evidence. There is no abnormality to be found in the blood analysis of these cases, the urea and sugar content being normal. In contrast to the true toxæmias of pregnancy, it is of interest to note that in the much more common neurotic vomiting of pregnancy the urine shows a normal diastase content. The vomiting of course leads to the immediate production and elimination of acetone bodies, and with it a high ammonia coefficient. The ammonia coefficient is often very much higher than in the cases of true toxæmia, and in consequence does not give results of any value either for diagnosis or prognosis. The blood analysis in such cases shows normal values, the urea usually being subnormal.

The most striking differences are to be found in the cases with nephritis in pregnancy, and here the value of the investigations is emphasized. Many of these patients are suffering from chronic parenchymatous nephritis ranging from a mild to a more severe form. The urine shows albumin with very little globulin, casts are generally present, and the diastase content is usually below the normal 10 units. The blood analysis is also of value as the urea content is generally on the high side of normal and in the more severe cases markedly raised. A urea content of over 0.1 gram per cent. should be regarded as unfavourable and such cases are liable to develop uræmia with a fatal termination. The urea concentration test is of value in the mild cases as giving one a ready means of assessing the degree of mechanical damage to the kidneys. It is never tried unless a blood urea estimation has been made previously in view of the danger of increasing the

excess of urea already present in the blood and body fluids generally. In ordinary cases of nephritis in pregnancy the urea concentration test has yielded results of value and the results are comparable with the general clinical condition of the patient.

The above conclusions are based upon a fairly complete examination of twelve undoubted cases of toxæmia of pregnancy, and fifteen cases of nephritis in pregnancy. A large number of cases of normal pregnancy and pregnancy with complications have been similarly investigated. The scheme outlined above has been followed in many of these cases, and the results speak for themselves. The mortality from toxæmias of pregnancy and nephritis in pregnancy has fallen to *nil* during the past eighteen months. The observations have taught us that all fits are not eclamptic fits, but may be uræmic, and that the treatment is different in the two conditions. The treatment of true toxæmic vomiting and pre-eclamptic albuminuria of pregnancy along the lines of neutralizing the toxin or toxins circulating in the blood is at present being pursued. I hope that in the future the early signs and symptoms of toxæmia may be recognized and the distressing sequelæ prevented. In the diastase test we have apparently a simple and ready means of attaining this end. I wish to express my indebtedness to Drs. Williamson, Barris, and Donaldson, of the maternity department of St. Bartholomew's Hospital, from whom I have received every assistance and encouragement. The actual laboratory work has been done in the pathological department of the hospital under the guidance and with the whole-hearted support of the Director, Sir Frederick Andrewes.

THE DIAGNOSIS OF SPINAL MENINGEAL TUMOUR AND ITS PRACTICAL IMPORTANCE.

BY

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THE diagnosis, especially the early diagnosis, of spinal meningeal tumour is important practically, because by early operation partial or almost complete recovery may sometimes be obtained.

By operative treatment in cerebral tumour permanently satisfactory results are obtained only in a very small percentage of cases. In spinal meningeal tumours the permanent results of operation are very much more frequently satisfactory, and a considerable number of recoveries have now been recorded. Cases of spinal meningeal tumour are rare, and are usually seen, at the early period, by general practitioners. This is the period for successful treatment, and if the practitioner or physician fails to remember the possibility of the symptoms being due to a spinal meningeal tumour the case may be lost. An operation performed after a long period may be too late, and though the tumour may be satisfactorily removed the paralysis may remain. Unfortunately many chronic spinal diseases cannot be arrested by treatment, but in the few that can, early diagnosis is most important. The diagnosis of spinal meningeal tumour is often difficult, and can only be definite after careful neurological examination, and a consideration of the various other spinal affections which might produce somewhat similar symptoms.

In this article the term "tumour" will be used in the clinical sense, and under it will be included meningeal new growths (tumours pathologically), hydatid cysts, gummata, and localized meningeal tuberculous masses. Frequently the exact pathological nature of a spinal "tumour" cannot be decided clinically; the symptoms may be the same in all of these affections, and an operation may be desirable in all forms.

CHARACTER OF TUMOUR AND PROGNOSIS AFTER OPERATION.

Sir William Gowers suggested the removal of spinal meningeal tumours in 1886, and considered the operation would be less dangerous than the removal of a brain tumour.¹ Soon afterwards he advised the operation in a case which he diagnosed as spinal meningeal tumour. The operation was performed by Sir Victor Horsley. The result was permanent and complete recovery.² Sir William MacEwen also reported successful cases of removal of "connective tissue tumour" in the same year. Since that date many cases have been operated upon,

often too late, but sometimes successfully. I have collected from medical literature eighty-six cases in which the operation may be considered very successful, since it was followed by recovery from the spinal symptoms to a great extent or almost completely.* In this list were included only cases in which practically complete recovery, or very marked improvement, had occurred and been maintained for a long period, so that the patient could walk again. A much larger list could have been collected if less successful cases had been included.

The percentage of permanently successful cases is no doubt small and cannot be estimated from the recorded cases in medical literature, since unsuccessful cases are not recorded. Success depends on early diagnosis and early operation, and also on the surgeon's special skill in spinal operations. No physician or surgeon meets with a large number of cases of spinal meningeal tumour, and few have published the results of a series of very many consecutive cases.

In all cases of spinal meningeal tumour, if specific treatment has failed and the diagnosis is definite and the level of the lesion can be localized, operation is justified, unless special contraindications are noted. The 86 successful cases which I have been able to collect would all have ended fatally, or remained permanently paralysed, if they had not been operated upon. This list is sufficient to demonstrate conclusively the value of operation for spinal meningeal tumour.

It may be asked, Why operate when the tumour, if found, will probably be malignant, and if removed will probably soon recur? But this is not correct. Unfortunately, many of the tumours are malignant, but a greater proportion are non-malignant if we use the term "tumour" in the clinical sense, and include under it cysts, gummata, etc., which produce the same symptoms clinically, and very often cannot be diagnosed from tumours in the strict pathological sense until removed.

Statistics furnish a definite answer to these objections.

1. In 100 cases of spinal meningeal tumour (new growths) which I have collected from medical literature the character of the tumour was as follows:

Spinal Meningeal Growths.	
Malignant 52 per cent.—	Non-malignant 48 per cent.—
Sarcoma 30	Fibroma 18
Fibro-sarcoma 11	Myxoma 13
Fibro-myxo-sarcoma 1	Fibro-myxoma 1
Myxo-sarcoma 1	Psammoma 9
Psammio-sarcoma 1	Lipoma 5
Glio-sarcoma 1	Angio-lipoma 1
Glioma (?) 2	Lymph-angioma 1
Endothelioma 5	

* Brief notes and references for each case are given in my book on *Diseases of the Spinal Cord* (second impression), London, 1911, and in my abstracts in the *Medical Chronicle*, 1911. References to cases after 1911 may be found in the *Review of Neurology* (Edinburgh) and in the *Journal of Nervous and Mental Diseases*.

If we include fibro-sarcoma amongst malignant tumours, we have 52 per cent. malignant and 48 per cent. non-malignant growths. Further, the growth is usually solitary, and very often it can be easily enucleated or removed if non-malignant. The tumour usually grows slowly. In the malignant cases metastatic growths in other organs very seldom occur. Spinal meningeal tumour is very rarely associated with growths in other parts of the body.

2. As already mentioned the symptoms caused by "tumour" in the clinical sense are often practically the same as those of tumour in the strict pathological sense. "Tumour" in the clinical sense includes cysts, gummata, and tuberculous masses, and in such cases the prospects of successful operation are much greater. In 100 cases of operations, unsuccessful and successful, which I have collected from medical literature, the character of the "tumour" found at the operation, using the term in the clinical sense, was as follows:

Character of "Tumour" in Cases Operated On.

Malignant 55—		Non-malignant 45—	
Sarcoma	23	Fibroma	14
Fibro-sarcoma	17	Fibro-angioma	1
Fibro-myxo-sarcoma	1	Myxoma	1
Myxo-sarcoma	1	Fibro-myxoma	2
Psammo-sarcoma	1	Psammoma	6
Glio-sarcoma	1	Lipoma	1
Endothelioma	11	Angio-lipoma	1
		Gumma	1
		Lymph-angioma	1
		Hydatid cyst	17

Thus in the cases operated upon the "tumour" found was most frequently sarcoma, hydatid cyst, fibro-sarcoma, fibroma, endothelioma, psammoma.

In addition to the lesions just indicated in this table non-parasitic cyst, serous meningitis, and localized tuberculous masses have been occasionally found, and successful results have followed the operation.

3. The records of cases published in medical literature show that successful results, permanently or for a long period, have been obtained, not only in non-malignant tumours, but also in many cases commonly regarded as malignant.

In 75 cases in which the operation was successful and followed by recovery from symptoms almost completely or to a marked extent, so that the patient could walk again, the character of the "tumour" was as follows:

Character of "Tumour" in Successful Cases.

Malignant 39—		Non-malignant 36—	
Fibro-sarcoma	15	Fibroma	13
Sarcoma	9	Fibro-angioma	1
Fibro-myxo-sarcoma	2	Myxoma	1
Myxo-sarcoma	1	Fibro-myxoma	2
Psammo-sarcoma	1	Psammoma	5
Glio-sarcoma	1	Lymphangioma	1
Endothelioma	10	Angio-lipoma	1
		Hydatid cyst	10
		Cyst (not parasitic)	2

Thus we see that successful results were obtained not only in non-malignant cases, but also in many cases of fibro-sarcoma and sarcoma.

Exploratory operation is sometimes justified even in cases in which root symptoms are absent, or in which the symptoms are not quite typical of meningeal tumour. In such cases a growth has occasionally been found and removed with successful results.*

EARLY DIAGNOSIS.

The facts just put forward are sufficient to justify the operation for meningeal tumour and to demonstrate its value. This being allowed, the great importance of early diagnosis is evident.

Symptoms.

Attention may be drawn to several features in the symptomatology. Briefly stated, the symptoms of a spinal meningeal tumour are usually (1) root symptoms (pains), often unilateral at first, later bilateral; followed after weeks or months by (2) symptoms of compression of the spinal cord, which may be unilateral at first (Brown-Séquard's paralysis), but are usually very soon bilateral (paraparesis and paraplegia).

The root symptoms are chiefly pains in the sensory distribution of one or two, or a few, spinal nerve roots;

which may be followed in course of time by diminished sensation in the same area as the pain. This pain may be a girdle pain, or pain in one limb, according to the seat of the lesion, and may be followed by localized anaesthesia, or by paresis or paralysis of muscles in one limb, or by both. The pain may be very severe, and may continue for weeks or many months before paresis is noted. The symptoms of compression of the spinal cord in some cases develop slowly, the legs becoming weaker day by day until they are completely paralysed at the end of some weeks or months; in other cases (after the root pains have been severe for weeks or months) complete paralysis may develop rapidly in the course of a few days.

A point of much interest is the condition of the reflexes. At the early stage of paresis or paralysis (from compression of the spinal cord by a meningeal tumour) for a time the chief reflexes may be normal. I am inclined to think they remain normal for a longer time after paralysis has developed than in other spinal diseases. Thus I have found the legs partially and then completely paralysed, and yet for a short period the knee-jerks normal, and no ankle clonus, and no Babinski reflex to be detected. At this stage sensation may be normal, but later the vibrating sensation* may be lost, though other forms of sensation are felt normally. Later the Babinski reflex may be obtained and afterwards ankle clonus. Symptoms of spastic paraplegia develop; or in other cases the knee-jerks and all reflexes are lost and the legs are flaccid. Anaesthesia to touch, pain and temperature develops, and, early or late, the bladder becomes paralysed, and a sacral bed sore may finally develop.

The root symptoms do not extend upwards, and the paralysis, though it increases in intensity (sometimes very slowly, sometimes rapidly), does not extend upwards, or extends upwards only slightly. The symptoms are those of a lesion localized to one or two or a few segments of the cord. They indicate, as the disease advances, increase of the "cross section" intensity of the lesion, without extension upwards in the long axis of the cord. We sometimes find pain on percussion of a vertebral spine, and the patient may suffer pain in the back a little below the level of the growth.

This course of development, root symptoms followed by symptoms of transverse lesion of the cord, is not noted in all cases. Root pains may occasionally be absent, if the growth compresses the cord between spinal roots where the interval between adjacent roots is greatest, as in the dorsal region. But in such cases the mode of advance of the paraplegia is important; the paralysis increases in "cross section" intensity, but does not extend upwards, or does so only to a very slight extent.

DIFFERENTIAL DIAGNOSIS.

In general practice spinal meningeal tumour is often wrongly diagnosed because the disease is rare and is forgotten in considering the differential diagnosis. This is especially the case at the early period, when the chief or only symptoms are "root pains."

We may consider the differential diagnosis in three groups of cases:

- I. When "root pains" are noted and paralysis has not yet developed.
- II. When paraplegia has developed and has followed definite root pains.
- III. When paraplegia has developed, but root pains have been indefinite or absent.

I. Diagnosis before Paraplegia has Developed, when Root Pains are the Chief Symptoms.

At this early stage the diagnosis is most difficult, and usually only a probable diagnosis can then be given. The early diagnosis had been stone in the kidney, gall stones, flatulence, and intestinal colic in cases I have seen. In other cases at first intercostal neuralgia has been diagnosed. The following are instances of such cases:

CASE I.—Root Symptoms similar to Intercostal Neuralgia, followed after Three Months by Gradually Developing Paraplegia.

A man, aged 60, had suffered for three months from pain along the course of the intercostal nerves, from the fourth to the sixth, on the left side; more recently on the right side

* Occasionally at exploration the growth is found to be within the spinal cord. When this is the case the operation recommended by Elsberg may sometimes be carried out—the extrusion method—in two stages.

* Tested by a large vibrating tuning-fork, the foot of which is placed on the malleolus or on the inner subcutaneous surface of the tibia.

also at the same level, without any signs of paresis. But for ten days before I first examined him increasing weakness in the legs had been noted. On examination: Slight weakness in movements of legs, knee-jerks slightly increased; no ankle clonus; no Babinski reflex. Vibrating sensation greatly diminished, almost lost, both legs.

A month later: Paresis of both legs; Babinski reflex both sides; ankle clonus on right side. Abdominal and epigastric reflexes lost; vibrating sensation lost, right leg, below the knee.

Five days later: Ankle clonus and Babinski reflex on both sides. Vibrating sensation lost on both legs; cutaneous sensation very slightly diminished below level of nipples.

I was unable to see the patient after this date, but I heard that he died five months later, complete paralysis of the legs and of the bladder and rectum, and a large bed sore having developed.

CASE II.—Continued Pain at the Upper Part of Abdomen (at first considered ? Flatulence and ? Colic): Paraplegia developed after Seven Months.

A man aged 65. Continuous pain around upper part of abdomen, between umbilicus and xiphoid cartilage, for four months. Troublesome flatulent dyspepsia and constipation; the pain, however, was very severe and of girdle character. The possibility of the girdle pains of spinal meningeal tumour was carefully considered at first, but no other signs of affection of nervous system, and no impaired sensation in distribution of lower dorsal nerve roots could then be detected. The pain continued and three months later (about seven months from the commencement of pain) retention of urine developed suddenly and was associated with paresis of legs. At this stage the reflexes were normal, but the vibrating sensation was lost in the legs (previously it had been normal). A few days later the Babinski reflex was obtained on each side and the paresis increased to total paraplegia. Anaesthesia to all forms of sensation developed and affected the legs and lower part of the abdomen up to the level of the umbilicus. Ankle clonus developed. A bed sore commenced over the sacrum and extended rapidly. Death occurred in a few weeks.

Cases I and II are examples of the characteristic symptoms of the disease—root pains of long duration, followed in the first case by gradually developing paraplegia, in the second by paraplegia of rapid onset.

Occasionally we may be able to give a "probable" diagnosis of spinal meningeal tumour at the very early stage from the nerve root symptoms, before paresis or paraplegia has developed. This may be possible when the root pains are bilateral and are in the sensory distribution of only a few spinal roots, and are associated with diminished cutaneous sensibility exactly limited to the distribution of these sensory nerve roots. (Tubes should of course be excluded.) In such a case exploratory operation may be occasionally justified and may verify the diagnosis thought probable.

The following is an example of such a case:

CASE III.—Meningeal Tumour (Sarcoma): Diagnosed and Removed before Paraplegia Developed.*

A man consulted me in the crowded out-patient room on account of "pain in the stomach." Fortunately, he was not dismissed as a case of dyspepsia or intestinal colic. The common causes of abdominal pain could, on examination, be excluded, and on careful inquiry the pain was found to be a girdle pain below the umbilicus and just above each groin. The pain was of three months' duration. He was able to walk quite well; no paresis could be detected and the reflexes were normal except that a Babinski plantar reflex was detected on each side.

A few days later diminished cutaneous sensation was detected on the lower part of the abdomen and upper part of the front of the thighs—roughly in the area supplied by the twelfth dorsal and first and second lumbar nerve roots. Over this area touch with cotton-wool could not be detected. Over the same area sensation for warmth and for pain was lost. In addition, sensation for pain and for cold was lost over the left leg. The bladder and rectum were not affected.

I concluded that the symptoms were probably due to a spinal meningeal growth, which was compressing the twelfth dorsal and first and second lumbar nerve roots and causing the pain and diminished cutaneous sensation in the distribution of these roots, but that the growth had only slightly compressed the spinal cord. An exploratory operation was performed by Professor Sir W. Thornburn, who found a spinal meningeal growth much more extensive than was indicated by the symptoms. This was removed partially, but it was so extensive that the whole of it could not be removed. On microscopic examination I found it was a sarcoma.

Later, unfortunately, paraplegia developed.

In this case the "probable" diagnosis proved to be correct, and had the growth been less extensive and non-malignant satisfactory result might have followed.

If the root pains are in the arm, cervical rib, primary brachial neuritis, intrathoracic aneurysm, or growth have to be considered in the differential diagnosis.

X-ray examination for signs of cervical rib, aneurysm, or intrathoracic growth may be helpful. From "primary" brachial neuritis the diagnosis at first may be almost impossible, but later this disease can be excluded. In "primary" brachial neuritis the pain is diffuse, and not associated with paralysis, wasting of muscles of the arm, anaesthesia, or changes in the reflexes. The diagnosis of "primary brachial neuritis" can, however, only be regarded as definite when recovery has occurred. If the root symptoms should at first have the characters of brachial neuritis, the longer they continue the more probable is the diagnosis of early meningeal tumour. In cases of pain due to a cervical rib, the localization of pain and diminished sensation in the distribution of the first dorsal nerve root, wasting of the small muscles of the hand, and x-ray examination are often diagnostic.

The following are notes of a case at first regarded as possibly "primary" brachial neuritis:

CASE IV.—Gumma of Cervical Dura Mater.

J. K., aged 38, consulted me on account of pain in the left arm of three months' duration. The pain was dull and aching in character, and often very severe. It was diffuse (all over the arm, and not localized to the sensory distribution of any nerve root). There was no wasting or paresis of muscles, no changes in reflexes, no signs of affection of the spinal cord. Syphilis was denied, but later a Wassermann blood reaction was obtained, and antisyphilitic treatment given. After many months in hospital he returned home, no signs of spinal cord affection and no paresis of arm muscles having been observed. Though the question of early meningeal spinal tumour was often considered no definite indications were detected. After being at home for a few months the left arm became rapidly paralysed, and then the left leg, and afterwards the right arm and leg: both legs and both arms becoming paralysed in less than a week.

On examination then the condition was as follows: Complete paralysis of both legs; paralysis of all the muscles of both arms except the deltoid, biceps, and supinator longus; paralysis of intercostals and of the bladder causing retention of urine; breathing entirely diaphragmatic. Anaesthesia to touch, pain, and temperature on the legs, abdomen, and thorax (up to the second rib) and on the inner side of both arms and hands and of both little fingers; impaired sensation over all the rest of left hand except thumb. Owing to the risk of death from complete respiratory paralysis if the changes in the cord spread upwards even to a very slight extent, operation was considered advisable. This was performed by Professor Sir William Thornburn. A "tumour" was found originating from the dura mater in the lower cervical region. This was removed. On microscopic examination it was found to be a gumma.

Rapid improvement followed. The paralysis of the bladder and intercostals and of the right arm and the anaesthesia soon disappeared. But the legs remained paralysed and gradually became spastic. The knee-jerks became increased; Babinski reflex and ankle clonus developed on both sides. In course of time he was able to perform feeble movements with the legs, but was unable to stand. The small muscles of the left hand gradually became wasted and remained paralysed, but the other muscles of the left arm gradually recovered. He finally left the hospital with spastic paresis of both legs and atrophic paresis of the muscles of the left hand.

From sciatica the diagnosis may occasionally be almost impossible at first, but in spinal meningeal tumour (in such cases usually in the region of the cauda equina) the sciatica soon becomes bilateral and other nerves beside the sciatic nerve become affected later: bilateral anaesthesia and paresis in the distribution of the sacral and lower lumbar nerves, and paralysis of the bladder develop.

II. Diagnosis when Paraplegia has Developed after Definite Root Symptoms.

In these cases the differential diagnosis from other spinal affections causing paraplegia has to be considered. Only the main points can be mentioned here.

From spinal syphilitic affections the diagnosis is often difficult, as the symptoms in the different forms of spinal syphilis vary much. A history of previous syphilis, a Wassermann blood reaction, improvement under anti-syphilitic treatment, definite syphilitic lesions in other systems besides the nervous system, would all be in favour of a spinal lesion being syphilitic, but would not be conclusive. Certain peculiarities of the spinal symptoms in the various forms of spinal syphilis, in addition to the indications just named, would, however, increase the probability of these affections, and be helpful in the diagnosis. In acute syphilitic "myelitis" root symptoms are absent or slight, and the onset of the paraplegia is rapid. In syphilitic meningo-myelitis and in meningeal gumma the root pains (especially in the former) are over a wider

* Reported in detail in the *Clinical Journal*, 1919, No. 12.

area and not limited to one or two spinal segments. Also we after find signs of other and more diffuse changes, or of several spinal lesions, and often the development of symptoms is not so steadily progressive; periods of sudden increase or diminution of the symptoms often occur. In rare cases the symptoms of gumma are practically the same as those of meningeal tumour, and if such cases have resisted antisyphilitic treatment, or if urgent symptoms have developed, as in Case IV, operation is justified.

In spinal pachymeningitis the pain is usually bilateral from the first, and has a much greater vertical extent than in meningeal tumour. A long duration and considerable improvement are in favour of pachymeningitis.

Localized serous spinal meningitis has frequently been mistaken for spinal meningeal tumour, but the former affection has little tendency to advance; great fluctuations occur in the symptoms, which also indicate a considerable vertical extent of the affection.

From myelitis the diagnosis is usually easy. If marked root pains limited to a few spinal segments occur for a considerable time before the paralysis, this is in favour of meningeal tumour. In myelitis such symptoms do not occur, or they are slight and are only noted for a very short time before the onset of the paralysis. In meningeal tumour, after the root symptoms have been noted for a considerable time, the paralysis may develop either slowly or rapidly. In myelitis the paralysis usually develops rapidly. Symptoms indicating extension of the lesion in the vertical direction would be in favour of myelitis.

In spinal caries the root pains are not so severe, and are of shorter duration; the root pains and paralysis are nearly always bilateral from the first, or become so exceedingly rapidly. Hence root pains, which are very severe, and are unilateral for a long period, are in favour of meningeal tumour. Pain or tenderness extending over a number of vertebrae would be in favour of meningeal tumour rather than caries. Often pain is caused or increased by pressing on the head or shoulders, or by spinal movement, in caries, but not in meningeal tumour as a rule, and when increased by movement in the latter disease the increase is slight. One or more prominent vertebral spines are often detected in caries (and generally so in cervical caries), or the x-ray examination shows signs of caries. Rigidity of the back and localized spinal hyperaesthesia to a sponge soaked in hot water, signs of tuberculous disease in other parts, psoas abscess, or abscess near the spine, evening elevation of temperature, and general wasting, would all be points in favour of caries.

The diagnosis from tumour in the vertebrae may be very difficult. Localized tumour or deformity in the spine, if caries can be excluded, pain increased by movement, and limitation in movement, would be in favour of vertebral growth. In this disease pain on movement is greater than in meningeal tumour. Also localized tenderness on pressure or percussion at the seat of the growth can almost always be detected; in meningeal growth it is often entirely absent. Usually in vertebral tumour the patient suffers from pain in the spine, as well as in the distribution of the nerve roots affected. X-ray examination may show indications of a growth connected with the vertebrae, or tumour growth may be found in the back or in other parts of the body.

Vertebral tumours are mostly malignant and metastatic, whilst in malignant diseases in other parts of the body secondary metastatic growths seldom occur in the spinal cord or meninges.

The symptoms of tumour within the spinal cord (intramedullary) are those of a transverse spinal lesion of gradual onset, and root symptoms are usually absent or slight. Loss of sensation for pain and temperature, whilst tactile sensation is preserved, would be in favour of tumour within the spinal cord. The differential diagnosis is often very difficult, but, as Oppenheim points out, we should remember that tumours developing within the vertebral canal arise chiefly from the meninges, and this is especially the case with the slowly developing non-malignant growths.

In the diagnosis of meningeal tumour from syringomyelia, glioma, or gliosis, within the cord substance the following points are also of service: Root symptoms (pain, etc.) are usually absent in gliosis: vasomotor and trophic symptoms in the skin, bones, and joints are in

favour of gliosis. In gliosis, as the changes advance, the symptoms indicate an extension of the disease chiefly in the vertical direction; in extra-medullary tumour chiefly in the transverse direction. If the symptoms are for a very long period those of Brown-Séquard's paralysis, or if the symptoms increase exceedingly slowly, or remain for a very long period stationary, these would be points in favour of gliosis.

The diagnosis between meningeal tumour affecting the cauda equina and tumour within the cord, at the conus terminalis, is very difficult; but severe pain, pain preceding other symptoms, and asymmetrical anaesthesia later, are points in favour of the former disease.³

III. Diagnosis when Root Symptoms have been Indefinite or Absent.

As already stated, Schultze and others have shown that pain is sometimes absent or slight in meningeal tumour. When, however, the symptoms indicate that the lesion of the spinal cord is progressive and transverse; that it is steadily increasing in "cross section" intensity, but that the upper limit of the lesion remains stationary, or at least extends upwards very little, we are justified in suspecting extramedullary spinal tumour. This opinion is supported by the results of exploratory operation in a number of cases.

Lumbar puncture may occasionally be of service, since tumour cells have been found in the puncture fluid in rare cases of meningeal tumour. Yellow colour of the puncture fluid (xanthochromia) is regarded by some observers as an indication of spinal tumour, especially if associated with increase of globulin but without increase of cells.

Signs of tuberculous disease, evidences of syphilis, or hydatid cysts in other parts, may give some indication as to the probable form of the spinal meningeal "tumour."

Hydatid.—The symptoms of spinal meningeal hydatid cyst are practically the same as those of meningeal tumour, but the diagnosis is sometimes possible when hydatid cysts are found in other parts of the body. Occasionally a small subcutaneous cyst has been found on the back close to the spine, and when punctured hydatid hooklets or scolices have been found in the puncture fluid, and operation has revealed also spinal meningeal hydatid cysts. Spinal hydatids are usually meningeal, and most frequently extradural. They are particularly suitable cases for operation. In the 75 successful cases of operation for meningeal "tumour" already tabulated, 10 were hydatid cysts.

The following is a brief abstract of a case:

CASE V.—Symptoms of Meningeal Tumour caused by Spinal Extradural Hydatid Cysts; Operation; Partial Recovery.⁴

A woman had severe pain in the back (mid-dorsal region) for three weeks, then complete paralysis of the legs gradually developed with anaesthesia of the legs, abdomen, and lower part of thorax up to the fifth rib. A small subcutaneous cyst was detected in the back to the left of the third and fourth dorsal vertebral spines. It was punctured, and the fluid was found to contain hydatid hooklets. A diagnosis of other meningeal hydatid cysts within the vertebral canal was made. Dr. Tytler, surgeon to the Ancoats Hospital, operated and removed fourteen hydatid cysts, which were in the vertebral canal on the outer side of the dura mater. Improvement followed rapidly. In twelve months she was able to walk with the aid of a stick. When last seen, six years after the operation, she felt quite well. The legs were spastic, but she was able to walk to the hospital with the aid of a stick, and was still slowly improving.

SUMMARY.

In the diagnosis of spinal meningeal tumour the following points may be specially emphasized:

1. Persistent localized root symptoms (girdle pain or pain in one limb), followed after a considerable time by paraplegia (of gradual or rapid onset), should always lead to a very careful consideration of the probability of spinal meningeal tumour, especially if the cord symptoms increase in "cross section" intensity but do not ascend, or only ascend very slightly.
2. In certain rare cases the root symptoms (pains) may be absent, but in such cases the motor and sensory cord symptoms steadily increase in "cross section" intensity but do not extend upwards.
3. Persistent abdominal or thoracic pain, if bilateral or of a girdle character, even if signs of paresis of the legs cannot be detected, should lead to a careful examination of the chest or abdomen for zones of diminished sensation

(tested by cotton-wool). If such should be detected, and if they correspond to definite root areas, meningeal tumour should be carefully considered. Also brachial "neuritis" of very long duration should lead to a careful consideration of the possibility of spinal meningeal tumour.

Spinal meningeal tumour is a rare disease, but not so rare as is generally believed. Closer consideration of this affection in the differential diagnosis at the early period of chronic spinal diseases would lead more frequently to its early recognition and to early successful operation.

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¹ Sir William Gowers: *Diseases of the Nervous System*, first edition, vol. i, London, 1886. ² *Med.-Chir. Trans.*, 1888. ³ *Diseases of the Spinal Cord*, London, 1911, p. 184. ⁴ Reported by Dr. Tytler and the writer in the *BRITISH MEDICAL JOURNAL*, February 7th, 1903.

THE OCCURRENCE OF URTICARIA AFTER SPECIFIC FEVERS.

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WHEN in general practice some years ago I frequently noted the occurrence of urticaria after specific fevers, especially pneumonia and clinical influenza. Other practitioners tell me they have noticed the same phenomenon, so perhaps it is worth recording.

The eruption usually occurs within a day or two after the temperature has become normal, but sometimes a few weeks later; it may be so transient as hardly to be noticed by the patient, or, on the other hand, persistent and troublesome. I estimate that it occurred in quite 20 per cent. of my pneumonia cases, but as a number of these were not observed with sufficient accuracy to be sure the eruption was not present at some time or other, it is possible the percentage is considerably higher. Sometimes a slight pyrexia coincided with the rash, and occasionally also pains in the joints.

Illustrative Cases.

CASE I.

Fig. 1 shows the chart of a male patient aged 22. On December 22nd, 1912, he had a rigor; typical signs of pneumonia were detected on December 24th in the right upper and middle

FIG. 1.

lobes. The temperature subsided by crisis on December 28th-29th, but there were a few slight fluctuations subsequently. On December 31st a sparse blotchy erythematous and urticarial eruption appeared over the abdomen and limbs; on the limbs confined mainly to the extensor aspects of the elbows and knees. By January 4th the rash had gone.

CASE II.

Fig. 2 shows the chart of M. M., a well-built railway worker of 46. At the onset there was a rigor, then headache, malaise, pain in the back and limbs, and epistaxis (twice). Definite

FIG. 2.

signs of pneumonia were first detected on the seventh day of the illness at the right base. The temperature subsided on the eleventh and twelfth days by a rather prolonged crisis; the

attack was a severe one. Ten days later, the twenty-second of the disease, general muscular pains were complained of. The calves and biceps were noticed to be tender to pressure on the twenty-fifth day, and from this to the forty-seventh there was occasional slight pyrexia. All pains disappeared, and there was an uninterrupted recovery after the forty-seventh day. On the fifty-first day an itching, coarsely macular rash appeared, mainly a pure erythema, but in places urticarial, and with much the same distribution as noticed in the previous case. Within twenty-four hours the eruption had disappeared.

CASE III.

W. S., a man aged 29, had an attack of influenza with pyrexia lasting about seven days, but never exceeding 101°. On the eighth day, the day after the temperature had become normal, an erythematous and urticarial eruption appeared, lasting about thirty-six hours.

I have noticed a similar occurrence in several influenza cases; it seems unnecessary to give details. The eruption was of much the same nature and distribution as already described, but varied in extent and duration. Other rashes were noticed occasionally about the time of onset of the disease, but this was a late eruption. I have also seen a similar urticarial rash six days after the onset of varicella in a girl of 14; and again eight days after the first appearance of a measles eruption.

In the following cases, for the account of which I am indebted to Dr. Parkinson of Horncastle, post-febrile urticaria was not such a transient affair as in those already narrated.

CASE IV.

A man, aged 65, with no previous history of urticaria or of any other illness, was attacked suddenly with headache and generalized pains, especially in the back of the neck and behind the eyes. The temperature ranged from 101° to 102° for two days, then gradually subsided to normal. The attack seemed a typical influenza. Seven days after the fever subsided a severe urticarial eruption appeared on the arms, legs and abdomen. Some of the patches might have been called "urticaria gigas"; and there was also dermatographia. The trouble resisted treatment by dieting, calcium salts, aperients and local applications for over six weeks. At the time of its disappearance he was taking 3 grains of ichthyol three times a day, but it cannot be stated whether this was connected with the disappearance or not.

CASE V.

O. C., a girl, aged 21, developed a severe sore throat, with pains in the back and limbs, which was at first thought to be diphtheritic, but later streptococcal. The temperature rose to 103°, but subsided in a few days; joint pains, however, persisted for fourteen days. Ten days after the temperature had become normal a severe, typical urticarial eruption appeared and lasted for a week, subsiding ultimately under treatment with aperients and alkaline baths.

Discussion.

The question of coincidence must of course be considered when dealing with such a common condition as urticaria. Out of 8 cases in which the previous occurrence of urticaria was investigated, a positive history was found in one only. On the whole, I think coincidence can be excluded in the majority. Nor can it be said that the eruption was a drug rash, for widely different treatment had been adopted in some of the cases.

1. The time at which the eruption occurs suggests its association with the development of immunity, as if the mechanism of immunity, after defeating the invader, proceeds further, and urticaria results.

2. The concomitant occurrence of joint pains and slight pyrexia suggest anaphylaxis, which might be related to the disposal of pathological by-products after resistance has developed.

3. The relation of urticaria to calcium salts and of calcium metabolism again to immunity gives food for further speculation.

I could find no mention of this post-febrile urticaria in any literature available to me at the time these observations were made, nor, to my knowledge at any rate, has anything since appeared on the subject.

THE Red Crescent, which takes the place of the Red Cross in Turkey, developed considerably during the war. It had under its charge 17,110 beds, in which 162,146 wounded cases were treated. It also opened popular kitchens, in which 35,000 indigent persons were fed, and an infirmary and out-patient department for children.

A NEW Spanish journal devoted to dermatology and syphilis, entitled *Archivos Dermosifiliograficos y Revista practica de la especialidad*, has recently been founded at Madrid under the editorship of Dr. Sicilia.