not be done to the same extent by means of tuning forks.

6. The charts are analogous to fields of vision, and are of like value in picturing the hearing loss in percentage.

7. Malingerering can easily be detected.

8. Finally, accurate hearing tests can be made speedily and filed away for permanent records which will prove of great value in medico-legal cases and industrial medicine.

Case Reports

CAVERNOUS ANGIOMA OF THE EPIDURAL SPACE WITH COMPRESSION OF THE SPINAL CORD*

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E. S., aged 31, waitress, was admitted to the General Hospital, Kingston, on December 28, 1918.

She stated that early in 1918 she had been troubled with stabbing pains on the right side over the lower ribs. A little later the other side became affected in the same way. She was treated for intercostal neuralgia without much success. During the early part of the summer of the same year she began to drag the right foot while walking and some weeks later the left foot became involved in a similar manner. The condition progressed so that she could move about only by holding on to objects. In November, 1918, she was forced to remain in bed. A diagnosis of spastic paraplegia was made. During September, 1920, one of us (W. T. C.) on first seeing her made the following notes on this case.

The patient is a well nourished woman of good colour. She is paralyzed from the waist down, but retains perfect use of the upper half of her body. The legs are not wasted, but all power of voluntary muscular movement is lost. Knee- and ankle-jerks are exaggerated and a positive Babinski is present in both legs. Ankle clonus cannot be elicited. On tickling the sole of the foot there is a slight withdrawal, but the patient states that she has no knowledge of the stimulus or movement. When the legs are handled there are some automatic muscular contractions, but these do not follow any regular sequence. Touch, pain, and temperature sensations are completely lost on the right side to a circular line about two inches above the umbilicus. There is a similar loss of sensation in the left leg and back of the thigh. However, there remains a vague sensation to pin pricks on the front of the thigh and lower abdomen. The patient does not recognize sensation definitely until a circular line about two inches above the umbilicus is reached on the left side.

Patient states that she has a feeling of fullness in the bladder just preceding micturition, but she has no control over this function. There is a similar feeling of fullness also preceding defæcation, but no control can be exercised.

The patient has perfect control over movements of head and arms. The reflexes and sensations of the upper part of the body are normal.

The blood counts were normal. The Wassermann test of the blood was negative. The spinal fluid was under low pressure; there was no increase in globulin, and the cell count was 8. The Wassermann test of the spinal fluid was also negative. An x-ray examination of the vertebral column gave negative results. A diagnosis of spinal compression due to a slow growing tumour was made. In the autumn of 1920 Dr. Austin, Professor of Surgery, strongly advised laminectomy, but the patient refused.

During 1921 the anæsthesia on the left side became absolute and reached the same level as that on the right side. The Babinski reactions disappeared. All knowledge of bladder and bowel movements was lost, although both physiological functions took place automatically. The patient showed practically no changes in the condition of the lower extremities from this period to her death 8 years later. This case was demonstrated each year to the medical students as one of transverse myelitis due to compression. The cause of the compression was thought to be a simple tumour, probably a psammoma of the dura. One objection to this diagnosis was that the circulation of spinal fluid to the

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lower end of the cord was not completely interrupted. Bone and cartilage growths were excluded by x-ray examinations. The patient remained otherwise in good health until the summer of 1929 when she developed a cystitis and pyelonephritis, with a fatal result within two weeks from the onset.

An autopsy was performed on July 27th. A partial examination only was permitted.

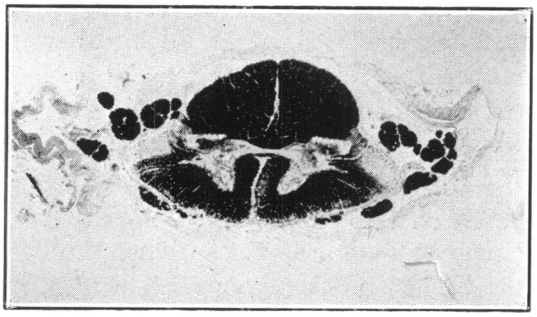

FIG. 1.—Section of cord taken below the lesion.

The body was that of a well nourished woman of 42 years of age. A decubitus was present over the right knee, and there was a sinus in the left buttock which was discharging foul smelling pus.

Abdomen.—The stomach and intestines were normal. The liver showed marked fatty change. The gall bladder contained several calculi. The spleen was small and fibrous; the pancreas normal. The uterus was small and contained several fibromyomata; its appendages were normal. The kidneys were swollen, pale and soft, with numerous hæmorrhagic areas beneath the capsules and also in their substance. The pelvis of the right kidney contained pus.

Spinal Cord.—A vascular tumour occupied the epidural space at the level of the 6th and 7th vertebræ. This tumour also involved the laminæ and to some extent the roots of the arches of the 6th and 7th vertebræ. The bodies of the vertebræ were free from new growth. The spinal cord at this level was compressed, so that nothing but the meninges remained for a distance of 3 centimetres. The dura mater appeared to be normal throughout.

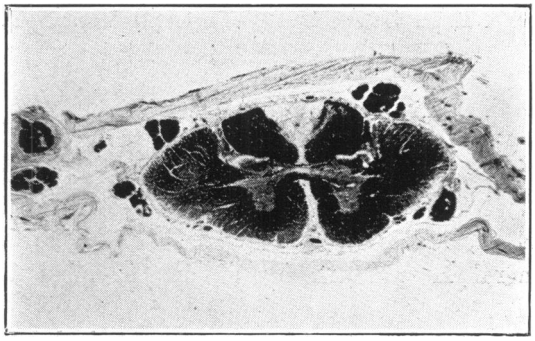

FIG. 2.—Section of cord taken above the lesion.

Microscopical examination.—Sections of the spinal cord were taken about 4 centimetres above and also the same distance below the area of compression. These sections were prepared according to the Weigert-Pal method for staining myelin. The low power photomicrograph of section No. 1, which was taken below this lesion, shows the large prominent dark areas representing the ascending tracts of Goll and Burdach. The descending crossed pyramidal tracts in the lateral portions of the cord are largely destroyed. The degenerative changes in the direct pyramidal tracts are not plainly visible in such a low power photograph. The great reduction in size of the anterior portion of the spinal cord relative

FIG. 3.—Photomicrograph showing the cavernous angioma in contact with the bone tissue forming the lamina of the vertebral arch.

FIG. 4.—An area of bone structure which has been invaded by the tumour.

to the area covered by the funiculi gracilis and cuneatus is evident.

The section of the cord, No. 2, taken above the lesion, shows almost complete absence of the fibres constituting the tract, funiculus gracilis (Goll's column). These fibres come largely from the lower extremities. There are numerous well developed fibres in the funiculus cuneatus (Burdach's column). These fibres have entered between the site of the lesion and the point at which the section was taken. There is considerable loss of myelinization in the areas occupied by the direct cerebellar and anterolateral ascending tracts. The dura mater covering the posterior aspect of the cord is definitely thickened, but it is not invaded by the tumour.

Photomicrograph No. 3 shows a portion of the caverous angioma occupying the epidural space and lying in immediate contact with the lamina of the 6th vertebral arch. The tumour blood spaces have assumed a flattened form owing to pressure between the cord and the vertebral arch.

Photomicrograph No. 4 shows a portion of the

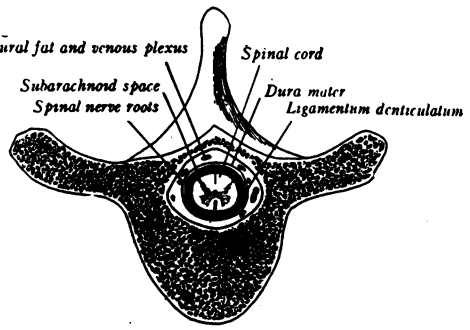

FIG. 5.—Diagram showing the relation of the epidural space to the vertebral column. (Ranson)

lamina of the 6th vertebral arch. At this point the tumour has invaded the bone. There is an organized thrombus in one large blood sinus. Several smaller sinuses are visible within the bone tissue. In spite of this apparent invasion the tumour is essentially a simple one.

The spinal dura mater corresponds to the inner layer of the cranial dural mater. The vertebral canal is lined with periosteum. The interval between the periosteum of the vertebral canal and the dura mater is known as the cavum epidurale. It is occupied by soft fat and a plexus of thin-walled veins. The diagram (Fig. 5) from The Anatomy of the Nervous System by S. W. Ranson (1923) illustrates the relation of the epidural space to the vertebral column and dura mater. The vertebral column and its ligaments, the membranes of the brain and spinal cord are derived from a continuous sheath of mesoderm which forms around the neural tube and notochord in the embryo. It is probable that the angioma in this case originated from the plexus of veins in the epidural space. The invasion of bone was comparatively slight. Ewing (Neoplastic Diseases, 1928), reports a case of cavernous angioma involving a dorsal vertebra, but the origin of the tumour is not stated. Angiomata of bone and meninges are comparatively rare. We can find no records of cases of angiomata of the epidural space.

CARCINOMA OF THE BRONCHUS*

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A short account of the following case has been judged worthy of record, partly because the course and diagnosis of the illness presented some noteworthy features, and partly because cancer is now recognized as contributing such a large proportion of pulmonary disease that all completely worked out cases of the kind should be collected for study.

The patient was a French Canadian, a salesman, aged 45. He was admitted to the Montreal General Hospital in May, 1929, complaining of cough, dyspnœa, weakness, and loss of weight. The family history was negative. The personal history was of interest mainly because it was so definitely free from any severe or chronic illnesses. He had been a heavy cigarette smoker, however, and had complained of a so-called "cigarette cough" for some years. His habits otherwise had been moderate. His best weight had been 158 lbs. four years ago; he weighed 144 lbs. one year ago, and his weight on admission was 126 lbs.

He had always been active and hard working, and had lost no time at work until six months ago, when he developed a severe cough and began to feel out of sorts. This culminated in a fainting spell five months before admission,

* From the medical wards of the Montreal General Hospital, service of Dr. C. A. Peters.