citations spoken of, if there were any, could not reach the medulla. The following extract (p. 244) will give some idea of the value of their researches: "If depressor influences were active and had not been impaired in any way then the slowing of the respiration was accompanied by slowing of the heart and a fall of blood pressure. When the respiration was arrested the heart was greatly slowed and then stopped. But if the depressor influence had been lost the heart was only slowed a little on the arrest of respiration and there was no fall of blood pressure nor arrest of the heart and the slight slowing was altogether lost when the heart was acting very quickly consequent upon paralysis of the cardio-inhibitory apparatus. The blood pressure affected the heart rate apart from any cardio-inhibitory effect, for after division of the vagi the heart became quickened as the blood pressure rose and slowed as it fell."

CASE OF TUMOUR OF THE SPINAL DURA MATER.

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WITH OPERATION BY
JOSEPH THOMPSON, M.R.C.S.,
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THE excellent results obtained five years ago by Mr. Victor Horsley in the case of tumour of the spinal cord, diagnosed by Dr. Gowers, have not been always followed by equal success in other cases in the hands of others. It is therefore of importance that all instances of attempted operation for tumour in the spinal canal, whether successful or not, should be recorded and the diagnostic and therapeutic difficulties detailed.

The following is the second such case in which it has fallen to my lot to invite the help of the surgeon,¹ and in each the diagnosis was justified, though the final therapeutic result was in each, from special causes, disappointing.

In the former the tumour, an extradural echinococcus cyst, was found *post mortem* under the vertebra next above those removed, the extreme stoutness of the patient having prevented accurate counting of the spines.

In the following case the tumour, after a long operation, was found and removed, but the patient succumbed two days later. As will be seen from the report of the microscopical investigation, even if a satisfactory recovery from the operation had taken place, the nature of the growth was such that a recurrence was unavoidable.

Medical History.—C. R., aged 50, stationary engine driver, first saw me in the out-patient room on May 12th, 1893. He then complained of pain in the epigastrium and just above the pubes, and of passing blood in his water. There were no other signs of bladder or renal disease, and it was ultimately found that the suprapubic pain and hæmaturia were due to turpentine administered to him by a doctor for the stomach pain. This, however, he did not mention for three weeks, and the difficulties of diagnosis were thereby increased.

The note of May 12th runs: "Ill two months, off work a week. Pain began in epigastrium and lower dorsal spine. It began gradually, and has been always of a dull aching character. Not made worse by breakfast or dinner, but is worse after tea, when he has some wind. The pain is worse when at work. During the last fortnight it has spread down to the pubes. He has also some trembling in the legs, but seems rather nervous and shaky all over. Has lost two stones in weight in the last two months. There is no physical sign of disease of the heart, lungs, stomach, or liver. The urine is normal, and no stone is found by the sound in the bladder. His only previous illness is rheumatic fever nine years ago. No history of syphilis or alcoholism."

It may suffice to say that the hæmaturia and suprapubic pain disappeared after the first visit, the reason being later made clear when the history of the turpentine was revealed. The epigastric pain, however, did not diminish, though it was never very severe, and he continued to complain of pain in the lower half of the dorsal spine. On further inquiry he also admitted a slight feeling of tightness in the waist. During May the trembling and weakness of the legs, which were at first not conspicuous, steadily increased, so that he had to take to a stick in walking. They also became stiff, and there were some aching pains in the front of the thighs and the calves. Whereas on May 12th he could walk well, on June 2nd he walked very stiffly, and complained of numbness on the front of the thighs. On this day the knee-jerks were exaggerated, but there was no ankle clonus. June 6th. Double ankle clonus, slight tactile anaesthesia on front of thighs; walks with difficulty, dragging toes on ground. June 27th. Admitted into hospital; cannot walk, and can only stand with support. During this time the patient had slept and eaten

well, and remained stout, although he said he had lost flesh. The urine and sphincters have been normal.

On July 2nd the following note was taken:

"Patient is a stout muscular man of healthy aspect. He complains of pain in the lower part of the epigastric region and a tight feeling spreading from this place round to the back, about the level of the eleventh rib. He has also pain in the back on either side of the spine about the level of the three last dorsal vertebrae. All his pains are dull and not accurately defined. There are also some crampy pains in the front of the thighs if he moves. He has a sensation of numbness on the front of the legs and thighs, more marked on the right.

"Motor power is normal in the eyes, face, arms, trunk, and sphincters, but the legs show great loss. He can just stand for a moment by himself, but cannot walk without support. The loss of power is greater in the left leg than the right.

"Sensation is normal on the head and arms. There is an area on the front of each leg, stretching from Poupart's ligament downwards as a narrowing cone to the lower third of the shin, on which sensibility is lost to touch, pain, and heat. On the left leg the anaesthesia is incomplete, but on the right it becomes almost complete at Poupart's ligament and extends an inch above it. On both soles and dorsal surfaces of the feet, on the back of the legs, thighs, and in the perineum sensation to touch and pain are normal, though heat and cold are sometimes confused.

"On the back of the trunk sensation seems fair, but there are a few points on either side of the eighth and ninth dorsal spines where a light touch is sometimes missed. There are similar patches of very faint anaesthesia in front near the anterior ends of the eighth and ninth ribs. On the abdomen sensation is normal. Just above the slightly anaesthetic spots behind there is a patch of slight cutaneous hyperaesthesia. Spinal tenderness is absent.

"The knee-jerks are increased, more especially the right, and there is double ankle clonus. The plantar, cremasteric, and abdominal reflexes are not obtained.

"Digestive, circulatory, respiratory, and urinary systems normal, except that he has occasionally some flatulence after tea."

Fig. 1.—C. R. Areas of anaesthesia. The dotted patches on the trunk indicate the spots of very slight and variable tactile anaesthesia. The deeper shading on the right leg indicates the greater intensity of the anaesthesia on that leg.

During the next fortnight, in spite of the administration of potassic mercuric iodide, the condition of the patient did not improve.

The note on July 16th says "he cannot lift either leg off the bed, although the toes of both can be moved. There has been no distinct girdle sensation, and the pain in the epigastric region and back has been less intense and ill defined.

"The sensory loss is slightly variable and is not increased. Painful impressions are felt on the left leg, but on the front of the right he often misses a prick or pinch. Pulling the hairs in the right groin may be felt on one day and not on another.

"On the trunk the disturbance of sensation is still more uncertain. The patient's fat makes counting the spines difficult, but in an area of skin a square inch in size about the level of the eighth and ninth spines he usually misses a light touch on either side of the vertebral column. Occasionally on the left there seemed to be slight dulling of sensibility for an inch higher, but there is no zone of hyperaesthesia. On the front of the body there is a point about three inches below the nipple and just internal to it where he sometimes fails to detect a light touch, but this spot of partial anaesthesia cannot always be demonstrated. Otherwise

¹ See Ransom and Anderson, *BRITISH MEDICAL JOURNAL*, November 25th, 1891.

there is no alteration of sensation on the trunk. (See Fig. 1.) There is no wasting of muscles, no bedsores, and the sphincters are unaffected."

DIAGNOSIS.

The cause of the paraplegia in this case was by no means obvious. The march of the symptoms—namely, pain, motor and sensory loss—did indeed suggest compression of the cord; but the small intensity and vagueness of the pain and the small and peculiar distribution of the anæsthesia obscured the diagnosis both of the nature and position of the spinal lesion. The only complete anæsthesia was in the area of the anterior crural nerves. I several times failed to demonstrate the slightly anæsthetic spots on the trunk, while hyperæsthesia was only once or twice detected. It was, indeed, the opinion of some of my colleagues that the paraplegia was due to myelitis and the pain to disturbance of the stomach, which last opinion was naturally inclined to by the patient. And a consideration of the well-known paræsthesiæ in the areas of the cutaneous branches of nerves whose visceral twigs are in communication with disordered organs—which have been so thoroughly investigated by Head² and Mackenzie³—gave additional weight to this view. The small patches of slight anæsthesia and occasional hyperæsthesia on the trunk closely corresponded with the region associated by Head with disorder of the stomach—seventh, eighth, and ninth dorsal areas—and Fig. 2, which is taken from a case of my own, shows this coincidence clearly.

Fig. 2.—J. B., aged 22. Case of slight dilatation of the stomach, with agoraphobia and general nervousness. Dotted spots show areas of cutaneous hyperæsthesia.

This was the case of a young man who for two months had suffered from various dyspeptic symptoms, which had been followed by general nervousness, vasomotor instability, and that form of neurosis which consists in an inability to walk out of doors, more especially in wide streets or open spaces.

The stomach was slightly dilated, but the chief peculiarity noted was the zone of intense cutaneous hyperæsthesia in the left half of the epigastric region, stretching as a narrower band to the back, where it again widened out so as to reach from the scapula to the crest of the ilium. On the right side in front was a small patch of less intense skin tenderness. These areas of functional nerve disturbance due to gastric trouble, though slightly more extensive, thus correspond very closely with the paræsthetic spots in the case of paraplegia. But further consideration shows differences. First, in the case of dyspepsia, there is hyperæsthesia only; in the other anæsthesia is more marked. The functional change of cutaneous nerves whose visceral branches supply disordered organs appears to be always in the direction of exaltation rather than depression, except in cases of definite hysteria. Secondly, the paraplegic patient presented no other signs of stomach trouble, the appetite being good, and his only complaint being slight flatulence and discomfort after tea. And, thirdly, he showed no other stigmata of the neurotic disposition, as do most of the patients with these hyperæsthetic zones.

In spite, therefore, of the absence of well-defined root symptoms, I arrived at the conclusion that the pain and the paraplegia were due to a common cause—compression of the

spinal cord, probably a tumour—and also from the absence of such symptoms that the tumour was probably situated outside the dura mater.

The position of the pain and the patches of slight anæsthesia pointed to the neighbourhood of the seventh and eighth dorsal roots as the level of the growth, but the total absence of anæsthesia lower down till the region of the anterior crural nerve was reached was difficult to explain. It is, however, a general rule that tumours of the spinal canal are found at or above the highest limit of sensory disturbance, and it is probable that extradural growths will usually be found higher above the anæsthetic zone than those situated within the dura mater. When therefore, after consultation, my colleague, Mr. Thompson, agreed to operate, we decided to commence the incision just below the small anæsthetic zone behind and to extend it some distance above. It was owing to a suspicion that there might be a lower portion of the growth causing the anæsthesia of the legs that I advised exploration at all below the anæsthetic spot on the back. If it had not been for the area of normal sensation on the abdomen I should have advised cutting altogether above this spot and, as it turned out, this would have been the right course to pursue.

Fig. 3. Transverse section of spinal cord of C. R. at level of tumour (Weigert's stain), showing slight degeneration in the ventral portion of the posterior columns and in the lateral pyramidal tracts. *d*, dura mater; *p*, compressed posterior root; *f*, fat infiltrated with sarcoma cells; *s*, part of the sarcoma not removed at the operation.

It was not thought advisable to delay operation, on the chance of more definite localising signs developing, as if relief was to be obtained it could only be expected before the cord was irretrievably damaged by the pressure. Moreover, when the patient is enfeebled by bladder troubles or bedsores the chances of a satisfactory result are much diminished.

OPERATION BY MR. JOSEPH THOMPSON.

July 19th. The thickness of the subcutaneous fat making it impossible to localise the anæsthetic spots on the back by reference to spines, their position was marked on the skin with silver nitrate, and, after the patient was under the influence of the A.C.E. mixture, an incision was made over the spine from a point 2 inches below the mark to one 5 inches above. The muscles were separated from the spines and laminae by the knife, and it was found necessary to make transverse cuts through aponeuroses at either end of the incision. Bleeding was very free.

Three spines having been removed by bone forceps, the trephine was applied to the lamina just at the mark on the skin. Then three laminae above were removed by the help of fenestrated sequester forceps.

Three inches of dura mater were now exposed, but no tumour or inflammatory mass appeared. On the fat being removed it was thought that the dura bulged unduly, and a longitudinal incision was therefore made along its dorsal surface. The spinal cord thus exposed was, however, quite normal in appearance, and an aneurysm needle passed round it detected nothing abnormal on its ventral surface. It was

² *Brain*, part I, 1893.

³ *Medical Chronicle*, August, 1892.

now noticed that the posterior roots directed towards the mark on the skin seemed to run into the cord higher up than the part exposed. The dura mater was therefore stitched up with four silk sutures, and the lamina next above removed. There was now seen in the position of the extradural fat a bluish lobulated mass, rising slightly above the normal fat, and distinctly firmer to the finger. This was found to be readily separable from the dura and the bones. Its lower end being raised by dissecting forceps, the growth was removed by scalpel and scissors, although small portions could be seen spreading down the sides of the dura, and therefore inaccessible. The dura mater under the tumour was markedly depressed. The oval mass removed was $1\frac{1}{2}$ inch in length, and *in situ* about $\frac{3}{4}$ inch broad.

It was not quite certain that the whole of the upper end was removed, but the condition of the patient made prolongation of the operation dangerous. Altogether the operation lasted two hours and a-half, during which time the loss of blood was considerable. The wound was frequently irrigated with 1 in 2,000 perchloride of mercury solution, and just before closing with warm iodised water. A long drainage tube was inserted, and the wound closed by deep sutures.

AFTER-HISTORY.

July 20th. Though apparently under the influence of considerable shock, the patient came round fairly well from the operation, being helped by brandy enemata. Last night, temperature 97° . This morning, temperature 100.5° , pulse 160. Patient feels faint, thirsty, and is occasionally sick, but has not much pain. A pint of urine was drawn off early this morning by the catheter. The dressings are soaked with red discharge, and a little pale fluid can be squeezed out from the drainage tube, at the bottom end of which is a clot with an offensive smell. Wound was syringed out with 1 in 2,000 perchloride of mercury solution, the tube shortened and reinserted.

July 21st. Patient is still very weak, but has kept down some iced milk and champagne. He was given a hypodermic injection of morphine in the night, as he had some pain in the back. There is still retention of urine. Temperature, 100.6° , pulse 150. The discharge is less abundant and less offensive than yesterday. About an ounce of dark sanious fluid was squeezed out from the drainage tube. Wound syringed with 1 in 2,000 mercurial solution, and some iodoform emulsion then injected into it. Tube reinserted. Yesterday sensation on the legs and abdomen was worse than before the operation, but to-day it has returned, so that now he feels rather better than before. He complains of some numbness in the upper part of the trunk.

July 22nd. Patient gradually sank during the night, and died this morning.

PATHOLOGICAL REPORT AND REMARKS BY DR. RANSOM.

I was unfortunately not able to be present at the *post-mortem* examination, which was done hurriedly, and without a sufficient investigation of several important points. Thus it was not accurately noted which were the laminae removed at the operation, and the exact relation of the tumour to a given dorsal vertebra was likewise not noted. The cord was exposed from the lower end of the dorsal to the middle of the cervical region, and this portion was preserved in Müller's fluid. No further trace of tumour was seen. The wound is described as "showing no sign of healing and looking in an unhealthy septic condition." The rest of the body was not examined.

From observations made at the operation and examination of the cord it is fairly certain that the laminae removed were those of the fifth, sixth, seventh, eighth, and ninth vertebrae, and that the tumour compressed the cord at the level of the eighth dorsal roots.

The growth, on microscopic examination, proved to be a round-celled sarcoma, apparently arising in the extradural fat. Sections of the cord showed thickening of the dura mater, with some infiltration of the latter by sarcoma cells at, and for 3 inches above, the site of compression, but below all was normal. A few sarcoma cells were also seen in the veins of the anterior surface of the upper dorsal cord. There was no infiltration of nerve roots. No tracts of ascending or descending degeneration in the cord could be made out by Weigert's or by carmine staining, but at the level of the tumour some disorganisation was evident (Fig. 3). The anterior and most of the lateral tracts appeared normal, but in the ventral portion of the posterior columns numerous degenerate fibres were seen, and there was a slighter degeneration of the fibres forming the lateral pyramidal tracts, and those limiting the grey matter in the bend between the anterior and posterior horns.

As will be seen from the figure, however, the greater part of the white tracts presented a normal appearance. The grey matter was slightly distorted, and the cells did not take

stains well, but there was no marked congestion or infiltration, either with sarcoma cells or leucocytes. One bundle of a posterior root was slightly flattened, and showed a few partly degenerate fibres.

Fig. 3 also shows a portion of the tumour outside the dura mater, but commencing to invade it and the fat.

None of the microscopical sections made demonstrated clearly the tissue of origin of the growth, but the naked-eye appearance at the operation and *post-mortem* examination strongly suggested the extradural fat rather than the dura mater itself. The bones were quite normal. It is probable that the growth was primary, as there was no clinical sign of tumour of any other part of the body, and secondary growths are rare in the spinal canal.

I append in tabular form the salient clinical points in this case and that of the echinococcus cyst referred to at the commencement of this paper.

	Extradural Echinococcus Cyst.	Extradural Sarcoma.
Level	Tenth dorsal vertebra	Fifth dorsal vertebra.
Duration, from onset to operation	One year and a-half	Four months.
Pain	Intense, shooting, and burning. Preceded motor loss by a year, but went away for intervals. Occurred in the area of anaesthesia, namely, in the legs and hips	Moderate, dull, aching, inconstant. Preceded motor loss by two months; relieved by rest. Was separated by a wide zone from the area of complete anaesthesia. Was in the epigastric region.
Spinal tenderness	Present, but slight	Absent.
Girdle sensation	Absent	Not definitely developed.
Motor loss	Slightly preceded the sensory. No spastic stage	Spastic condition preceded sensory loss. Paralysis ultimately complete.
Sensory loss	Was over the whole of the lower limbs, but most complete on their posterior aspect, beginning in the feet	Was only complete in the area of the anterior crural nerves, and was greater on the side where the motor loss was less. Very slight and variable in the zone of pain.
Hyperaesthesia	Slight and transient	Very slight and transient.
Reflexes	Knee-jerks and ankle clonus absent. Plantar reflex slight. Cremasteric and lower abdominal reflexes absent	Knee-jerks increased; double ankle clonus. Plantar, cremasteric, and abdominal reflexes absent.
Sphincters	Retention of urine	Bladder and rectum normal.
Bedsore	Formed rapidly on buttocks	Absent.
Muscular wasting	Towards the end came on in the thighs	Absent.

To return to the clinical aspect of the case, it has been already stated that the symptoms pointed to an extradural tumour. From the small amount of pain, I thought it probable that the growth was non-malignant, possibly lipoma, osteoma, or echinococcus cyst. According to the statistics collected by Horsley, lipoma was unlikely, because of the age of the patient and the rapid onset of the symptoms—paraplegia in three months. Both of these points, on the other hand, would agree with the diagnosis of hydatid. Osteoma as a cause of paraplegia was not met with in the fifty-four cases collected by Horsley, but Caselli² has recently successfully operated on such a case.

The present case shows, however, that an infiltrating sarcoma of fairly rapid growth may produce pressure paraplegia with but very little pain.

With regard to the relation of symptoms to the level of the tumour, the general rule that the growth is at or above the highest zone of anaesthesia or hyperaesthesia is again found true. Such slight and vague root symptoms as were present pointed to an affection of the seventh or eighth dorsal nerves, and the growth was found under the fifth dorsal vertebra, the spine of which, as is shown in Mr. Reid's valuable paper on the relation of nerve roots to vertebral spines,³ is over the point of entry into the cord of the eighth dorsal root.

Mr. Horsley remarks that this rule appears to be without exception, and it was also illustrated by my case of echinococcus cyst of the spinal canal referred to above.

² *Rif. Med.*, November 8th, 1893; *EPITOME*, December 23rd, par. 511.

³ *Journ. of Anat. and Physiol.*, vol. xxii, 1889.

[An exception would, however, appear to have been at last met with in the case of Caselli, in which intense pain at the level of the third dorsal vertebra was produced by an osteoma of the fifth.]

The puzzling feature in the present case was the peculiarly limited anæsthesia in the legs with the wide zone of normal sensation above. This may, however, be partly explained by the appearances of the cord under the microscope, which show complete integrity of the columns of Burdach and only very slight affection of those of Goll. It would seem as if external pressure caused disintegration of the central sooner than the peripheral portions of the cord, and thus the fibres whose conductivity was impaired were a group which had entered the cord far below the level of the compression.

CHANGES IN THE POSTERIOR COLUMNS OF THE SPINAL CORD IN DIABETES MELLITUS.

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THE following are abstracts of notes in two cases of diabetes, in which pathological changes were found in the posterior columns of the spinal cord.

[The first case was under the care of Mr. Milner, M.B., at the Salford Union Hospital; the second was under the care of Dr. Steell, at the Manchester Royal Infirmary. To the kindness of these gentlemen I am indebted for the opportunity of making the clinical and pathological examinations.]

CASE I.—J. D., aged 52. Symptoms of diabetes were first noticed whilst the patient was recovering from a severe cold. The amount of urine varied from about 140 to 170 ounces daily; the specific gravity was generally about 1040; the amount of sugar varied from 20 to 26 grains per ounce. The urine contained no albumen. The patient complained of weakness, loss of flesh, and thirst. The arteries were markedly atheromatous. There was paresis and wasting of the right pectorals, deltoid, biceps, and triceps muscles. The same muscles were affected on the left side, but to a less extent. There was numbness and tingling in the fingers, but no loss of sensation to tactile and painful impressions. The knee-jerks were absent when the patient was first seen; at a later date they became normal (I do not know the condition of the knee-jerks during the last two months of life). There was no ataxy in walking, and no symptoms of tabes were noted. Death occurred from phthisis, about eleven months after the onset of the disease.

Necropsy.—Body wasted. A considerable amount of serous fluid in the abdominal cavity. Tuberculous disease of the lungs. Pancreas firm; weight 3 ounces; microscopic examination, after hardening, revealed cirrhosis. No changes of importance in the heart, liver, kidneys, or spleen. Atheroma of the aorta. Attached to the left side of the lumbar vertebrae (first and second) was a firm oval tumour the size of an egg. Microscopical examination showed that it was a fibroma. The brain (including medulla and floor of fourth ventricle) and the spinal cord appeared normal to the naked eye. The arteries and their smallest branches, to the biceps muscles on each side, were completely calcified.

The spinal cord was hardened in Müller's fluid. On section of the hardened cord, in the lumbar region the cut surface appeared quite normal, but in the cervical and dorsal regions there were marked naked-eye changes in the posterior columns. Portions of these columns were much paler than the rest of the white matter of the cord. The colour of the affected parts resembled closely the colour of tracts of ascending degeneration—in cases of transverse lesion of the cord—after hardening in Müller's fluid. In the lowest dorsal region this change—marked paleness—was seen only at the posterior half of Goll's column and the posterior third of Burdach's column on each side. A little higher the whole of both posterior columns, with the exception of a narrow area in front, was much paler than the rest of the white matter (see Diagram 3). Higher still, about mid-dorsal region, these changes were seen in Goll's columns and the median halves of Burdach's columns. At one spot in the upper dorsal region the cord was slightly bruised in removal; but examination of the bruised part showed the absence of compound granular cells or other evidence of myelitis. In the uppermost portion of the dorsal region, just above the bruised part, the changes (marked paleness) affected Goll's columns chiefly, but extended slightly into Burdach's columns. In the lowest cervical region the changes were very well marked, and affected Goll's columns only. The changes gradually diminished at the anterior parts of these columns, and in the highest cervical region

only the posterior two-thirds of Goll's columns were affected, but the alteration in colour was quite distinct (see Diagram 1). With the exception of the posterior columns, the cord appeared quite normal to the naked eye.

Case 1.—Naked-eye appearances of the spinal cord on section, after hardening in Müller's fluid; normal white matter is shaded. The portions of the posterior columns affected are unshaded; 1, upper cervical region; 2, lower cervical region; 3, dorsal region.

On microscopical examination the changes found were very slight, and this was surprising considering the well-marked naked-eye appearances. In sections stained according to Weigert's method, the posterior median columns in the cervical region were paler to the naked eye than the rest of the white matter. In the dorsal region they were very slightly paler than the other tracts of white matter, but the difference was less marked than in the cervical region.

In sections stained with aniline blue-black the posterior median columns of the cervical region were slightly darker in colour than other parts of the white matter; but in the dorsal region the change could only just be detected.

Under the microscope, sections stained both according to Weigert's method and with aniline blue-black showed slight excess of neuroglia connective tissue in the posterior median columns of the cervical region.

In the posterior median columns (cervical region) many of the nerve fibres were swollen, and the part of myelin which is stained black by Weigert's method (that is, outer part) was reduced to a very narrow rim. In sections stained with aniline blue-black many of the axis cylinders of nerve fibres in the posterior median columns were seen to be swollen.

In sections stained according to Marchi's method, scattered degenerated fibres (stained black) were seen in posterior columns (median and external) of the dorsal region and in the posterior median columns of the cervical region; they were more numerous in the latter region. Sections of the lumbar part of the cord appeared normal. At no part of the cord was there any evidence of myelitis. The pyramidal tracts (direct and crossed), the direct cerebellar tracts, and all other parts of the white matter were normal. In the lower part of the cervical region most of the nerve cells of the anterior horns of grey matter were pigmented, and some—chiefly those of the inner group—were perhaps slightly atrophied.

The finest nerve fibres entering the biceps muscles (branches of the musculo-cutaneous) were teased fresh in osmic acid, but microscopically they appeared quite normal; also sections of nerve fibres to the biceps muscles, hardened and stained according to Marchi's method, appeared normal. The floor of the fourth ventricle and medulla appeared normal microscopically.

CASE II.—E. B., aged 21, gave a history of severe fright, followed by great mental distress and anxiety, twelve months previous to admission to the hospital. Prior to that date the patient had been in good health, but she has not been able to follow her employment (that of a dress-maker) since. Thirst and diuresis noted first about four weeks after the fright. The patient was considerably emaciated. The urine had a specific gravity of 1038; it contained a large amount of sugar, but no albumen; it gave a distinct (Gerhardt's) reaction with perchloride of iron, and a well-marked reaction for acetone (Legal's test). There were signs of tuberculous disease of the apex of the left lung, and the sputum contained numerous tubercle bacilli. The knee-jerks were present, but feeble. The pupils reacted to light and accommodation. A few days after admission the knee-jerks disappeared; they remained absent up to death, which occurred from asthenia about seven months after admission. During the last few days of life there were slight pains in the legs, chiefly about the ankles and soles of the feet, but there were no symptoms of locomotor ataxy or other cord lesion during the illness. Both lungs were extensively affected with tuberculous disease during the latter three months of the patient's life. The quantity of urine varied from about 90 to 116 ounces daily during the time the patient was in the hospital, and the amount of sugar from 28 to 32 grains to the ounce.

At the necropsy there was extensive tuberculous disease of both lungs. The pancreas was small, and weighed 10 drachms 55 grains, but the heart and other organs were proportionally atrophied. On microscopical examination the pancreas appeared normal.

The spinal cord appeared normal at the necropsy, but after hardening in Müller's fluid, marked naked-eye changes were seen in the posterior columns, on transverse section. The affected parts appeared much paler than the rest of the cut