frequent stimulation of the hypoaesthetic areas with a strong coil and metal brush, and by strictly limiting leave until some improvement is shown. It is not wise to keep them too long in plaster, as they develop a contracture of the opposing muscles.

For the sketches of the hands I am indebted to M. Arouy, orderly in the electrical service. A few typical diagrams of the alterations in sensibility have been added.

REFERENCE.

¹ *La Presse Médicale*, February 24th, 1916.

NOTE ON THE DISTANT EFFECTS OF RIFLE BULLETS; WITH SPECIAL REFERENCE TO THE SPINAL CORD.

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EXPERIENCE of gunshot wounds in the present war teaches that the effects of a high velocity bullet with rapid rotatory spin are rarely limited to the parts through which it passes; as a rule there is evidence either of indirect or of secondary lesions and sometimes of remote lesions. Thus, haemothorax may be caused by a bullet passing through the muscles of the chest without injury to the pleura; haemorrhage into the abdominal cavity, or even rupture of a viscus, by a bullet passing through the abdominal wall without penetration of the peritoneum. The passage of a bullet through the scalp which strikes but does not fracture the cranium may be followed by symptoms of an intracranial lesion; indeed, the effects of such concussion are sometimes quickly fatal owing to inhibition of the respiratory and cardiac centres in the medulla.

Paralysis, and anaesthesia of parts supplied by one of the nerves to a limb, may be set up by the passage of a bullet through the limb at some distance from the nerve which becomes affected—for example, the functions of the sciatic nerve are often affected by gunshot wounds of the thigh when it seems unlikely, from the position of the wound, that the nerve could have been directly injured. Under the heading "*sciaticques télétrésiques*" (τέλῆς, distant; τρώεις, act of wounding), Lortat-Jacob, Sézary, and Ferrand¹ describe eight cases of traumatic sciatica produced by a projectile penetrating either the lower limb or the ileo-lumbar region without directly implicating either the sciatic nerve or the lumbosacral plexus. Such sciaticas may present the most diverse clinical types, from simple neuralgia to severe neuritis, characterized by paralysis, sensory disturbance, and loss of the knee-jerk. The symptomatology does not differ from that which is observed in cases in which the nerve is directly injured. In one of their cases which was operated on, the nerve was yellow and indurated, although it had not been in contact with the bullet and was not involved in scar tissue. The authors believe that a definite lesion of the nerve may be produced by the vibrations set up in adjacent tissues by the passage through them of a swift rotating bullet.

Of particular interest are the effects on the spinal cord of the passage of bullets in its immediate vicinity, in cases in which there is no evidence of direct injury to the cord. In some instances there was an impact of the bullet upon some portion of a vertebra; in others, however, it was probable that the bullet did not strike the bone, but passed through the tissues outside it. In both conditions the damage to the cord may be either severe or slight. Records of such damage are to be found in the Goulstonian Lectures recently delivered by Gordon Holmes,² and in the address by James Collier.³

In the first of the two following cases some of the dorsal spinal roots were severely injured; the spinal cord was also implicated, and it is probable that the bone was injured. In the second case the soft tissues were probably alone involved.

CASE I.

Lance-Corporal S. was admitted to the Stepping Hill Hospital, Stockport, on June 1st, 1915. He stated that on April 26th he was struck by a bullet which entered the back near the top of the left shoulder, and came out on the right side of the spine. He was unconscious for two or three days, could not hold his water for about a fortnight, and has suffered from severe pains in the back and sides since the injury. On examination the scars of the bullet wounds were observed, the scar of entrance

being just above the spine of the left scapula, that of exit about two inches to the right of the tenth and eleventh dorsal spinous processes. The whole of the dorsal spine below the third vertebra was very tender to pressure, the greatest pain being produced by touching the sixth spinous process. The hyperaesthesia extended over the ribs on both sides, the area included between the fifth and eighth ribs being most affected. Partial anaesthesia to cotton-wool and pin-prick was detected over the back on the right side, between the seventh and the tenth ribs, and in front on both sides, from the fourth to the eighth rib. During inspiration the action of the lower intercostal muscles seemed to be impaired. The right leg was weak, and the dorsiflexors of the right ankle were nearly completely paralysed. The abdominal reflexes were normal. The knee-jerks were slightly exaggerated, the right jerk being the greater of the two. Slight ankle clonus and Babinski's reflex were obtained on the right side.

During the two months that the patient was in hospital the pains in the back and the sides and the hyperaesthesia persisted, though gradually lessening in intensity. The anaesthesia on the left side disappeared in a fortnight, that on the right side in about six weeks. The weakness of the dorsiflexors of the right ankle persisted. On August 24th the patient was transferred to the Calgarth Park Auxiliary Hospital, Windermere, and was under the care of Dr. John Mason, who has kindly kept me informed as to his condition. The patient still suffers from pain to the right of the spine and in the back of the right thigh. He is able to walk a mile, and is able to work a few hours daily in an office. The right knee-jerk is exaggerated, though less so than formerly. The right leg is weak, and the foot tends to drag along the ground.

The main points of interest in this case are: (1) The temporary incontinence of urine; (2) the implication of some of the dorsal roots; (3) the signs of a lesion of the right pyramidal tract, the fibres which convey impulses to the dorsiflexors of the ankle being chiefly affected.

CASE II.

Private G., aged 19, was admitted to St. George's Hospital, Stockport, on December 31st, 1915. He was shot in the back on December 1st, the bullet going in over the posterior border of the left scapula at the level of the sixth dorsal spine and out over the middle of the right scapula at the level of a line between the fourth and fifth dorsal spines. At the time he was shot he was standing on a firing step in a trench; he fell backwards, his feet remaining on the step and his back resting against the wall of the trench. He did not lose consciousness; suddenly he felt severe pain in the upper part of the abdomen, which lasted for a few days. He was laid down at the bottom of the trench where he remained for three hours before being conveyed to the dressing station. He was unable to move his legs; when they were touched a curious painful sensation went right through him from the legs to the back. For two or three weeks after the injury his legs were completely paralysed and sensation was lost as high as the middle of the body. During this time his urine had to be removed by a catheter; strong medicine was required to move his bowels; he had no sensation in the bowel during defaecation. Power and sensation gradually returned to the legs, and thirty days after the injury when I examined him I was unable to detect any paralysis in the movements of his lower limbs. The knee-jerks were much exaggerated and ankle clonus and Babinski's reflex were present on both sides. The presence of the superficial epigastric reflex was doubtful, the abdominal was absent and the cremasteric was normal. There was no anaesthesia. The man still suffered from pains in the abdomen. He was unable to hold his water for more than an hour. There was incontinence of faeces, and sensation in the rectum was impaired. The condition of the bladder and rectum gradually improved, and on April 19th, when he left the hospital, the action of these viscera was almost normal; the knee-jerks were still exaggerated and ankle clonus was present, but the plantar reflex was of flexor type.

In the group of "spastic paralyses," cases are not uncommon in which no paralysis can be detected, the lesions of the upper neurones being represented clinically only by exaggeration of the deep reflexes; such a condition one has often observed in cases of early disseminated sclerosis. The explanation is difficult. It may be that a lesion too slight to produce paralysis, or at least paralysis that can be detected, is sufficient to cut off cerebral impulses which are inhibitory to muscular tonus, when there will be overaction of the spinal centres which is probably the result of the unopposed action of the cerebellum.

REFERENCES.

¹ *Rev. de méd.*, August, 1914; November, 1915. ² *BRITISH MEDICAL JOURNAL*, November 27th, December 4th and 11th, 1915. ³ *Lancet*, April 1st, 1916.

ON account of the epidemic of infantile paralysis in the United States, the military authorities of Cuba have ordered that children arriving from American ports who have an abnormal temperature shall be isolated until the cause of the condition can be diagnosed. Children in normal health will be kept under supervision till any danger has passed.