A CASE

IN WHICH

ACUTE SPASMODIC PAIN IN THE LEFT LOWER EXTREMITY

WAS

COMPLETELY RELIEVED BY SUB-DURAL DIVISION OF THE POSTERIOR ROOTS OF CERTAIN SPINAL NERVES, ALL OTHER TREATMENT HAVING PROVED USELESS.

DEATH FROM SUDDEN COLLAPSE AND CEREBRAL HÆMORRHAGE ON THE TWELFTH DAY AFTER THE OPERATION, AT THE COMMENCEMENT OF APPARENT CONVALESCENCE.

BY

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Received February 12th—Read April 23rd, 1889.

The following case is thought worthy of record, partly on account of its interest in relation to the present position of the Surgery of the Nervous System, and especially as it is believed to be the first instance published in which the treatment described has been deliberately proposed and subsequently carried out.

History of the patient.—W. T.—, æt. 45, a labourer, was admitted into St. George's Hospital under my care on August 29th, 1888, complaining of acute spasmodic pain in the left leg. Twenty-one years previously he had contracted chancres, which were followed by secondary symptoms and extensive ulcerations on various parts of
the body. For nine years the left leg had been swollen and painful the pain having, during the past two years become more acute and persistent; whilst at times there had occurred violent spasms in the limb, during which his sufferings were described as agonising. In 1883 he had been in St. George's Hospital, under the care of Mr. Warrington Haward, with general thickening of the left tibia, for which he was treated with large doses of iodide of potassium, slight and transitory relief only being obtained. Since that time he had attended at several London hospitals, and had taken, he said, enormous quantities of iodide of potassium and mercury without feeling in any way the better for the medicine; on the contrary, the pain steadily increased in severity.

During the year prior to his coming under my care the man's sufferings were stated by his relations to have been terrible, so much so that they were compelled to move from lodging to lodging on account of the disturbance caused by his cries during the attacks of spasm. He was said to be of steady and sober habits, and there was no history of insanity or mental peculiarity in any of his family.

On admission, the patient was emaciated, pale, and anxious looking. He complained of acute pain in the left lower limb below the knee. This pain was persistent, but occasionally was greatly increased by spasms in the limb, during which he groaned, his face at the same time being expressive of extreme suffering. The anterior surface of the tibia was thickened and irregular, but the tenderness was less than seemed probable, and the increase of temperature locally was insignificant. Scattered over the body and limbs generally were many scars of old syphilitic origin. No visceral disease could be detected, and the urine was normal.

He was given large doses of iodide of potassium, but on September 4th the pain was so acute that I thought it wise to cut down upon the thickened bone, which I accordingly did, laying open the peritoneum, which in parts was
a quarter of an inch in thickness, and subsequently trephining the somewhat sclerosed tibia above and below, afterwards connecting the trephine holes by an incision through the bone, which freely laid open the medullary cavity.

No benefit of any kind followed upon this treatment.

Gradually the spasms in the limb became more frequent and severe, especially at night, when they often awoke the patient in spite of large doses of narcotics, causing him to shriek loudly. At first these attacks could be rapidly controlled by antipyrin, of which he took large quantities, but a tolerance of the drug was soon established, and it became useless.

On September 29th, after consultation, it was decided to amputate through the knee-joint, a proceeding in which the man placed much faith. At the same time it was fully recognised that the pain was very probably due to some central lesion, and that the amputation might entirely fail to afford relief.

30th.—The leg was removed by Stephen Smith’s method at the knee-joint, the operation being followed by no improvement.

On October 21st, as the patient attached some importance to a change into the country, he was sent to the Convalescent Hospital at Wimbledon, under the care of my colleague, Mr. Dent.

The spasms still continued to increase in frequency, and on November 10th Mr. Dent, with my concurrence, exposed and stretched the left sciatic nerve, removing also a small piece of the skin from the stump, over the spot from which the pain appeared to start. No benefit having been obtained from this treatment, Mr. Dent, on November 22nd, excised about two and a half inches of the sciatic nerve; but this again entirely failed to produce any effect upon the man’s sufferings, which were now beginning to produce serious exhaustion.

On December 8th he returned to St. George’s again to be under my care, when his condition was as follows:
The face was thin and hollow, and the expression was one of great distress; the body was extremely emaciated, the pulse weak and at times intermittent, the temperature was normal, and the urine free from albumen but full of phosphates. Referred to the whole of the leg, which had been removed by amputation, was continual pain, and at intervals varying in length from ten minutes to half an hour, there occurred in the stump and whole of the left thigh violent spasms, which caused the patient to clutch the part tightly and shriek with pain. These attacks lasted usually for five minutes or rather more, and then gradually subsided, leaving the man exhausted and bathed in profuse clammy sweats. The spasms were limited to the muscles of the left thigh, the left latissimus dorsi, and erector spinae.

The affected thigh was wasted, the sensation was normal, and there was no loss of power beyond that which would naturally follow such extensive interference as the sciatic nerve had been subjected to by operation. Narcotics and anodynes, whether given by the mouth, rectum, or under the skin, had little effect, unless pushed to a dangerous extent; and even when so given the spasms occurred, causing the patient to groan and contract his facial muscles as if in pain.

By December 11th it appeared to me quite plain that the exhaustion was steadily increasing, from the combined effects of pain, want of sleep, and inability to take food; and must indeed, at no very distant period, end in death, unless something could be done to relieve the man’s sufferings. I therefore thought that it would be justifiable to suggest any surgical proceeding, however severe, which was likely by any means to attain this end. Taking into consideration the character of the pain, as well as a certain weakness in the lower part of the spine, of which the patient sometimes complained, it seemed not impossible that there might exist some condition of the cord or its membranes, perhaps of syphilitic origin, within the area of the lumbar enlargement which might
prove amenable to surgical interference, and further, that it would be almost certainly possible, in the absence of any such lesion, to relieve the pain in the manner to be presently described. I submitted the question therefore to my colleagues, who thought that before undertaking such a serious form of treatment a further trial of full doses of mercury should be made.

This was accordingly done, but by December 24th it was manifest that the patient was rapidly approaching the final stage of exhaustion. No good effect of any kind having resulted from the extended trial of mercury, I then made the following proposition:—First, to lay open the spinal canal and examine the membranes, or, if necessary, the cord itself, as high as the eighth dorsal vertebra, and, in the event of this exploration producing a negative result only, as seemed extremely probable, to proceed to the division of the posterior roots of those spinal nerves which seemed to correspond in their distribution to the area over which the pain was felt, leaving at least the fourth and fifth sacral nerves intact, in the hope that the control of the bladder and rectum may not be interfered with. By this operation it appeared to me that whatever may have been the cause of the symptoms I should, even if the spasms continued, at least render them painless. I also proposed to commence the exploration at the extreme lower end of the cord, in order that I might be enabled to at once divide the nerves mentioned, if, as was very likely, the condition of the patient’s powers should at any moment render a rapid completion of the operation necessary, before I had been able to extend my examination as high as I hoped to do. The whole of this proposition was made with a full consciousness of the serious character of the treatment, as well as of the uncertainties which must necessarily be connected with a proceeding which, so far as I could ascertain, had not previously been adopted in the human subject.

Having received the consent of my colleagues, I carried out my intention at 1 p.m. on the same day.
The operation.—The patient having been anaesthetised, and placed on his left side with the thighs flexed, the vertebral canal was laid open in the manner indicated by Mr. Victor Horsley in the last volume of the Society's 'Transactions.' A vertical incision six inches long was made in the middle line of the back, having for its centre the spinous process of the eleventh dorsal vertebra. The muscular mass in each vertebral groove was then quickly separated from the sides of the spinous processes and posterior aspects of the laminae by cutting freely with the knife. One vessel only was ligatured, and but three required to be clipped. The bleeding was insignificant, and rapidly ceased spontaneously. The spines of the first lumbar and of the eleventh and twelfth dorsal vertebraæ were then removed with cutting forceps, and the posterior arch of the twelfth dorsal vertebra was taken away by means of a trephine one inch in diameter; the posterior arches of the eleventh dorsal and first lumbar vertebrae being then cut away with angular forceps. The extradural fat, for the most part, came away with the arches, and that which remained on the dura mater was easily pushed aside, giving no trouble of any kind. At the bottom of the wound, the sides of which could be widely retracted without any transverse incision, the dura mater was now freely exposed, and bulged backwards, not as a uniform tube, but at the lower part presented a circumscribed oval swelling corresponding to the area of the twelfth dorsal vertebra. There was no pulsation visible, but this could easily be felt by the finger upon gentle pressure being made. This irregular shape of the dura mater was so suggestive of the existence of some lesion beneath that it was decided to open it at once. A small puncture was therefore made, from which the clear cerebrospinal fluid immediately jetted forth to a height of about six inches. This fluid having been allowed to slowly drain away, the dura mater was laid open along the whole length of the wound. The cord exposed was now seen to be perfectly natural in every respect.
DIVISION OF NERVE-ROOTS.

The posterior arches of the ninth and tenth dorsal vertebrae were then removed by the cutting forceps, and the cord further exposed by extension of the incision in the dura mater to the upper limit of the wound, nothing abnormal being detected, in spite of a very complete examination of the cord on all sides, by gently raising it on a blunt hook.

At this stage Mr. Haward, who was kindly watching the pulse, informed me that the patient’s strength would probably stand no further exploration. I therefore, as quickly as possible, picked up, one by one, the left lumbar posterior nerve-roots, which were readily distinguished by their size and relation to the ligamentum denticulatum, and divided, as I supposed, the lower four of these with a pair of strabismus scissors. This proceeding resulted in the complete arrest of the pulse, which, however, almost immediately returned upon a little gentle pressure being made on the cord with a warm sponge. I then picked up what I supposed to be the two upper sacral nerves, and also divided their posterior roots, with the effect of again suddenly stopping the pulse which rapidly reappeared as before.

The patient had now become so exhausted that I dare not expend time in stitching up the wound in the dura mater, as I had intended to do, its edges were, therefore, merely adjusted as accurately as possible.

The wound in the soft parts was now closed by means of seven silk sutures, four deep, and three superficial. One drainage-tube having been placed at its lower end in contact with the dura mater, and a second at the upper extremity in the superficial parts. A moist sublimate dressing was then carefully applied, and the patient put to bed, the actual operation having lasted a little over one hour and a quarter.

In consequence of the haste with which the division of the nerve-roots had to be completed, there was some doubt as to whether I had not omitted to cut the second lumbar. This ultimately proved to be the case, but the immediate
success of the treatment was fortunately not affected by the omission.

The most striking points noticed during the operation were the following:

1. The extreme comparative ease with which the spinal cord can be exposed even in its most inaccessible situation, as in this case, where it lay at its greatest depth from the surface.

2. The singular insignificance of the hemorrhage, which was certainly less in quantity than is ordinarily lost during the removal of a mamma. The satisfactory result is undoubtedly due to the rapidity with which the muscular arterial branches retract and close after their division with a sharp knife.

3. The irregular shape of the dura mater, and the want of pulsation in it.

4. The absence of any sudden effect upon the pulse, either by the general severity of the proceedings, the escape of cerebro-spinal fluid, the free incision of the dura mater, or even the lifting of the cord from its bed for purposes of examination.

5. The sudden cessation of the pulse upon the division of the nerve-roots, and its rapid re-appearance when slight pressure and warmth were applied to the exposed cord.

Subsequent progress of the case.—An hour after the operation the patient was sleeping, bathed in perspiration; but the pulse, although weak, was at least as strong as when he was first placed on the operating table.

At 9 p.m. on the same day the man was irritable and grumbling because his back felt so weak; he also complained of pain shooting down both thighs. The temperature was 100·6°, the pulse 104. He had taken nourishment.

A restless night followed, during which a good deal of discomfort was felt about the back. The spasms in the thigh occurred at intervals, and were distressing, because they shook the patient, rather than from any actual pain connected directly with them. Urine was
voided naturally, although as a precaution it had been drawn off after the operation.

The next morning (December 25th) found the man still very irritable and discontented. There was considerable sweating. The pulse was rather stronger, the temperature 101°. Nourishment was taken freely.

The pain shooting down both thighs continued, but soon disappeared after the removal of the lower drainage-tube, which probably pressed a little on the theca as the patient lay on his back. The night following was better, with no pain worth mentioning.

On the 26th December the cerebro-spinal fluid, &c., had completely soaked the dressings again. The wound was therefore dressed. It was looking perfectly quiet, and was commencing to heal at the upper part, in spite of the violent twitches which frequently occurred in the mass of muscles forming its left side.

The temperature was 100·6°, the pulse distinctly fuller, perspiration less.

The bowels acted once naturally during the day. The urine was passed in the ordinary manner, and appeared normal.

27th.—The temperature was still rather high and irritable, fluctuating upon the least movement or excitement. The pulse was also very irritable, but, on the whole, not very weak. Nourishment was taken freely still, but towards night he was stated to have been slightly delirious once or twice. The next day, however, he was altogether better, and well pleased with his general condition.

29th.—The patient was comfortable, quite free from pain, and looking altogether better in the face. The spasms occurred at intervals, but were not painful; indeed, he had ceased to complain of them.

Some diarrhoea occurred during the morning, and unfortunately a portion of one of the loose motions passed up beneath the dressings, an accident, however, which was followed by no serious consequence.
The wound was dressed, and found to be almost healed, the upper tube having been removed and two of the deep stitches taken out.

The flow of cerebro-spinal fluid was still free, but rapidly diminishing. In connection with this a rather curious fact was observed, viz. that whereas the irritation caused by this fluid on the right (sound) side of the wound was intense, on the left side, which was in great part insensitive, there was hardly any irritation at all. I at first thought that this was due to the fluid trickling more particularly over the right side; but it could hardly have been so, as the patient up to this time had been lying flat on his back; moreover, the moisture in the immediate neighbourhood of the wound was uniformly distributed over the dressings. It was further noticed that a small bedsore, situated over the left sacro-iliac joint, which had been quite inactive before the operation, rapidly healed after the part had become insensitive.

The notes of the case after this date need not be given in detail. The diarrhoea, which was very obstinate, ultimately subsided, the bowels acting twice daily. A small abscess, caused presumably by the passage of the loose motion into the dressings, formed along the tract of a suture, but was superficial, and gave rise to no serious inconvenience. The temperature gradually fell. The pulse varied considerably at different times, but on the whole steadily gained strength. The spasms occurred as before, but the pain did not return.

On the morning of January 3rd, 1889, the patient was comfortable and contented. The temperature was normal, the pulse 84 and regular, the appetite was good, the bowels had acted healthily. The wound, which was now dressed with boric ointment, had entirely healed, with the exception of a small sinus at the lower end, through which there drained in the twenty-four hours sufficient cerebro-spinal fluid to cause a mark on the dressings of about the size of a crown piece.

In the evening he complained of flatulence, and vomited
some food which he had taken shortly before. A good night, however, was passed, and on the following morning (January 4th) at 10 o'clock, when I happened to be in the hospital, he was quite himself.

About 11 a.m. he said he felt "queer" in his head and placed both hands under his occiput. Almost directly he became suddenly collapsed, and vomited with violent straining. Copious cold sweats followed, and the vomiting recurred. All attempts to rally him from the collapse failed, he shortly became semi-comatose, and died on January 5th, at 2.30 a.m.

In the progress of the case nothing beyond the points incidentally alluded to in the notes requires special comment, excepting the effect of the operation upon the sensation in the affected thigh. This was in some respects remarkable. (See Diagrams, p. 347.)

On December 26th, at 1 p.m., the earliest time at which the patient's irritability would admit of the application of any reliable tests, the condition was as follows (Diagrams A. B.) :-The whole anterior aspect of the thigh was absolutely insensitive. The upper margin of this anaesthetic tract being abruptly marked by a line commencing just above the anterior superior iliac spine, and passing sinuously downwards to the point where the thigh joined the perineum. Laterally this line of demarcation coursed downwards and backwards from a point about two inches behind the anterior superior spine, to the junction of the middle with the lower third of the buttock, from which, on the inner side, it curved upwards, passing close to the left sacro-iliac joint to terminate just below the middle of the operation wound, the left side of which at the lower part was quite insensitive.

The external, internal, and posterior aspects of the limb were insensitive, excepting along a narrow vertical tract, about one inch wide, which commenced suddenly at the lower border of the gluteal fold and passed down on to the back of the stump, fading away almost to nothing at its lower end.
Over an area extending downwards for about eight inches along the outer side of the thigh, from a point situated three fingers' breadth below the anterior superior spine of the ilium, the anaesthesia was less absolute than in the other parts.

The whole perineum was normal in its sensation, and the external sphincter resented with its usual "grip" the introduction of the finger into the anus.

From the conditions just described it was clear that in dividing the nerve-roots I had not interrupted to any material extent the fibres passing to the small sciatic, that I had in no way interfered with the nerves supplying the parts about the perineum, and that the nervous supply to the rectum and bladder had been left intact. It was also manifest that the genito-crural nerve had partly escaped injury, and that the external cutaneous had been only partly interrupted; these last two circumstances tending to strengthen the doubt which was felt as to my having divided the posterior root of the second lumbar nerve.

On January 3rd, 1889, the last occasion on which the sensation of the affected parts was tested, the condition was as follows (Diagrams G. H.).

The whole circumference of the greater part of the lower half of the thigh was at least as sensitive as the corresponding part on the opposite limb. Over the upper half of the anterior surface there was an anaesthetic area, limited above by a line which, commencing one inch below the anterior superior iliac spine, passed with a double curve downwards and inwards, coursing round the inside of the thigh two and a half to three inches from its junction with the perineum. Passing down the centre of the inner side of the thigh from the perineum was a tongue-shaped sensitive tract, about five inches long, the base of which was three inches wide, or thereabouts. The posterior margin of this tongue passed upwards, and joined the gluteal fold at the outer end of its innermost fourth (Diagram H.).
The superior half of the posterior aspect of the thigh was normal in its central (vertical) two fourths, this area of sensitiveness passing rather abruptly on each side into the anaesthetic parts.

The lowest third of the buttock was still insensitive, but above that level all the parts which had at first been deprived of sensation were now normal. The stages of transition from the condition of December 26th, 1888, to that of January 3rd, 1889, can be seen at a glance by reference to Diagrams c, d, e, f.

It is, I think, obvious that the rapidity with which sensation was recovered by the parts previously rendered insensitive by the operation, greatly exceeded anything of the kind commonly met with in surgical practice when a complete nerve-trunk (e.g. the median) has been divided. Moreover, this restoration, as was shown by the post-mortem examination, was quite independent of any attempt at union between the divided ends of the nerve-roots. Although it is, I understand, pretty generally accepted by physiological authorities, that complete restoration of sensation may follow, with remarkable rapidity after the division of the posterior root of a spinal nerve on the proximal side of its ganglion, there has been, so far as I can ascertain, no extensive corroboration of this view in the human subject, until the occurrence of the case which I now record.

To whatever cause the return of function may be attributed, one very important contingency seems fairly certain in the case, viz. that had the patient lived sufficiently long the sensation over the whole of the affected part would have been regained, and further, that no danger of a recurrence of the pain need have been apprehended with the return of sensation, seeing that the restoration was independent of union between the cut ends of the nerve-roots.

Post-mortem examination.—The operation wound was soundly healed, excepting at its lower end, where a narrow channel led directly into the vertebral canal. On cutting
down through the line of union a small abscess cavity was found between the muscular planes, following the course of two of the suture tracks; the abscess was, however, quite superficial to and unconnected with the spinal canal.

The posterior arches of the ninth, tenth, eleventh, twelfth dorsal and first lumbar vertebrae were wanting.

The wound in the dura mater was healed over its upper two thirds, but below the edges gaped, and were fringed with granulation tissue, lying upon which, on the right side, was a thin streak of organising lymph.

The spinal cord was perfectly normal as far down as the lower border of the sixth cervical vertebra. Below this point there were some minute recent blood extravasations in the sub-arachnoid space, and in the sub-dural space, about the level of the ninth dorsal vertebra, was also a small recent clot.

Opposite the seventh and eighth dorsal vertebrae there was a well-defined hardish thickening of the arachnoid on the left side, about a quarter of an inch wide and an inch long, somewhat spindle shaped, which apparently involved two of the posterior nerve-roots.

On the left side the first, third, fourth, and fifth lumbar and first and second sacral posterior nerve-roots had been divided, the proximal ends lying close to the cord, the distal extremities just appearing at the dural foramina. There was no attempt at union between the cut ends.

No lesion was found in any of the nerves forming the lumbar and sacral plexuses.

On opening the skull there was at once noticeable a relative smallness of the occipital lobes of the brain, especially on the left side, on which the surface was much discoloured by blood extravasation. On the upper surface of the tentorium, on each side of the falx, was a large patch of effused blood, and beyond this there was found, on the left side, another considerable blood-clot firmly adhering to the dura mater.

The occipital lobes, in addition to the peculiarity already alluded to, were distinctly harder to the touch than any other part of the brain. Scattered about the pia mater
over the convexities of the two hemispheres, were a few well-marked opacities.

On section the whole brain with its vessels appeared healthy.

*Microscopical examination.*—Sections from the various regions of the spinal cord were prepared by Dr. Penrose, who has kindly provided the report which forms the appendix to this communication. As will be seen, the main point shown in the sections is a somewhat extensive *sclerosis* in the posterior root-zones and columns of Goll.

The sclerosed areas are more extensive in the left half of the cord than in the right, although the excess of sclerosis in the left side varies somewhat in different regions of the cord. Beyond the lesions noted in the cord itself nothing has been found which could in any way account for the pain from which the patient suffered.

As to whether the pain was in reality connected with the sclerosis I am unable to express any decided opinion, but the marked excess of the lesion in the left posterior region of the cord points to the possibility, at all events, of its having been the cause of the symptom. One point, however, seems quite clear, viz. that the perseverance in the administration of drugs could have effected no useful purpose, a circumstance which, in my mind, goes far to justify the treatment finally carried out, as I can conceive no other method by which the necessary relief to the sufferings could have been procured.

*The cause of death.*—On this point I am not quite clear. It is, of course, possible that the collapse which ushered in the fatal termination may have been in some way connected with the loss of cerebro-spinal fluid, but on the whole this seems unlikely when the length of time which had elapsed since the operation is considered, and also as the quantity of fluid draining away had become so small, and, indeed, was gradually growing less, there having been no sudden increase or diminution shortly before the onset of the fatal symptoms.

It is obvious that there was nothing whatever about the
parts at the seat of operation to account for the symptoms, indeed, with the exception of the small abscess in relation with the track of the suture, which was of no consequence at all, the condition of the parts was quite satisfactory, the minute recent hæmorrhages being clearly due to the straining from the vomiting.

It is probable that the fatal issue may be attributed to one of two causes: (1) vomiting, possibly from flatulence with much straining, which produced the cerebral hæmorrhage and collapse; (2) apoplexy resulting in vomiting, collapse, and semi-coma.

Some slight evidence in favour of the former of these two causes is afforded by the fact that the patient was stated to have had on a previous occasion a similar attack of vomiting followed by collapse, from which he recovered slowly.

In conclusion little remains to be said. Cases in which a consideration of the treatment adopted in this case would be indicated must of necessity be rare. At the same time I can recall to mind certainly two patients who suffered from intractable pain of this kind, although hardly so severe, in each of whom repeated amputations were practised without any good result.

I venture to submit that in the case I now record the treatment was not only sound in theory, but was practically justified by the result, for the relief from pain was complete, and the patient lived not only long enough to survive the immediate effect of the operation, but also to commence what I think may, without any straining of terms, be called convalescence.

It is true that at the end of twelve days he died from a sudden and unexpected cause, but it is by no means clear that his death was even remotely connected with my operation; in fact, the inference seemed to be rather that the fatal issue was, as it were, accidental. Moreover, it was manifest to all who saw the patient before the operation, that he was certainly although slowly sinking, and that his survival for very many days was hardly possible. It was
also quite plain that the attacks of exhaustion which followed the spasms might at any time end in fatal collapse.

Even if it be conceded for the moment that the issue was remotely contingent upon my operation, it seems extremely unlikely that life was shortened, and it is certain that it was made comfortable.

Considering the remarkable way in which the man rallied, in spite of his previous state of extreme weakness, from the immediate shock of the operation, and the manner in which the strength was returning up to the time of the commencement of the fatal symptoms, I cannot help feeling that had I possessed the courage to propose and carry out the treatment earlier in the case, when the constitutional powers were comparatively good, instead of wasting valuable time by acquiescing in the patient’s wish to go into the country, there is every probability that this paper, in the place of containing a description of a post-mortem examination, would have been accompanied by a living specimen.

APPENDIX.

Result of Microscopical Examination by Dr. Penrose.

No lesions other than the following have been detected in the contents of the spinal canal:

The pia mater sheath of the posterior root of the left sixth dorsal nerve is thickened by cicatricial deposit, which binds it down to the surface of the cord, forming an extra sheath completely surrounding the fibres of the nerve, of which the endoneurium and perineurium are both increased. This sheath is apparently composed entirely of fibrous tissue, of tolerably recent though not of fresh origin, as is shown by the degree to which the fibrous tissue has been formed with the very small quantity of round-cells present. This
condition may be taken as fairly clear evidence that the thickening had existed longer than twelve days (the period which had intervened between the date of the operation and the death of the patient). The nerve-fibres contained within this mass of tissue show signs of inflammation also in having lost their medullary sheaths. The axis cylinders are still for the most part, if not entirely, intact.

It is impossible, from the histological characters, to determine whether the mass is or is not gummatous in nature.

In the neighbourhood of the operation wound is a little recent granulation tissue tracking up the cord for a short distance along the pia mater.

The spinal cord.—Sections have been cut and prepared from the following regions:—Upper and middle cervical; upper, middle, and lower dorsal; upper, middle, and lower part of lumbar enlargement.

The sections have been stained by Pal’s method (a modification of Weigert’s); with aniline, blue-black; lithium carmine; and sections from all the regions have been stained by each of these methods.

Throughout the whole of the lower half of the dorsal portion of the cord there are small irregularly distributed areas of sclerosis in the posterior median (Goll’s) columns and in the posterior root-zones.

The section shown in the drawing (Plate VIII) is from the lower dorsal region, and it shows fairly typically the condition of the whole of the lower half of the dorsal portion of the cord, although in the other parts the sclerosis is slightly different in position, and is apparently more irregular.

The sclerosed areas tend to gradually diminish towards the upper dorsal region, and finally disappear altogether, leaving the cord above the middle cervical portion quite normal in appearance.

The sclerosis throughout is distinctly more extensive in the left than in the right half of the cord, and tends to affect the posterior median columns proportionately more
in the higher parts of the cord, although, as has been mentioned, the general area of the sclerosis is less in these regions.

In the posterior root-zones there is no one part in which the lesion can be said to be relatively more extensive than in another.

There are no changes in the vessels of the cord suggestive of syphilis.

The sections of the brain which have been examined show nothing abnormal.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. i, p. 115.)
DESCRIPTION OF PLATE VIII.

A Case in which Acute Spasmodic Pain in the Left Lower Extremity was completely relieved by Subdural Division of the Posterior Roots of certain Spinal Nerves; all other treatment having proved useless (WILLIAM H. BENNETT).

Transverse section through spinal cord in lower dorsal region, showing distribution of sclerosis in posterior area.
Plate VIII

Med. Chir. Trans Vol. LXXII.

A Stone, del.

Daneisson & Co. sculp.