ART. XIX.—*Myelitis, with special reference to that due to Trauma and New Growths, illustrated by four cases.*^a

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At the outset we find some difficulty in defining the term myelitis. Some authors use the word rather loosely, and apply it to many mere degenerative softenings of the cord, and employ the terms "acute and chronic" myelitis; others limit it to its more literal meaning—viz., inflammation of the cord. These deny the existence of a true chronic myelitis, as it is more properly chronic induration having as its bases various processes of sclerosis.

Definition.—Myelitis, or acute softening of the cord; myelomalacia, red or white softening of the cord, is a localised or extensive inflammation or acute degenerative softening of the cord substance affecting either the grey matter only, or the grey and white together.

Ætiology.—According to Erb, myelitis of the cord is more frequent between the ages of ten and thirty years than in older people, but of seven cases which I have seen in the last year, six were over this latter age. Most cases occur in men in the proportion of about three to one. Its main causes are :—(1) Exposure to cold and great bodily fatigue; (2) as a sequel or complication of acute diseases, especially during convalescence; (3) disease of the vertebræ; (4) new growths of the cord, meninges or bone; (5) trauma, either fracture of the spine or very severe muscular effort. The latter cause is by far the most common, while new growths claim a large percentage of the remainder.

PATHOLOGY.

1. *Traumatic Lesions.*—The most frequently occurring traumatic lesion is fractured dislocation; less commonly, punctured wounds and bullet wounds are met with. In case of fractured dislocation the conditions of the spinal cord may

^a A Thesis read for the Degree of Doctor of Medicine in the University of Dublin, December, 1915.

be several. (a) Dislocation may be momentary, the spinal cord may present no signs of lesion. Microscopically any degree of degeneration of the nerve element may be found. (b) The spinal cord may be compressed by a small fragment of bone, or by hæmorrhage. (c) The spinal cord may be completely broken across, or crushed.

2. *New Growths*.—Neoplasms may arise in the substance of the spinal cord itself (intramedullary growths), but these are not very common nor do they attain to any large size. The more common growth is sarcoma. Extramedullary growths may be situated in the theca, or be attached to its outer surface. The commonest form is said to be a benign myoma. Secondary growths are very common as extramedullary tumours, and are generally associated with involvement of the vertebræ. Mammary carcinoma is especially liable to affect the spinal meninges.

When the spinal cord is pressed upon by a gradually increasing force, either from trauma or new growth, there ensues a physiological severance of continuity of paths. Voluntary power is first lost, next the muscular sense, then sphincteric control and common sensibility.

Many weeks of considerable pressure with a condition of some spasticity and motor and sensory palsy may pass before permanent damage is done to the spinal cord. The onset of flaccidity, however, is followed immediately by ischæmic necrosis. The flaccid paralysis indicates total physiological interruption.

Histological Changes.—The degeneration is first manifested in the white substance, the fibres of which swell up and disintegrate; the axis cylinders swell and become varicosed, and the myelin sheaths break down into fat, while the laminated bodies known as *corpora amylacea* may be seen. The ganglion cells ultimately become swollen and irregular in outline, and undergo vacuolation and chromatolysis; they stain irregularly, their nuclei are dislocated, and the protoplasmic processes are fragmented. The blood vessels are congested and surrounded by lumps of leucocytes, and the small arteries are often the seat of

thrombi. In a few days the degeneration may be traced throughout the neuron. Later, fibres and sheaths have almost disappeared, and their place is taken by newly-formed glial tissue, which finally leads to sclerosis (Adami).

Symptoms.—Those common to any region. The temperature of the paralysed limbs is variable. Immediately after an injury it may rise even as high as 108° , it may then drop in fatal cases as low as 80° . The pulse, as a rule, follows the temperature. The motor functions are rapidly lost, and the paralysis of the lower limbs is usually complete. Sensation is lost, though at first there may be some hyperæsthesia. The effect of injury is at first to entirely abolish reflex action; subsequently, the reflexes below the segment affected may become exaggerated, and when downward degeneration sets in these are finally lost. The urinary organ early suffers from shock, and retention occurs—afterwards, if the injury is above the lumbar region, the retention gives place to involuntary or reflex discharge of urine; but if the lumbar enlargement be involved the urine continually dribbles away through the urethra. The bowels are constipated, and incontinence of fæces is generally associated with retention of urine. At first there is no change in the urine, except the presence of a little sugar in some cases; but it soon becomes ammoniacal, ropy, and occasionally discoloured and with blood. After a time the bladder walls undergo degenerative processes, becoming discoloured and ulcerated. Priapism often occurs with the paraplegia. It is never seen when the lumbar enlargement is involved. Finally, distention of the abdominal parietes, vomiting, hiccough, are met with in cases when injury is high up. According to Boveri, the zonal reaction of spinal fluid is well marked, *i.e.*, if to 1 c.c. of cerebro-spinal fluid is added 1 c.c. of '1 per cent. potassium permanganate solution there is a brown or yellow colouration at the junction of the fluids.

CASE I. (Fig. 1.)—R., aged 31 years, entered hospital on September 21st, 1915. Seven days previously he had fallen a distance of about five feet on to the lumbar portion of his

back, rather to the left side. The patient offered a perfect picture of the symptomatology of a total transverse lesion as presented by Collier. (a) Both the deep and superficial reflexes were abolished. There was no Babinski sign or skin reflex. (b) There was total flaccid paralysis of the lower limbs, with complete anæsthesia. Caloric sensation was negative right up to the umbilicus; also touch and pain sensation up to within one inch of the umbilicus. Location and deep sensibility were negative. There was no zone of hyperæsthesia. (c) The sphincteric control was lost, there being incontinence of fæces, and the man complained of complete retention of urine with a little dribbling. (d) The electrical reaction was somewhat peculiar. In the right leg there was total loss of faradic excitability below the knee and much lessened above the knee. In the left leg there was little loss of excitability above the knee, while below there was a slight peroneal reaction. It was impossible to take an *x*-ray photograph with any success owing to the rapid abdominal breathing. The patient was semi-comatose a good deal of the time. His relatives took him away from the hospital at the end of a week, a catheter being supplied to them.

CASE II. (Fig. 2).—A. J., aged 43 years, fell from a tree on to the cervical portion of his spine, and was brought into hospital the next day (fall, 2/6/'15). (1) There was complete paralysis of the legs, no reflexes, no clonus nor Babinski's sign. (2) All sensation was lost, both superficial and deep. (3) The abdomen showed the same phenomena as the legs. This paralysis extended up to between the fourth and fifth ribs. The deep sensation was present for two or three inches below the fourth rib. (4) In the arms, below the elbow, paralysis was complete. Epicritic, protopathic, and stereognostic sensation were lost. Above the elbow, extending up to a line level with the fourth rib, the deep muscle sense could be elicited. There was very little paralysis in the muscles of the shoulders. (5) The diaphragm was working, but there was some dyspnœa on account of the loss of the lower intercostal muscles. There was no vomiting or hiccough, but some dysphagia and a slow pulse. (6) The pupillary changes were two—haziness of vision and contraction of pupil. (7) No electrical changes had taken place at the time of examination. The patient died on the third night after the accident. Although no skiagram was

taken it was easy to locate the seat of injury as being at the level of the sixth or seventh cervical vertebra.

CASE III.—C. W., aged about 35, was admitted into hospital with a history of having had one breast (left) removed about two years previously for a tumour. She complained of pain in the lower part of the neck. (1) There was complete paralysis of the lower limbs with loss of reflexes deep and superficial. (2) Loss of all forms of sensation. (3) Loss of control over bladder and bowels. The paralysis extended up the body to about the fifth rib, and there was orthopnoea. The arms were also paralysed, though there was little loss of sensation in the upper part. The electrical reaction showed a gradual decrease to both galvanic and faradic currents in the lower limbs, while some of the muscles had undergone the reaction of degeneration, the A. C. C. being stronger than the K. C. C. In the abdomen and arms the decrease was not so well marked. Two or three skiagrams were taken, but no clear shadows were seen. However, there seemed to be very little doubt that the case was one of secondary malignant growth in the spinal cord producing complete transverse myelitis.

CASE IV. (Fig. 3).—N., aged 40 years, a milk seller, had a history of syphilis ten years previously. Nine days before coming to hospital he had tried to lift a heavy weight, but was unable to do so, and suddenly found himself without the power of standing. Before this he had experienced some girdle pain, but had felt no other indication of the onset of the paralysis. There was no Argyll-Robertson's pupil. (1) There was paralysis of the lower limbs. (2) The deep reflexes were lost, but the superficial reflexes were present though diminished. (3) There was incontinence of fæces and retention of urine. (4) Abnormal sensory phenomena were few, only that on the outer side both right and left, extending to three inches above the malleoli, touch and pain sensation was much lessened, and for another two inches higher up the thermal sensation was poor. (5) To the faradic current there was a much weakened response by the peroneal muscles, especially in the right leg—the remaining muscles showed no change from the normal. (6) The muscles of the thigh and calf were measured, and showed no loss of size during patient's stay in hospital. (7) The urine when first drawn off was slightly

ammoniacal, but there was no sugar. A vigorous treatment of mercury and potassium iodide was commenced. On the sixth day control of the rectum was regained. There was slight improvement in the paralysed parts. Unfortunately a few days after the patient left hospital. The diagnosis was gumma of the lower part of the cord. The peculiar point to notice was the very small area of sensory disturbance as compared with the large motor area, and the fact that it was only a portion of the area supplied by one nerve, viz., fifth lumbar. A point common to all these cases was, that no line of 10 hyperæsthesia above the level of the injury was determined.

Treatment of Myelitis.—As near as possible absolute rest is necessary, the prone position being best. The most careful nursing must be insisted on, especially to prevent bed-sores, which are so likely to occur, and the closest attention given to the state of the bladder. Sterilisation of the catheter must be thorough, and urotropine given internally. Pain is to be met by the application of either leeches or ice to the spine, and in severe cases by injections of morphine. Laminectomy in some early cases of trauma and new growths is useful. Drugs are of little or no value in any case, except in syphilis, when the use of mercury and iodides should be pushed vigorously. Tonics are usually given as a routine. Massage and faradisation of the muscles are beneficial.

PERISCOPE.

USEFUL LEGISLATION.

THE Governor-General of the Commonwealth of Australia has issued the following proclamation:—"Whereas it is desirable in the interests of the public health and welfare to prohibit the importation into the Commonwealth of electric or magnetic belts, or any belt which is alleged or intended to produce a therapeutic effect by electric or magnetic influences. Now, therefore, I, Sir R. C. M. Ferguson . . . do hereby prohibit the importation into the Commonwealth of Australia of electric or magnetic belts, or any belt which is alleged or intended to produce a therapeutic effect by electric or magnetic influence."—*The Medical Journal of Australia*, August 7, 1915.