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

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

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

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

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

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

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

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

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

2.

3.

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

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

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

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

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

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

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

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

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

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

surface, the colour resembling that of degenerated tracts above a transverse lesion of the cord, when the specimen has been hardened in Müller's fluid. In the lowest lumbar region no changes could be detected, but in the middle lumbar region the median thirds of both posterior columns (external and median) were slightly paler than the rest of the cut surface of the cord. In the upper lumbar region the change in

Case 2.—Naked-eye appearances of the spinal cord on section after hardening in Müller's fluid. Changes in the posterior columns; normal white matter shaded, parts of white matter affected are pale; 4, cervical region; 5, upper dorsal region; 6, upper lumbar region.

colour was more distinct and the pale area more extensive (see Diagram 6). In the lower dorsal region there was a very pale streak in each postero-external column. This was especially well marked in the upper dorsal region, and extended over the whole of each postero-external column (see Diagram 5). In the lower cervical region the postero-median columns presented this pale appearance. In the upper cervical region only the posterior halves of these columns were affected (see Diagram 4). The direct cerebellar tracts and other parts of the white matter appeared normal in all the regions of the cord.

Microscopical Examination.—Sections were stained according to the same methods as in Case 1. In the pale tracts in the posterior columns numerous swollen nerve fibres were seen. Only a very narrow rim of the myelin of these fibres was stained black in the Weigert's specimens; no other changes were detected. Nerve fibres (branches of the anterior crural nerve) to the rectus femoris (left) appeared normal on microscopical examination.

I have examined the spinal cord in three other cases of diabetes, but the appearances above described were not met with.

The changes in the posterior columns in the above cases were probably the result of the toxic diabetic blood condition. Slight changes in the posterior columns of the cord, in diabetes mellitus, have been described by Sandmeyer¹ and also by Leyden.² Somewhat similar changes in the posterior columns, more marked to the naked eye than on microscopical examination, have been reported by Minnich³ in three cases of pernicious anæmia. Tooth⁴ has pointed out that on the sixth day after section of the cord in animals, tracts of secondary degeneration are well marked to the naked eye (by their light colour) on hardening in bichromates, whilst the microscopical changes at this date after section are very slight, and consist chiefly in swelling of the axis cylinders and nerve fibres. Probably tracts of degeneration can be recognised by the naked eye, after hardening in bichromates, before any microscopical changes occur, and Tooth considers that the naked-eye changes are due to a preliminary chemical alteration in the nerve fibres. The condition of the posterior columns in the cases of diabetes recorded above, would appear to correspond closely to the early stage of degeneration described by Tooth.

In the second case the knee-jerks were absent, and slight naked-eye changes were found in the lumbar region of the cord. As the peripheral nerves (fibres of the anterior crural to the rectus femoris) were normal, it is possible that these changes were the cause of the loss of knee-jerks. Eichhorst has found degeneration changes in the peripheral nerves in two cases of diabetes in which the knee-jerks were lost; but in other cases the peripheral nerves have been normal.⁵ The absence of knee-jerks in some cases of diabetes may be due to changes in the lumbar region of the cord, such as those slight described above.

¹ *Deutsches Archiv für klinische Medizin*, Bd. 50.

² *Wiener medizinische Wochenschrift*, No. 21, 1893 (society report, p. 925).

³ *Zeitschrift für klinische Medizin*, Bd. xxii, 1893.

⁴ *BRITISH MEDICAL JOURNAL*, 1889, vol. i, p. 754.

⁵ Eichhorst (and Nonne, quoted by Eichhorst), *Virchow's Archiv*, Bd. cxxvii, p. 1.

A PSEUDO-HYPERTROPHIC FAMILY.

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THE accompanying illustrations are reproduced from photographs kindly taken for the Children's Hospital by Messrs. Taylor, photographers to the Queen. They represent two

James R., aged 16.

members of a very interesting family, in which four individuals are affected by pseudo-hypertrophic paralysis in a very marked degree. I have not been able to discover any-

James R.—Back view.

thing noteworthy in the history of previous generations, but the present one comprises the following members: