SPINAL TUMOURS, THEIR DIAGNOSIS AND LOCALIZATION.

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RECENTLY great advances have been made in the methods of localization and surgical treatment of tumours of the brain; it is now possible to remove even large new growths with complete success, the operative mortality in the most skilled hands being at the present time under 10 per cent. Equal if not greater progress has taken place in the methods of dealing with spinal tumours and a consideration of this problem should be of special interest as tumours in this situation are by no means uncommon, and when diagnosed the operative results are often most satisfactory. That these tumours are not rare will be seen from Schlesenger's report on a series of 35,000 post-mortems where spinal cord tumours were found in 43 (i.e. about 2.06 per cent of the total number of tumours).

As regards the level incidence, Potal and Vaudueau found that 52 per cent of the spinal cord tumours were in the dorsal region, 20 per cent cervical, and 28 per cent lumbosacral and caudal.

With regard to their relation to the circumference of the cord, Frazier found about 75 per cent to lie on the dorsal or dorsolateral aspect of the cord; in Elsberg's series 64 per cent were posterior and the rest were ventral or ventro-lateral.

The term tumour is generally used in a clinical sense to include new growths, gummata, cysts, tuberculous abscesses, etc., but in Elsberg's and Antoni's series the term is limited to new growths. In about 400 cases collected by Schlesenger the nature of the tumours was as follows:—

- Sarcoma and glioma, 134; tuberculous, 64; hydatid, 44; neurofibromata, 37; gummata, 28; endotheliomata, 24; and other rare conditions.

Elsberg found that 20 per cent of his series were neurofibromata and fibromata, and 48 per cent endotheliomata. Antoni, after a careful study of 30 cases of spinal cord tumours, found that two-thirds were neurofibromata and one-third endotheliomata. It may be concluded from this that neurofibromata and fibromata form a large proportion of spinal cord tumours and as they are benign and easily removable the chances of recovery after surgical treatment are very great.

CORD CHANGES.

It has been shown by Riddoch and Purves Stewart that the effect of the actual pressure on the cord elements is very limited, degeneration, softening and atrophy usually only occurring in the immediate vicinity of the tumour; more serious damage and interference with cord function may, however, be produced by interruption of its blood supply by oedema, haemorrhage, or thrombosis.

Elsberg considers that the majority of cases of spinal tumour with
symptoms of less than two years duration will recover after removal of the growth and be able to return to work. One should therefore not despair of obtaining good results even though paralysis be extensive and of long duration.

**Classification.**

The topographical and not the histological features are taken as a basis for classification. Tumours are thus divided into:

1. **Extradural**, arising in the arches or bodies of vertebrae or extradural fat. These form about three-sixteenths of the total and the majority of them are of a malignant nature.

2. **Intradural**, but extramedullary. Fifteen of twenty-seven cases collected by Sargent belonged to this group. In Elsberg's series of 100 cases three-fourths were extramedullary; of these 78 per cent, or more than half the total, were intradural. Most of these tumours are benign and easily removable; in many cases they lie almost free in the subdural space and can be very easily shelled out.

3. **Intramedullary**. They usually form from one-sixth to one-fourth of all the cases.

**Clinical Features.**

In the majority of cases, the onset of symptoms is slowly progressive. From the clinical standpoint the whole course of the disease can be divided into two stages. (1) Irritative stage or stage of root symptoms, which are generally of a neuralgic nature. (2) Stage in which symptoms due to interference with cord function appear; these vary from impure Brown-Séquard's paralysis to complete compression paraplegia.

1. **Irritative Stage with Root Symptoms.**

   a. Pain is usually the first symptom occurring in about one-third of the cases of extradural tumours, in two-thirds of intradural extramedullary and in less than one-sixth of intramedullary growths. In a series of 100 cases collected by Elsberg only 27 had no pain at the onset and in only 8 was pain absent throughout the whole course of the disease. It was the first symptom in 8 out of 15 cases described by Sargent. In our series it was practically absent in one case and present to a varying degree in the rest. These pains are usually referred to the area of distribution of one or more roots and may be accompanied at first by hypesthesia in this area and later on by anaesthesia (anæsthesia dolorosa).

   As regards severity, this varies from a mere unpleasant sensation of constriction to the most severe and persistent pain. Starr considers that there is no other disease which causes such recurring and persistent pain. The pain is in many cases aggravated by movements of the spine or by strong expiratory efforts, such as coughing, sneezing, straining, etc.

   It may appear suddenly and persist throughout the whole course of the illness; but in many cases it disappears when symptoms of cord compression become prominent.
Root pains vary in nature according to the segmental level of the tumour and may simulate any visceral disease, hence the importance of recognizing this possibility in all cases of vague and persistent pains. Pain due to involvement of the upper thoracic nerve roots is often referred to the axilla, underneath the scapula or to an intercostal space. It is here that a diagnosis of pleurodynia, pleurisy, angina pectoris, intercostal neuralgia, etc., is often made and the case is thus wrongly treated for long periods.

Tumours situated in the lower dorsal region may give rise to pain simulating intra-abdominal disease such as intestinal, renal or biliary colic, flatulence, gastric ulcer, etc.

Tumours of the cauda equina give rise to intense pain which may radiate down the backs of the legs, and it may be sometimes difficult to differentiate these cases from ordinary sciatica.

In addition to the above root pains many cases of cervical and upper dorsal tumours start with pain in both lower limbs due presumably to pressure on the pain fibres in the spinal cord.

(b) Motor irritative phenomena may occur early if the tumour involves anterior nerve roots. Tremors and spasms are quite common in these cases and fibrillary twitchings may be seen even when marked atrophy of the corresponding muscles is present. These are more frequent in intramedullary tumours.

(2) Stage with Cord Symptoms.

As soon as the tumour begins to exert pressure on the cord two sets of symptoms appear.

(a) Local symptoms due to compression and destruction of the segment subjected to the direct pressure of the tumour and consisting of atrophy and paralysis of the muscles supplied by this segment with resultant reaction of degeneration and absence of deep reflexes. These signs must be looked for carefully, usually in the area of previous root pains, because they denote the segmental level of the tumour.

(b) Remote symptoms due to pressure on the long tracts traversing the cord. No rule can be formulated regarding the progress of symptoms of this class, as they vary a good deal according to whether the tumour is extra- or intra-medullary, also as regards its position in relation to the circumference of the cord, and whether it is slowly growing or not. In all, however, the paralysis, although increasing in cross-section intensity, does not show any marked tendency to progress upwards or does so only to a slight degree.

Tumours lying to one side of the cord give rise at first to spinal hemiparesis and later to paraplegia. Reversed Brown-Séquard’s Syndrome has been described by Elsberg, especially in extradural tumours.

In cervical tumours the order of the progress is almost always as follows:—

Affection of the upper limb of the corresponding side; then the homolateral lower limb, followed by the opposite lower limb, and lastly, the
contralateral upper limb. In benign extramedullary tumours the weakness is slowly progressive, starting in one lower limb and progressing upwards from toes, feet, etc., then involving the opposite side in the same order.

Signs of pyramidal lesion in the form of extensor plantar response, absence of abdominal reflexes, etc., may appear early; the chief reflexes, however, may remain normal for a longer time after paralysis has developed than in many other spinal diseases (Williamson).

With more extensive lesion of the pyramidal tracts the flexor withdrawal response appears; its receptive field increases, so that it can be elicited by any strong stimulus applied to the body below the level of the lesions. Mass reflexes may also be present.

At first, when the pyramidal tracts are alone involved, rigidity is more marked in the extensor muscles and paraplegia in extension results; later on other extrapyramidal tracts are affected and paraplegia in flexion results; flexor spasms occur which may be painful, and later still the limbs are held rigid in flexion.

Paraplegia in flexion is therefore a late phenomenon, and when present denotes a severe compression destroying the extrapyramidal as well as the pyramidal fibres, and is an indication for immediate surgical interference. It is characterized by flexion of the different segments of the lower limb upon each other, weak or absent knee-jerk and marked exaggeration of the flexor reflexes.

Objective sensory changes usually appear late and so are of little localizing value in the early stages of the disease.

Similarly sphincter troubles do not usually appear until motor and sensory phenomena are well marked, though they may be early in onset in intramedullary tumours of the lumbosacral region where the bladder and bowel reflex centres are directly affected. Bladder disturbances are usually the first to appear; precipitate micturition, and some hesitation in the act or actual retention may be present. Constipation, tympanitis or incontinence of faeces are usually late phenomena.

Bed sores appear early in tumours of the lumbosacral region and cauda equina.

VARYING CLINICAL PICTURE AT DIFFERENT LEVELS.

The root pains and other neurological findings vary according to the segmental level of the tumour. The following additional signs may be present.

In the upper cervical region nystagmus is sometimes present. Intense pains and stiffness of the neck resembling very much cervical caries; spasmodic torticollis or muscular rheumatism are frequently seen, especially in extradural tumours of a malignant nature involving the vertebrae.

If the roots of the phrenic nerve on one or both sides are affected partial or complete paralysis of the diaphragm may occur.

Tumours of the lower cervical and upper dorsal region, in addition to
producing atrophy and weakness in the small muscles of the hands, may involve the cervical sympathetic, causing in the early irritative stage exophthalmos, dilatation of pupils and retraction of the upper lids with vasomotor and secretory changes in the face, neck and upper limbs.

**Neurological Data from which the Level of Growth can be Determined.**

The chief cause of failure to diagnose a spinal tumour is failure to suspect the presence of such a condition.

A most careful and painstaking neurological examination is sufficient in the majority of cases for the diagnosis and correct localization of spinal cord tumours. Dandy says that ninety per cent of cases can be accurately diagnosed in this way. The important data may be summarized as follows:

1. **Sensory features:** (a) Referable to roots in the form of pains and anaesthesia. They indicate with a fair degree of accuracy the segmental level of the tumour. (b) Referable to conducting paths; when the level of the tumour is judged from the sensory signs alone, it is often found to lie several segments higher than that indicated by the signs. This is due to the fact that the various sensory fibres follow an oblique course in the spinal cord when they cross to the opposite side to join the spinothalamic tracts. Pain crosses soonest, then cold and heat. Touch follows the most oblique course. The crossing is quick in the lumbar region, but it takes place slowly when the cord is followed upwards. In the mid-dorsal region the crossing of pain and heat is complete one segment above the point of entrance of the corresponding nerve-root, whilst in the cervical region this decussation may take five or six segments before all the fibres reach the opposite side. It follows from this that the level of sensory loss is highest for pain and lowest for touch.

2. **Motor paralysis:** (a) upper motor neuron type of affection indicating that the tumour causing it is at a higher level; (b) lower motor neuron type showing the segment affected.

3. **Reflexes:** (a) somatic, both deep and superficial. If a deep reflex is absent and those above it are normal, while those below are exaggerated, the segmental level of the tumour is indicated; (b) organic.

4. **Surface anatomy of the segments:** It must be noted that a given segment of the cord is situated more cranially than the corresponding vertebra. The rules given by the Committee of the Medical Research Council on injuries of the nervous system may be quoted in full:

   "(1) The intraspinal course increases fairly regularly for the cervical and thoracic nerves. It is equal to the depth of 1 vertebra for the upper cervical, 2 vertebrae for the lower cervical, 3 for the upper dorsal and 4 for the lower dorsal.

   (2) The origin of the lumbar nerves is opposite the tenth and eleventh thoracic spines."
(3) The origin of the sacral nerves is opposite the twelfth spine and the ligament between it and first lumbar.

In applying these rules it must be remembered that the spinous processes vary much in length and obliquity, so that in the thoracic region, the tip of one spine may reach the level of the body of the vertebra next but one below it. Moreover the relations of the nerves to vertebrae change at the eighth cervical; above this level the nerve arises above the vertebra of the same name; below this level the nerve issues below the vertebra of the same name."

AIDS TO DIAGNOSIS AND LEVEL LOCALIZATION.

These should only be resorted to after a very careful clinical examination has been carried out.

They will be discussed under the following headings:

1. Loculation syndrome.
3. Radiological examination both simple and aided by lipiodol.

(1) The loculation syndrome in the cerebrospinal fluid was described by Froin in 1903. It was the first step in the diagnosis of spinal compression. The syndrome is characterized by: (a) an increase in the protein content, which rises from the normal 0.025 per cent to 0.1 per cent or more. Greenfield and Carmichel propose that the term should be applied to cases in which the amount of protein is 0.5 per cent or more. An increase in the protein is not pathognomonic of compression; it is present also in syphilitic meningitis, polyneuritis and Landry's paralysis. (b) The number of cells remains normal or is slightly increased. (c) Xanthochromia or yellow colour due probably to altered blood; it is not a common feature, being present in only 39 per cent of seventy-seven cases described by Elsberg. The idea that it is due to exudation from the surface of the tumour does not hold good, as it is present in some extradural tumours. (d) Spontaneous coagulation due to the presence of fibrinogen. The syndrome is in all probability due to the state of engorgement of the spinal veins leading to increased permeability; the spinal fluid tends gradually to approximate in chemical composition to the blood plasma. Ayer and Greenfield lay much stress upon the protein increase as a sign of greater value than the others.

(2) Hydrostatic Method.—The next step in the diagnosis and localization of spinal block was by double spinal puncture; the fluid from the upper puncture differs in pressure and other respects from the lower fluid. This method was discovered in 1913 by Pierre Marie and others. Of more value than this is Queckenstedt’s sign. This was described in 1916; it is simple and gives much information. By using lumbar puncture alone Queckenstedt showed that the pressure in the lumbar canal rose on compression of the jugular veins and quickly fell to normal when the pressure was removed; in cases of complete block no rise occurred. Stookey studied the results in cases of incomplete block, and found that slight hesitation or slowing in
the rise or fall of the fluid was of great significance in demonstrating block. Most of our cases gave similar results to these.

Queckenstedt's sign is not always trustworthy; moreover, it is of no help in the localization of a tumour. It was negative in 14 per cent of Elsberg's series.

(3) X-ray Examination.—Whenever there are found in the X-ray plate changes in the vertebrae not due to spondylitis deformans, the most probable cause is malignant disease or a tuberculous process.

Intramedullary tumours rarely produce any change. In 13 intramedullary tumours verified by Elsberg, no X-ray evidence of any bony change was present; in 71 of intradural, 56 showed no changes, and 10 showed the changes of spondylitis deformans; in 15 cases of extradural tumours there was definite erosion from pressure in 2. In the differential diagnosis between Pott's disease and metastatic deposits in the vertebrae, Sicard and others draw attention to the fact that the latter condition primarily involves the bone and is entirely limited to it, the intervertebral discs remaining free. There results thinning of the vertebra until it becomes about one-fifth of its height, and, moreover, the change is more marked on the sides than the front.

**X-ray Examination with Lipiodal Injections.**

This method is very effective in demonstrating the level of a spinal block; the density of the shadows given is very striking and its use makes the diagnosis and localization almost certain. We have had considerable experience with this method and have found it of great value for accurate localization.

Lipiodol is a forty per cent solution of iodine in poppyseed oil; it was discovered by Lafay in 1920 and used by him in the treatment of lethargic encephalitis. It is transparent and pale-yellow in colour; the iodine is present in chemical combination and dissociates very slowly, being present in the urine in very small amounts over long periods. The German product iodopin is practically the same.

In 1921 Sicard and Forestier first made use of its radiopaque properties in demonstrating the level of spinal block. In 1924 lipiodol ascendans was discovered. It is of lower molecular weight than ordinary lipiodol and is lighter than the cerebrospinal fluid, and therefore it ascends in the spinal canal when injected. Owing to its diminished iodine content, the shadows given by it are not very sharp, and, moreover, it is liable to stick to the meninges in its ascent, causing confusion in the reading of results.

Early in 1927 we started using ordinary lipiodol in the medical unit as a means of diagnosing some obscure lung conditions and the details of the process were published in this Journal in July, 1929. Since then the method has been extensively employed and forms a part of the routine examination of many lung diseases in this hospital in Egypt.

About the same time we commenced using lipiodol to assist in the
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diagnosis of spinal conditions, and since then many cases have been investigated, the information obtained proving of the greatest value both in confirming the diagnosis and in assisting in localizing the tumours.

**Technique.**

The patient is given an injection of 1/2 grain morphine or pantapone one hour before injection of lipiodol; he is allowed to sit on a chair with the head flexed so as to open the space between the occiput and atlas. The back of the neck is shaved and painted with tincture of iodine. The point through which the puncture is made is in the middle line or a little to one side of it, and on a line joining the tips of the mastoid processes. The skin in this area is anaesthetized with two per cent novocain using as little as possible; too much novocain may cause swelling of the tissues and difficulty in estimating the depth of the cisternal space.

An ordinary stovain needle is used; for the beginner it is better to use one with a mark at five centimetres. The needle is steadily and carefully pushed through the skin and deep structures in a line parallel to that joining the external auditory meatus and glabella. It is always safer to direct the point of the needle a little more upwards so as to strike against the occipital bone, following this downwards one can quite easily recognize the posterior border of the foramen magnum. The needle is then pushed through the atlanto-occipital membrane and dura, and the stilette is removed. In the majority of cases no cerebrospinal fluid appears and one has to put on a syringe and apply some suction. If no fluid comes out the needle is pushed carefully inwards with the syringe in place so as to apply suction after each slight push.

The depth at which the cistern is reached varies with different subjects according to the thickness of the neck, and no rule can be formulated; but for a beginner it is advisable not to go beyond the five centimetre mark.

When the cisterna is reached 1½ cubic centimetres of the warmed clear oil are injected slowly, and after finishing the piston is withdrawn a little to make sure that the point of the needle was in the right place during the whole injection. After five minutes the patient is then X-rayed in the sitting position and again next morning.

If the above technique is carefully followed there should be no difficulty. The procedure is very simple and does not require more than ordinary skill to perform it. No cerebrospinal fluid should have been removed from the patient for several hours before the injection as the collapsed membranes take some time to refill and separate; only a few drops should be allowed to escape after the needle is inserted.

**Dangers.**

Opinions differ very much as regards the safety and reliability of the method. Sicard and his co-workers believe that it is harmless, while more than one clinic in America has entirely stopped its use.
Ayer and Mixter, from experiments on animals, found that there was a meningeal reaction that reached its height a day or two after the injection. There was a rise in the cells up to 1000 and a moderate increase in the protein; the reaction passed off entirely in ten days.

In one of our cases in which the injection was repeated after a few days, the cerebrospinal fluid was found to be definitely turbid and under high pressure. Sharp and Peterson are of the opinion that lipiodol in its present irritating and non-absorbable quality is not safe for injection. In one of their cases a good deal of inflammatory reaction occurred, causing the patient’s symptoms and signs to increase very much and necessitating its removal by laminectomy four and a half months after injection. Encysted globules of lipiodol were found surrounded by dense and recent adhesions.

The usual irritative symptoms are: (1) increase in the root pains, (2) pain and stiffness in the back at the seat of injection, (3) headache, insomnia and some rise in temperature, the fever reaching its maximum in a few hours and subsiding the next day.

Ebauch and Mella found that pains in the legs occurred in 30 per cent of cases, rise of temperature in 23 per cent, nausea and headache in 7 per cent, leucocytosis in 30 per cent, and pleocytosis in 60 per cent. Sleeplessness and restlessness were frequent.

From the above data it appears that the substance is not entirely free from harm, as claimed by Sicard, and it should only be used with the strictest precautions.

It may be well to quote here from Armour’s Lettsounian lectures the following rules which he has formulated for cisternal injection of lipiodol.

“(1) It should in no way usurp the place of careful and repeated systematic clinical examination of the case. Recourse to it as a labour-saving device and a short cut to diagnosis and localization cannot be too strongly deprecated.

(2) It should not be used unless the possible dangers and complications are outweighed by the more exact localization likely to be obtained.

(3) Finally, in properly selected cases, we have in lipiodol a definite aid in the study of spinal cord compression.”

With these rules we entirely agree, and would like to advise against its indiscriminate use. Most of our cases suffered from some after-symptoms, and one developed retention of urine for twenty-four hours following the injection, but where assistance is required in the investigation of a case suspicious of being a spinal tumour we have no hesitation in recommending its employment.

Interpretation of Results.

In the absence of a block, lipiodol passes quickly into the sacral cul-de-sac and is seen there after five or six minutes in the form of a large globule; in other cases arrest of the lipiodol either partial or complete occurs.
Partial arrest: this may occur normally in the upper dorsal region (called false arrest by French writers); this part of the canal is very narrow and the lipiodol will appear as big drops separated from each other; X-ray taken a few hours later will show that all the lipiodol has gone down. Lipiodol may also be arrested at the seat of the injection if the needle did not enter the cisterna. In such cases a lateral view will show the lipiodol lying outside the spinal canal.

Partial arrest may occur in such pathological conditions as chronic leptomeningitis or pachymeningitis, early compression, swelling of the cord from inflammation, intramedullary tumours, etc.

(b) Complete arrest is due in the majority of cases to intradural tumours. Lipiodol is held up permanently at the upper level of the block and it may exhibit a straight or a curved lower border. It is in these cases that the injection gives valuable help. Sicard and Forestier claim to have accurately located by this method thirty-seven spinal cord tumours, in more than half of which there were no objective sensory changes.

Negative Findings and Confusing Results.

Lipiodol may give negative results in the presence of a tumour if it is small in size or of a destructive nature; on the other hand, occasionally a positive result may be obtained and no block found at operation. De Martel reported four cases of this nature where he found no adequate reason for the arrest at the time of the operation. This occurred in one case under our care.

Again lipiodol may occasionally be held up some distance above the tumour, probably from œdema or inflammatory swelling of the cord. In one of our cases lipiodol showed a definite block at the level of the first dorsal vertebra, but when exposed at operation no block or any indication of a pathological change was seen at this level. The patient died some time after the operation and the post-mortem showed an extradural abscess just below the seat of the laminectomy at the level of the third, fourth and fifth dorsal vertebrae.

In the great majority of cases, however, lipiodol is of the greatest value in confirming a careful clinical diagnosis of spinal tumour.

CASES.

The following cases recently under our care show certain points of interest.

I.—Fibromyxoma of the Spinal Cord.


Complaint and History.—Inability to move both lower limbs.

Disease began two and a half months ago with severe sawing pains in the region of the upper dorsal vertebrae; the pain was more severe at night. Together with this there was heaviness in his left lower limb with tingling in the sole of the foot.
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After about a fortnight the pain in the back disappeared but the right lower limb started to become weak. Gradually he became unable to move his lower limbs, which were held in extension and he could only flex them by scratching the inner part of the thigh (flexor reflex).

There was no past history of injury, syphilis or any important disease, and no family history of importance.

**Examination.**—Nervous system: mental condition normal; cranial nerves normal.

Motor power: weakness of upper limbs; complete paralysis of lower limbs which were held rigid in extension. There was some atrophy of the small muscles of the hand.

Reflexes: deep reflexes were present and normal in the upper limbs; markedly exaggerated in the lower limbs; definite ankle clonus.

Superficial reflexes: abdominal and cremasteric absent on both sides.

Plantar responses: extensor on both sides and the receptive field was very wide. Strong stimulation of any part of the lower limbs gave rise to the typical flexor withdrawal reflex.

Sphincters: some hesitation in starting the act of micturition.

Sensations: superficial lost as high as the nipples; deep sensations lost in lower limbs.

**Investigations.**—Wassermann reaction negative in blood.

Cerebrospinal fluid slightly yellow; clotted rapidly.

Albumin 0.8 per cent; no increase of cells; colloidal gold normal.

Pressure 120 millimetres of cerebrospinal fluid, slight rise on pressure on jugulars to 200 millimetres of water and slow fall; feeble respiratory excursions and only slight rise on coughing, indicative of partial block.

X-ray: ordinary X-ray examination showed no abnormality. Lipiodal was injected into the cisterna magna and X-ray then showed a definite block at the level of the upper part of the body of the sixth cervical vertebra.

**Progress.**—Patient developed retention of urine with overflow on the third day after admission into hospital; incontinence of faeces on April 22. Sensory loss progressed to second intercostal space with slight anaesthesia on ulnar border of both hands.

The triceps reflexes became absent on both sides; supinator present on right but absent on left; biceps present on both sides but weak.

In view of the progress of the lesion and the high situation of the block, urgent surgical interference was thought necessary, and the patient was transferred to the surgical side.

Patient was operated upon on April 26.

Laminectomy fifth cervical to first dorsal. Spinal canal opened and dura exposed and was found very swollen. During the operation the condition of patient became unsatisfactory, and it was thought advisable to postpone the rest of the operation to another day and the wound was closed without the dura having been opened; the patient died next day from respiratory failure.
Post-mortem.—An elongated tumour, subdural in situation, was found very loosely attached to the cord lying on its posterolateral aspect on the left side opposite the lower part of the cervical enlargement about the level of the fifth cervical vertebra. It was about the size of a date stone and of a fairly soft consistency and a yellowish white colour. Microscopic examination showed it to be a fibromyxoma.

Fig. 1.—Case 1. Showing part of the spinal cord with tumour exposed at post-mortem after incision through the dura.

Comment.—This case demonstrated beautifully the phenomenon of paraplegia in extension and the flexor withdrawal response; it also showed definitely the loculation syndrome and conformed with Stookey's findings on the spinal pressure in partial block. It is evident from the result of the operation that mere removal of the vertebral arches does not relieve compression if the dura is left intact, and this case indicates the necessity of opening the dura in a two-stage operation prior to closure of the wound; such a procedure would most probably have saved this patient's life.

II.—Endothelioma of the Spinal Cord.


Complaint and History.—Patient was normal till three months ago; then while working he felt sudden severe pain in lower part of vertebral column. After two days severe pain occurred in lower part of the legs; this was more marked on right side, causing patient to sleep on the left.

At first the patient was able to carry on his work, but after seven days
he became unable to extend his back or stoop and walking became very
difficult.

There also occurred some difficulty in initiating the act of micturition.

No past history of syphilis or any disease of importance.

Examination.—Nervous system: mental condition normal; cranial
nerves normal; upper limbs normal.

In the lower limbs, the muscles were flabby and the limbs definitely
weak, the right more than the left. Sensations superficial and deep intact.
Knee-jerks weak; ankle-jerks normal and the plantar reflex flexor.
Abdominal reflexes present. Sphincters normal.

Heart and lungs normal.

There was some rigidity of the spine and slight tenderness in the
lumbar region.

Investigations.—On lumbar puncture, a few drops of yellow cerebro-
spinal fluid came out; no effect was produced by coughing or pressure on the
jugular veins, indicating complete block, cerebrospinal fluid showed typical
“loculation syndrome.” Yellow in colour. Albumin, 2:6 per cent. No
excess of cells.

Colloidal gold test normal. Wassermann reaction negative in blood
and cerebrospinal fluid.

Cisternal Puncture.—First attempt failed perhaps because too much
novocain had been used for local anaesthesia and the needle consequently
was not sufficiently introduced.

On the second attempt, which was successful, the needle was introduced
to half a centimetre beyond the five-centimetre mark. Patient felt pain
when the needle pierced the dura.

He stated that the shooting pains disappeared, and the weakness became
more marked after the injection of the lipiodol.

Myelography showed a complete stop of the lipiodol just at the level of
the space between the eleventh and twelfth dorsal vertebrae.

Progress.—March 18, 1931. Knee-jerks absent; ankle-jerks present.
Plantar reflex, extensor on left side and flexor on right. Doubtful
anaesthesia in feet; deep sensations normal. Patient unable to move right
lower limb. On March 28 he was transferred to surgical side; operated on
April 1.

Tenth, eleventh, twelfth dorsal and first lumbar laminae removed and
spinal canal opened.

A tumour was found lying over the posterior and lateral aspects of cord
opposite the lower part of eleventh, twelfth dorsal and first lumbar vertebrae.
It was extradural; fleshy, dark red in colour, soft and non-vascular, separated
easily from cord. It was removed.

Pathological report, endothelioma.

April 4.—Practically no change; knee-jerks abolished on right side,
ankle-jerk present on left; sensation intact and sphincters normal.

April 6.—Patient able to move slightly the right lower limb; sensations
and jerks as before; no sphincter trouble.
April 16.—Recovered a good deal of power in right lower limb, no sensory changes, ankle-jerks present on right side but knee-jerks still absent, incontinence of faeces developed, patient feels the desire to defaecate but cannot control it.

April 24. No further progress; incontinence of faeces is still present, motions are liquid and mixed with blood.

May 21.—Patient retransferred to medical side still suffering from diarrhoea, but regaining power in lower limbs slowly.

Sigmoidoscopic examination showed the presence of amoebic ulcers and *E. histolytica*, the diarrhoea disappeared rapidly on treatment. The patient was able to walk without any support by the end of June.

Comment.—This patient first complained of pain in the back, shooting pains down the lower limbs and was admitted as a case of sciatica. It was only after careful neurological examination aided by lumbar puncture and lipiodol that the correct diagnosis was arrived at.

The result of the operation was very satisfactory, patient regaining full power in both lower limbs.

The difficulty experienced in the cisternal puncture emphasizes the importance of not using too much local anaesthetic preparatory to making the puncture. The case is also interesting in that the cause of the diarrhoea after operation was an amoebic infection and had nothing to do with the spinal condition.

III.—Upper Dorsal Neurofibroma.

Patient A. K. aged 29. Hospital No. 12364. Occupation, clerk. Admitted May 3, 1931, complaining of pain along the inner side of the right arm and girdle pains around the upper part of the chest. He stated that he had had treatment for some time before entering hospital but had obtained no relief.

Examination showed some wasting of the small muscles of the right hand but no sensory change or other alteration could be detected. Examination was made and a cervical rib excluded.

After admission, the pain remained almost constant and was not relieved by any form of treatment.

Lumbar puncture showed fluid not under pressure; pressure on the jugulars failed to produce any rise in the manometer reading—indicative of a block. Cerebrospinal fluid examination showed increase of proteins, 0.50 per cent, and the Wassermann reaction was found positive.

It was considered that the block might be due to a syphilitic condition, and patient was put on antisyphilitic treatment without, however, any benefit.

X-ray with lipiodol was then carried out and a block was shown, the oil being held up at the level of the first dorsal vertebra (see fig. 2).

Patient was operated on and a fibroma was found, size three by one centimetre, at the level of the first dorsal vertebra inside the dura and attached to it.
It was easily removed, the patient made an uninterrupted recovery, the pain being relieved and the wasting in the hand gradually disappearing.

Comment.—This case illustrates how a positive Wassermann may be present without having anything to do with the patient's symptoms, and emphasizes the importance of searching for another cause where the result of antisyphilitic measures is unsatisfactory.

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