and that he very frequently bit hairs from his moustache and swallowed them.

The patient was again referred to me in March, 1913, with a breaking-down tumour situated about the middle of Scarpa's triangle on his right leg. I excised it and found it to be a spindle-celled sarcoma growing from the superficial fascia.

His general condition is excellent.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, November 19th, 1912, p. 1282.

REMOVAL OF INTRATHECAL TUMOUR FROM LUMBAR REGION OF SPINAL CORD.

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This case illustrates the symptoms produced when a tumour compresses both the upper roots of the cauda equina and the spinal cord itself, and affords another instance that these intrathecal growths are so often single and non-malignant.

HISTORY.

The patient was under the care of Dr. Harvey Bird, of Bridgwater, who recognized the nature of the case, and sent her to the Bristol General Hospital. She was married, aged 52, had had six children, and had enjoyed good health until the present illness; there was no suspicion of syphilis.

ORDER OF SYMPTOMS.

Towards the end of 1909 she began to suffer from "rheumatic pains" in the right thigh, which henceforth recurred at gradually decreasing intervals. In 1912 the pains became worse, they were sharp and shooting in character, from the hip down into the leg and foot, and the right leg became weak. In April, 1912, the pains greatly increased; she also felt "pins and needles" in the toes, and increasing numbness and loss of power in the whole limb. By May the right leg was paralyzed, and from this and increased pain she could no longer get about. At the end of May shooting pains were also felt in the left leg, though not so severe as in the right, and were accompanied by numbness and gradually increasing loss of power in it. She also suffered from pains in the back, and a feeling of tightness around the lower abdomen.

At the end of July, 1912, there was paraplegia; she was unable to walk or stand. For a fortnight during August she had retention of urine, but recovered control of her bladder under use of the catheter; from this time, however, she was liable to occasional incontinence. Bowels constipated. Severe pains continued until admission to Bristol General Hospital on September 7th.

CONDITION ON ADMISSION.

She was well nourished, but had a drawn, haggard expression. She was completely paraplegic and moved or turned herself in bed with the greatest difficulty. Passive movements of the lower limbs caused great pain, especially at the joints. She complained so constantly of great pain, when moved or touched, that it was both difficult to examine her or to do anything for her; possibly she was unnerved by the pain she had suffered, which had necessitated morphine injections. She slept badly. The thoracic and abdominal organs were normal. The urine was normal. The cranial nerves, upper extremities, and trunk muscles were entirely unaffected.

Motor Symptoms.

The right lower extremity could not be moved at all in any part of it; she could draw up the left thigh a little way and bend the left knee slightly, but these were the only movements possible in this limb.

The paralysis was of the flaccid type; there was double foot-drop and the toes were flexed.

The anterior thigh muscles were not wasted, except from disuse. There was marked wasting of all muscles below the knees in both legs, predominating in the tibialis anticus, peronei and extensors of feet, more marked on the right than on the left side, though the circumference of each calf measured the same. The glutei and hamstring muscles were also wasted.

Electrical Reactions.

Diminished reaction to both electrical currents was present in both quadriceps extensor muscles, especially the right, and in the glutei and hamstring muscles. Reaction of degeneration was present in tibialis anticus, peronei, extensors of toes, calf muscles, and plantar accessorius. The peroneal nerves reacted very feebly to the faradic current; to the constant the formula for the right nerve was KCC=0, ACC=20 milliampères, and for the left KCC=10 milliampères, ACC=8 milliampères.

Sensory Symptoms.

The sensory affection is shown on the chart (Fig. 1). Apparently the border of loss of sensation to cotton-wool

Fig. 1.—Loss of sensation to touch, pain, and temperature; dotted area, defective sensation to touch, pain, and temperature; well-defined band of hyperaesthesia.

and pin-prick was coterminous. The loss to heat and cold was absolute over the affected areas, whilst there was diminution of sensation to pressure over the same distribution. Both feet felt very cold to the touch. There was also some loss of the sense of position of the limbs; she had constantly a feeling that her legs were floating in the air and not lying on the bed. There was an indefinite zone of hyperaesthesia on the left side in the lower lumbar or upper sacral and lower abdominal regions.

The chart gives the result of a number of observations on the sensory changes, and can be regarded as approximately correct; she was a difficult patient on whom to make any investigations of this kind.

Reflexes.

Abdominal present and normal. Plantar absent or (?) feebly flexor on strong stimulation.

Knee-jerks and ankle-jerks present. Right knee-jerk active. Marked ankle clonus on right side, not on left; no knee clonus. The bladder was not distended; there was occasional slight incontinence of urine, which seemed partly due to inadvertence, as she was not always aware of it; she could not hold her water for more than an hour at a time. There was no anaesthesia of bladder or rectum. The anal sphincter contracted normally.

There were no trophic lesions of the limbs, and no actual bedsores; but on admission the skin over the sacral and lower lumbar regions of the back was in a very unhealthy state and on the verge of breaking down.

X-ray examination and lumbar puncture showed the spinal column and cerebro-spinal fluid to be normal.

DIAGNOSIS.

From the above signs the diagnosis of an extramedullary tumour at the level of the fourth and fifth lumbar and first sacral roots, chiefly on the right side, was made and operation advised.

The operation had to be considerably delayed until the skin of the back could be got into a more healthy condition, which was a matter of some difficulty.

OPERATION.

On October 15th, 1912, Mr. C. A. Morton removed the laminae of the eleventh and twelfth dorsal and the first and second lumbar vertebrae. When the dura mater was thus exposed it was seen to be pushed backwards, and on splitting it up the cord was found also pushed backwards, so that it lay closely pressed against the dura mater sheath, and the latter had to be divided with great care, so as not to cut into the underlying cord. When the lumbar enlargement of the cord was exposed, it was seen to be not only pushed backwards, but also much flattened and spread out, on a plum-coloured, smooth tumour lying anterior to it and chiefly to the right side. There was a free escape of cerebro-spinal fluid as soon as the dura mater was exposed. The growth lay opposite the body of the twelfth dorsal vertebra; it was about an inch in length, and seemed to fill the anterior part of the spinal canal. By means of the flat end of a small probe some very delicate connexions of fine membrane between the front of the cord and the tumour were broken down, and the cord was then lifted off the tumour, and gently drawn to one side. Some very loose connexions of the tumour with the dura mater sheath in front were then easily torn through with the probe, and the tumour readily enucleated. It was not necessary to divide any nerve roots in order to remove the tumour, as in this part of the cord they all pass obliquely downwards, and those underlying the tumour were turned aside with the cord. The tumour was very soft, of a pink colour, and about the size of the part distal to the last joint in an average-sized middle finger. After its removal the cord fell back into the canal. The dura mater was closed with a continuous suture of fine silk. This prevented any leakage of cerebro-spinal fluid, which was evidently distending the sewn-up sheath at the completion of the suturing. There was practically no bleeding within the spinal canal. The mass of muscle and aponeurosis reflected from the laminae, before these were removed, was brought together over the gap in the spine. No drain was employed. She did not suffer from shock.

The muscles united firmly across the gap in the spine, and the skin wound was soundly healed a fortnight after the operation. There were no signs of any inflammatory changes in the spinal membranes during the healing of the wound.

Nature of Growth.

Microscopical examination of the growth showed it to be a soft fibroma. No other tumour could be found, and its large size accounted for the wide extent of the symptoms, and its situation, chiefly anterior to the cord, for their roughly symmetrical character.

AFTER-HISTORY.

She made a good and uneventful recovery from the operation.

On October 23rd, she had recovered power over the bladder, could move the left leg and toes, and flex the right knee. She could feel a light touch over both thighs and legs, but imperfectly over the calf of the leg, and not at all over the feet, and a pin-prick over the right leg, but not over the left. The right ankle clonus was still present, and a flexor plantar reflex was present on each side. At the end of another week there was further gain of power, especially in the left leg. She looked well, and had greatly improved in appearance, although she still complained of much pain. She had no more morphine after this time. She insisted on going home—a journey of 35 miles—early in November. Her friends found it, however, impossible to nurse her at home, so she returned to the hospital on November 18th.

Two months after operation the condition of sensation was: Pain (pin-prick) felt over whole posterior surface of both buttocks, thighs, and legs, but defective, often felt as touch only, over front of thighs, legs, and dorsum of right foot; normal over dorsum of left foot. Sensation to light touch (cotton-wool) defective over areas shown in Fig. 2; localization was defective over right leg and foot; pressure was felt everywhere, but distinctly unpleasant on right leg and thigh. This defect of sensation in the areas of the third lumbar and increased loss in those of the fourth lumbar roots on the right side had appeared since the operation, and probably represented a slight but unavoidable bruising of these roots in holding them aside in order to deliver the tumour from under the cord. To the same cause is to be attributed a decrease of the right knee-jerk, and almost complete loss of response of the right quadriceps extensor to both faradic and constant currents after the operation.

By this time she had regained power over her bladder, and could hold her water for several hours; the unhealthy condition of the skin had entirely disappeared, and the feet and legs no longer felt cold.

Without going into details, the further history of the case was one of steady but slow recovery of sensation and

Fig. 2.—November 28th. Tactile sensation (cotton-wool): Dotted area, defective; — absent; /// hyperaesthesia to cotton-wool.

of muscular power. Recovery was much more rapid in the left than in the right leg, owing to the more extensive damage done by the pressure of the tumour to the spinal cord and roots on this side.

She made up her mind to go home again early in January, 1913, and left the hospital on January 14th, three months after operation. Her condition then was that she could sit up in bed and in a chair quite well, and had recovered power in the left leg; lying in bed, she could raise it in the air and move it freely in all directions; she was not able to stand alone, but with help she could almost support her weight on the left leg. The wasted muscles had filled up very much, and reacted normally to faradic and constant currents.

Right leg: Recovery in this limb had not proceeded so far; there was still foot-drop; she could move the toes and flex and extend the foot; there was feeble flexion of the knee and hip, but this was all. The muscles of this limb were still much wasted and many of them tender; they only reacted feebly to a very strong faradic current; they reacted to a constant current of 8 to 10 milliamperes. ACC = KCC, with the exception of the quadriceps extensor, which hardly reacted at all. The knee-jerk was present; ankle clonus still continued to be marked. The reflexes in the left leg were normal.

Sensation to touch and pain had returned over the sacral region and over the whole of the left lower extremity, but over the right, although improved, was still somewhat defective; and over the back of the right

thigh and leg a touch was disagreeable (protopathic sensation); sensation to heat and cold normal except over the front of the right thigh.

Dr. Bird reports that on March 25th—five months after operation—sensation over both legs is normal, the left leg has recovered, and she can support her full weight upon it; there is still right foot-drop, but she can move the right foot and toes, and can extend the right knee, so that steady recovery is proceeding in this limb also. She can sit up, and has not had any morphine.

The history of the case with the severe root pains increased by moving the limbs, the muscular wasting, the reaction of degeneration in the muscles, the distribution of tingling, and loss of sensation—the latter so far as could be made out of posterior root type—in certain root areas together with slight affection of the bladder, pointed to a lesion chiefly on the right side and affecting certain roots of the cauda equina high up. There was one symptom, however, which definitely indicated that the spinal cord was also involved from pressure, and not only aided in the diagnosis of the side of the tumour, although this was clear enough from the predominance of sensory and motor troubles in the right leg, but also of the main position of the tumour as above the origin of the first sacral root and below that of the third lumbar, and that was the persistent and very marked ankle clonus on the right side in presence of an active right knee-jerk. The slower recovery in the right leg is due to the more severe damage to the roots on this side, which must take a considerable time to recover, though it is to be anticipated that she will regain the use of this leg in from eight to twelve months from operation.

CLASSIFICATION OF TUMOURS OF THE PITUITARY BODY.

By GERHARDT v. BONIN.

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WHEN I was engaged in work upon a recent case of acromegaly¹ I was constantly met by a practical difficulty due to the absence of a generally accepted or standard nomenclature of pituitary tumours. It has therefore occurred to me that a useful purpose might be served by suggesting a new scheme of classification that would be easy of application and might recommend itself for general adoption, because it is based on the principle of histogenesis, and thus takes into consideration the physiology of the tumours; for epithelial tumours, even when malignant, lead to hyperpituitarism, whereas tumours developed from the stroma will destroy the glandular tissue and thus lead to hypopituitarism.

The following scheme differs in some important respects from that published by Roussy and Clunet,² and it is hoped that for the reason above explained it will afford a still better basis of classification.

I. Heterotopic Tumours.

1. Tumours of the cranio-pharyngeal duct.
2. Teratomata.

II. Homoiotopic Tumours.

1. Epithelial tumours:

(a) From anterior lobe	{ Chromophile
Chromophobe
Combined	Cubic cell
adenoma.
Round cell
adenoma.
(b) From pars intermedia		Carcinoma.

2. Tumours developed from connective tissue:

(a) From anterior lobe and pars intermedia	{ Fibroma.
Sarcoma.
(b) From posterior lobe	... Glioma.

3. Mixed tumours		Fibro-adenoma.

1. The group of heterotopic tumours comprises those which develop from a tissue normally not present in the pituitary.

1. Tumours of the cranio-pharyngeal duct were first recognized as such by Erdheim³ eight years ago. They arise from *Anlagen* of the epithelium of the duct which are frequently met with in normal pituitaries and which have been developed from the ectoderm of the buccal cavity. They consist of squamous epithelium, often

containing *Schichtungskugeln*. They occur in the infundibulum or in the pars anterior of the hypophysis and are either benign or malignant. Erdheim collected a number of cases from the published literature which were described under different names, some of them as adenomas, but which really belonged to the category of tumours of the cranio-pharyngeal duct.

2. Teratomata in the pituitary are rare, but great importance has been attached to them by some authors, especially by Marburg.⁴

II. Homoiotopic tumours arise from a tissue normally present in the gland.

1 (a) According to Courtellemont⁵ the following features are characteristic of the epithelial tumours of the anterior lobe:

1. A tendency towards the development of a single cellular type.
2. Rarefaction or entire disappearance of interlobular connective tissue.
3. Diminished disposition of the cells to arrange themselves in acini.

The first characteristic holds good for most pituitary tumours, although it is to be remembered that some cases have been described in which both kinds of cells were present in the new growth.

Three types of glandular tumours can be distinguished: Chromophile, chromophobe, and combined; each type may deviate more or less from the normal structure of the gland—that is, it may be more or less degenerated. Adenomas with cubical cells approximate most closely to the original glandular structure, so closely, indeed, that some authors designate them as struma of the hypophysis. The cells are still arranged in acini, which, however, are larger and more irregularly disposed, and contain less connective tissue than is the case in the normal gland.

If these tumours begin to degenerate the glandular structure is almost completely lost, and the cells are grouped round the blood vessels, which are mostly sinusoidal capillaries. The specific cells are slightly smaller than the cells of the adenoma. At the same time they assume a round shape. Hence these tumours are described in the scheme as round cell adenomas. Clinically these tumours should be regarded as benignant. Malignant tumours seem to have the same histological appearance; they can only be distinguished by their behaviour in forming metastases. The germs from which such metastatic tumours arise are carried not only by the blood stream, but also by the cerebro-spinal fluid. Malignant tumours of the pituitary are, however, extremely rare. If the histological examination of an extirpated tumour reveals a tumour possessing the features just described, it will in the vast majority of cases be a round cell adenoma, which permits a good prognosis.⁶

(b) Tumours of the pars intermedia appear to be rare. Those tumours described as glandular tumours of the posterior lobe seem really to have developed from the pars intermedia, the cells of which normally show a tendency to proliferate into the pars nervosa.

2. The tumours developed from connective tissues in the pituitary exhibit the same feature as those formed in other parts of the body.

3. The term "fibro-adenoma" is proposed for the mixed tumours first described by Zak,⁷ in which the stroma, instead of being rarefied, has undergone considerable increase. These tumours are said to be a sign of diminished glandular function; they have never been found to be associated with acromegaly, but only with degeneratio adiposo-genitalis.

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* These "round cell adenomas" are often very similar to sarcomas, so that the differential diagnosis can be extremely difficult. Sarcomas, however, are very rare; most sarcomas of the literature are really adenomas. Von Eiselsberg⁶ has recently published his cases of pituitary tumours; in his paper will be found some instructive illustrations of the histological appearance of these tumours.

THE estate of the late Dr. Henry William Cross of Whitley has been declared at a net value of £17,993. Dr. Cross, who became M.D.Durh. in 1886, was formerly in practice at Newcastle.