had slight involuntary movements in both legs and pain down the crest of the right tibia. Rigors and profuse sweats ensued and he died on January 13th, 1900.

Post mortem.—The bullet, a Mauser, made an oblique course through the bodies of the 7th and 8th dorsal vertebrae and lodged in the left spinal muscles of the upper lumbar region. The cord was practically uninjured, but an extravasation of blood (small
clot) was found between the anterior surface of the cord and the back of the body of the 7th dorsal vertebra. Pus was present on the membranes, giving the impression that it had spread up from the bedsores over the sacrum, which were very deep and sloughy.

Case 4.—Private J. T., 1st Scots Guards, was wounded at Modder River on November 28th, 1899, at a range of about 800 yards. He was lying prone when hit. Admitted to No. 2 General Hospital, Wynberg, on December 3rd. Condition: entrance wound in the centre of his left axilla; exit wound over the spine of right scapula; both were small and circular. The patient had the usual paralytic symptoms. No hyperesthetic zone at upper limit and no sign of hæmothorax. Troublesome cough. Had some hæmoptysis when hit, but none since. Progress bad. On December 12th his respirations were 36 and temperature 102° F. Had daily rigors and profuse sweats. Rapid wasting and polyuria, cystitis and bedsores. On January 14th, 1900, he had œdema of both feet and ulcers on the tongue and mouth, and was passing quantities of mucus per rectum. He died on February 12th, 1900.

Post mortem.—Cord found in a “custard condition” for 1½ inches opposite the 4th dorsal vertebra; membranes adherent, but only a slight amount of clot was found in spots. The bullet, a Mauser, entered and passed out between the laminae or pedicles, as no bone was found fractured or depressed.

Fig. 2 shows the condition of this man’s cord. The extent of damage is considerable, the dura much damaged and adherent. Most of the cord substance had disappeared by absorption at the injured spot, little remaining but the membranes.

Case 5.—Private J. J., 1st Loyal North Lancashire Regiment, was wounded at Modder River on November 28th, 1899, and admitted to No. 2 General Hospital, Wynberg, on December 8th. Range, 300 yards; bullet, Mauser. Entrance wound in the 7th right intercostal space about 4½ inches from the spinous processes. No exit. He died in about a month with the usual paralytic symptoms of complete cord injury.

Post mortem.—Had a loculated empyema on the right side, under entrance wound. Bullet (Mauser) entered the spinal canal, between the 12th dorsal and 1st lumbar vertebrae. This portion of the column was removed as a specimen with part of the 12th rib attached on left side; the laminae were sawn through on both sides and the cord exposed, which on examination showed a dark point through the membranes; this was found to be the nose of the bullet, which was lodged in the 1st lumbar vertebra and protruded into the
FIG. 3
To illustrate paper by Lieut.-Col. S. F. Loughed, C.M.G., "Gunshot Injuries of the Spine."

FIG. 4.
cord itself, having pierced the dural sheath on one side only. The
dura is divided in the specimen exposing the nose of Mauser bullet.

Fig. 3 shows the condition well. The destruction of the cord
was limited to the immediate surrounding of the bullet; it appeared
normal above and below. There was no damage to either pedicles
or laminae.

Case 6.—Private H. T., 2nd Lincoln Regiment, was wounded
at Paardeburg on February 27th, 1900, at a range of about 300
yards, by a Mauser bullet, and admitted to No. 2 General Hospital,
Wynberg, on March 16th. Condition: entrance wound ¼ an inch to
the right of 8th dorsal spine. No exit. Patient had the usual
paraplegic symptoms of complete cord injury, and died on May 18th,
1900.

Post mortem.—Spinal column exposed from behind. No bone
injury could be detected anywhere. Column removed from 6th to
10th dorsal vertebrae and preserved. Laminae sawn through and
dural sheath exposed. The base of the bullet was seen projecting
from the back of the cord, the rent in meninges being very small.
The bullet lay in the centre of the cord with its nose buried in the
back of the body of the 9th dorsal vertebra. Some “custard”
softening of the cord round the bullet for 1½ inches, but apparently
normal above and below this lesion.

Fig. 4 shows the condition. The dural sheath is left intact.
The base of a Mauser bullet can be seen just projecting through
a rather ragged opening in the dura, a little to the right of the
middle line.

Case 7.—Sergeant F. C., 1st South Lancashire Regiment, was
wounded at Knillfontein, Orange River Colony, at a range of about
50 yards, and admitted to No. 12 General Hospital, Springfontein,
the day he was wounded, October 26th, 1900. Condition: entrance
wound small and circular, one inch to the right of mid-sternum
in the 1st intercostal space. Exit wound, also small, ½ an inch
to the right of the 5th dorsal spine. He had a large quantity of
hemoptyysis when hit and this condition continued for three days.
He had complete paralysis, motor and sensory, in both legs, and up
to the level of the nipples, and his breathing was diaphragmatic.
Had retention of urine and loss of control over the rectum. Dulness
over posterior and lower part of right chest, indicating hemothorax.
Progress bad; rapid formation of bedsores; the urine, which had
to be drawn off, soon became fetid. As the bullet had not crossed
the middle line of his body I determined to operate.

Operation on November 10th, by a median incision. Separated
the muscles from 4th, 5th and 6th dorsal spines; removed spines of 4th and 5th with cutting forceps; found lamina of 5th, with a perforation in it, fractured but not displaced. Applied trephine over this hole and removed a disc of bone. The spinal dura beneath also had a hole in it, through which softened cord substance was exuding. No pus or blood were found. The dura was adherent to part of the cord at injured spot. No bone depression. Parts cleaned and wound closed. Patient recovered soon from the operation, but no improvement of the paralysis followed. At this time the dulness at the right base had partly cleared up, but the patient had a short dry cough persisting. On the morning of November 12th the patient coughed up about half a pint of pus and suddenly died.

Post mortem showed a wound through right lung with a small cavity; some pus was present in bronchial tube on the same side, also a small quantity of non-infected blood-clot in the lower part of the right pleural cavity. There was a tunnel in the side of body of the 5th dorsal vertebra. Soft “custard condition” of the cord for about one inch. Adherent membranes but little hemorrhage found at the site of injury.

Case 8.—Private W. H., Imperial Yeomanry, was accidentally wounded at Prior’s siding by a comrade, with a revolver bullet (lead), ‘410 bore, at a few yards’ range, on May 7th, 1901. He was standing when hit and fell at once. Admitted to No. 12 General Hospital on May 8th. Condition: entrance wound small and circular, 1½ inches to the right of 7th cervical spine. Exit wound one inch above and outside the left sterno-clavicular joint. The patient remembered nothing for twenty-two hours after receipt of injury. Had absolute paralysis, motor and sensory, up to the level of the 4th ribs on both sides. Sensation in both hands, but their power was much impaired. Priapism and retention of urine present. Breathing diaphragmatic. Both the knee jerks were absent. No apparent injury to the vessels in neck, but cord must be damaged about 6th or 7th cervical vertebrae. Speech thick, but could protrude tongue straight and swallow. Quite sensible. No operation thought advisable. Progress bad; the temperature went up from normal on admission to 103.4° F. on May 12th, it then began to descend till normal on May 19th, and remained so till death. Constant catheterism was necessary. Urine became foetid and blood-stained, and towards end very copious. His wounds healed rapidly under collodion dressings. He suffered little pain, became rapidly emaciated and vomited much. Complained of tightness in chest on May 18th, and died on May 19th, 1901.
FIG. 5.
To illustrate paper by Lieut.-Col. S. F. Lougheed, C.M.G., "Gunshot Injuries of the Spine."

FIG. 6.
Post mortem.—Spinal column removed from 3rd cervical to 4th dorsal vertebra. Bullet entered through the right lamina of 1st dorsal near its upper border, detaching a small piece of bone downwards on to the posterior surface of this lamina. It then passed to the left and slightly upwards through the substance of the cord, but nearer to its posterior than anterior surface, and emerged between the pedicles of the 6th and 7th cervical vertebrae close to the inter-vertebral disc on the left side. The pedicles were not damaged. The cord was almost completely divided across, except at its anterior part, where a few bundles of nerve fibres remained. Quite 1½ inches of the substance of the cord had disappeared by absorption, some “custard”-looking débris filling the gap. The membranes were adherent to the cord at the injured part, where it was of a pinkish colour. No hemorrhage present or pus. On either side of the injury the cord looked healthy.

Fig. 5 shows the entrance made by the bullet through the 1st dorsal lamina on the right side. A stout wire has been passed through it. It will be seen that the entrance is much larger than that found after a Mauser or Lee-Metford bullet.

Fig. 6 gives an anterior view of the same cord, with the bodies of the vertebrae removed and the dura mater slit up in the middle line and reflected outwards, and stitched to the inter-vertebral discs.

(To be continued.)