monic phthisis, without coma. In seven other cases of coma, the epithelium did not present important changes.

Teschenacher draws attention to the resemblance to traumatic shock, and suggests that the cause is to be found in some lesion of the sympathetic system. The symptoms are certainly suggestive of this view, and the contracted left ventricle often found *post mortem* favours it. If a poison, developing in or retained in the body, is the cause of the coma, this may act especially on the great abdominal sympathetic.

In conclusion, it seems to me, from the foregoing review of the evidence advanced in their favour, that (as Ebstein also has said) no one of these theories is applicable to all cases of the coma of diabetes, though each explanation may fit particular cases. Though the evidence in favour of acetonæmia appears to me at present quite inconclusive, yet, intoxication by some such poison, with a special affinity for the sympathetic system, developing in the blood or tissues, appears to me the most likely direction in which we shall have to search for the cause of diabetic coma.

REMARKS ON THE MORBID ANATOMY AND PATHOLOGY OF DIABETES.*

By R. SHINGLETON SMITH, M.D., B.Sc.,
Physician to the Bristol Royal Infirmary.

SINCE the discovery of Claude Bernard, that an artificial diabetes might be produced in the lower animals by stimulation of the diabetic centre in the medulla oblongata, pathologists have been looking out for the results of such stimulation in consequence of disease directly affecting, or secondarily involving, the diabetic centre.

Various pathological conditions have been found in individual cases to be associated with glycosuria, and conditions not involving simply the medulla oblongata, but inducing the same result through the agency of various peripheral portions of the vaso-motor system. The presence of sugar in the urine was attributed by Schiff to consecutive paralysis of the vaso-motor centre; but recent researches seem to show that irritation of almost any portion of the vaso-motor system may cause glycosuria. Not only may injuries of the vaso-motor conducting paths, in their passage downwards from the medulla through the spinal cord, be followed by diabetes, but the same result will follow sections of the cord in various regions down to the level of the first lumbar vertebra, by destruction of the upper and lower cervical, and of the upper thoracic sympathetic ganglia, or even after section of the large peripheral nerve-trunks, such as the sciatic (Schiff). In 1868, Braun first drew attention to the frequent presence of sugar in the urine in cases of sciatica; and this observation has since been confirmed by numerous other observers.

Disorders of the nerve-centres, giving rise to diabetes, may be of very various kinds: they may be either cerebral or medullary; and Eckhard has shown that destruction of the vermis cerebelli in rabbits will give rise to the presence of sugar in the urine, which is not attended by any alteration of the blood-pressure, and, consequently, is not likely to be caused by disturbances in the circulation. Changes of various kinds have been recorded by numerous authors; tumours, extravasations of blood, softening, and various microscopic indications of degeneration, are the changes most commonly found. The minute changes recorded by Dickinson have not been confirmed by all observers; the feature observed by Dickinson, and believed by him to be constant and characteristic, was "a dilatation of the arteries and of the perivascular spaces in the medulla and the pons, which appeared to lead to the escape of the contents of the vessels, and subsequent softening and destruction of the nerve-substance around." I have carefully examined the medulla oblongata in several well-marked cases of diabetes, and have not been able to see there the changes described by Dr. Dickinson. The spinal cord appears to be much less frequently the seat of the primary lesion than the brain. Dickinson observed a dilatation of the central canal in the dorsal and lumbar portions, with proliferation of the lining epithelium.

As regards the condition of the sympathetic ganglia in diabetes, I have made numerous observations, but without finding any uniform and definite change. Ponikio states that, in five cases of diabetes observed by him, there was an absence of the medullated bundles of fibres from the sympathetic system in the abdomen. This is an observation which I have not been able to confirm, inasmuch as there has been no difficulty in demonstrating the usual axis-cylinder fibres in sections of the semilunar ganglia, of the splanchnic nerves,

and of the cervical ganglia, from various fatal cases of diabetes which have come to my notice. On comparing the sections from diabetic patients with other sections from the ganglia of patients who had died by accident and from various diseases, the specimens, having been preserved and mounted in a similar manner, show only very slight differences, depending on the thickness of section and variations in staining, etc. There is, however, one feature on which I would desire to make a further word of comment; it is, that there appears to be an excess of granular pigmented cells in the diabetic sections. Such granular cells are always present; but my sections show a larger number of pigmented cells, and more numerous granules in the cells, than in sections from the ganglia in other diseases.

In spite of much discrepancy as regards the details of the influence of the nervous system in mellituria, there is an universal accord that injuries of the medulla oblongata, of the lowermost cervical and uppermost thoracic ganglia, and of certain connecting filaments of the two, give rise to the presence of sugar in the urine.

The following case is an interesting illustration of the point in question. I have here sections of the cervical cord of a patient aged 51, whose symptoms pointed to the existence of an injury, probably (at the commencement) a minute hæmorrhage, high up in the cervical spinal membranes, followed by irritative meningitis, and then very gradual myelitis from pressure, and finally ascending degeneration reaching up to the medulla. Glycosuria had existed for one month before the fatal syncope occurred. After death, a small tumour was found at the middle of the cervical region, occupying the anterior aspect, and compressing the cord. The tumour was situated in the dura mater, was composed of a reddish myxomatous tissue, occupying cyst-like cavities in the meshes of the fibrous membranes. In the sections of the cervical cord, various abnormal conditions were present. The most striking feature was the looseness of texture of the grey matter, as if much infiltrated with serum; its texture was loose and spongy, very unlike the usual compactness of the grey matter of the cord. The looseness of texture brought into view numerous neuroglia-cells with delicate fibrillary processes. The epithelium of the central canal had undergone abundant proliferation, the canal being blocked with a mass of small round nucleated cells, with none of the normal columnar form. The canal was surrounded by a number of concentric rings of connective tissue with very fine elongated nuclei. Scattered throughout all parts of the cord were numerous and large amyloid bodies; they were most abundant in the tissues immediately around the central canal. In the dorsal and lumbar regions of this cord, similar appearances were observed, viz., proliferation in the central canal and diffusion of amyloid corpuscles; but the sponginess of the grey matter was limited to the cervical region.

In this case, the diabetes was clearly due to the implication of the vaso-motor nerves along the track of the cervical region of the cord, or in the medulla itself; and the question naturally arises, How is it that diabetes is not a more constant symptom in cases where the cervical cord is affected? It is well known that, in tabes dorsalis, mellituria is rarely, if ever, present; and yet the disease may be so advanced as to have caused an atrophic diminution in size of the cord to one-half its bulk, and there may be evidences of disease as high up as the floor of the fourth ventricle. I have prepared numerous sections of the medulla from cases of tabes; they show decidedly abnormal conditions from the extension upwards of the sclerosis along and around the central canal to the floor of the fourth ventricle, and yet no one of these patients presented any evidences of glycosuria. Now, it is a remarkable feature of sections of the cord in tabes, that, in spite of the most advanced sclerosis of the posterior columns, perhaps also a general sclerosis of the antero-lateral white columns, the grey matter continues to be fairly healthy; the cells have not undergone atrophic changes; and the grey matter, as a whole, is the most healthy portion of the cord. On the other hand, in the case I have quoted, and of which I now exhibit the specimens, the white matter is the most healthy, the grey matter having undergone a complete transformation from its normal texture and appearance. By contrasting these two conditions, in the one of which sugar was present, and the other in which it was absent, it would appear that the presence or absence of glycosuria may depend on the implication or otherwise of the grey matter of the cord in the cervical region; and we may hence infer that the grey matter is the portion of cord along which the vaso-motor nerves pass. Experiments have been made by Schiff, who found that division of the entire cord at the level of the second dorsal vertebra would cause diabetes; often also it would result from section of the individual columns of the cord, sometimes the

* Read in the Section of Pathology at the Annual Meeting of the British Medical Association in Worcester, August 1882.

posterior, at other times the anterior. Pavy found that section of the cord between the second and third cervical vertebrae soon gave rise to sugar in the urine; but below this point section was ineffectual. As regards the cervical region, we may surmise that the presence of glycosuria is an indication of disease affecting the grey matter, and therefore deeply seated. Pavy's experiment further shows that it must be above the third cervical vertebra. We may, therefore, expect to have, in association with glycosuria coming on in cases of spinal disease, other symptoms resulting from destructive disease of the grey matter of the upper cervical cord and the nuclei of the medulla oblongata. It may, accordingly, be suspected that other and perhaps more serious symptoms will shortly follow the appearance of glycosuria in cases of spinal disease.

DR. SAUNDBY (Birmingham) said that, to his mind, the evidence in favour of the acetonæmia theory was very far from being conclusive; but he believed that the symptoms were most probably due to some form of toxæmia, though it was not at present possible to identify the poison. The only other suggestion that commended itself to him, was that of Teschemacher, which drew attention to the resemblance of the phenomena to those of traumatic shock. He was not able to regard the theory of fat-embolism, suggested by the late Professor Sanders and by Professor D. J. Hamilton, as at all adequate. The blood in by far the largest number of cases of diabetic coma was not milky, and when it was, it certainly did not usually give rise to embola. In a paper by Dr. Barling and himself, in the July number of the *Journal of Anatomy and Physiology*, they had pointed out that the vessels of a patient, who died recently in diabetic coma with milky blood, contained no true embola, but merely fat-globules embedded in the blood-clots. So far as he had seen, the fat existed in the blood in the form of a fine emulsion, which could not cause embolism; and he believed it was only after death that the granules of the emulsion ran together to form large globules, which simulated the appearance of fat-embolisms. It was, moreover, important to remember that fat-embolisms were apparently the rule in all cases of fracture or severe contusions of soft parts; yet it was only in exceptional cases, where the embola were very numerous, that any symptoms were produced.—DR. MACKENZIE said that, whilst differences in the circulatory organs in the aged and the young accounted for certain differences, yet some cases, terminating by coma, did occur in aged persons. As regarded Dr. Pavy's suggestion, that diabetic coma was due to some disease of the respiratory and vascular centres in the medulla itself, whilst as an hypothesis it was entitled to respectful consideration, it must be remembered that this was the point to which the attention of microscopical investigators had been directed. Dr. Saundby's remarks interested him very much, and confirmed the assertions of other observers, that fatty embolisms, when present, had not the importance that had been attached to them by some.

DONATIONS AND BEQUESTS.—Mr. George Henry Strutt, of Bridge Hill, Belper, has given £1,000 to the endowment fund, and promised £50 *per annum* for three years, to the Derbyshire Hospital for Sick Children.—Miss Caroline Hutton, of Lincoln, bequeathed £300 to the Earswood Asylum for Idiots, £200 to the Samaritan Free Hospital for Women and Children, £500 in trust for building a fever ward at the County Hospital, or for maintaining it if already built, and £500 out of the proceeds of the sale of her dwelling-house in Eastgate to the Lincoln General Dispensary, and the remainder to the Lincoln County Hospital.—Mr. Henry Matcham, of Ramsgate, bequeathed £500 to the Ramsgate and St. Lawrence Royal Dispensary.—The Lowestoft Convalescent Home has received £300 under the will of Mrs. Cann, of Wramplingham.—Mr. B. J. Hudson has given fifty guineas to the Middlesex Hospital.—Mr. G. W. P. Bentinck, M.P., has given £50 to St. Peter's Hospital for Stone, and £50 to the Middlesex Hospital.—“E. T.” has given £50 to the Hospital for Women.

PRESENTATION.—Dr. Edgar Flinn, on the occasion of his leaving Brownhills, Staffordshire (where he had been in practice for over seven years), was presented with an illuminated address and very valuable time-piece, subscribed to by the employes of the Brownhills and Conduit collieries. The inhabitants of the district also presented him with a superior case of surgical instruments, accompanied by a neatly-illuminated album, containing a complimentary address and the names of the subscribers. Dr. Flinn, previous to his departure, was entertained at dinner at the Station Hotel by his fellow-townsmen, when many expressions of regret were made at his removal to Kingstown to undertake the appointment of surgeon to St. Michael's Hospital.

NOTES OF CASES OF DILATED STOMACH: WITH REMARKS.

By T. SANCTUARY, M.D., Hale, Cornwall.

(Continued from page 614.)

CASE IV.—A machinist, aged 37, complained of heartburn after eating, followed in a short time by nausea, pain in the stomach, retching, and vomiting. She was pale, emaciated, with bad teeth, and looked much out of health. Besides her food, she vomited a brownish sticky liquid, which varied in quantity from one to two teacupfuls. Her family history was unimportant. The present illness had come on gradually with flatulence and distension after food, and a feeling of fulness. Her tongue was pale and moist, her bowels constipated, urine and menstruation scanty. On examination, I found the stomach extending an inch below the navel, and the cutaneous veins well marked, though the skin of the abdomen was not tense, but rugged and withered. The amount of gastric distension varied, but not apparently inversely as the amount of eructation, and was never constant for more than five minutes at a time. She told me that (some years ago) she had suffered a good deal of pain after food, and had also occasionally vomited blood. I could not define the pain more exactly than over the whole area of the stomach; and from this fact, as well as the knowledge that no blood had been vomited for several years, I was inclined to think that I had to deal with a case of simple dilatation, caused, perhaps, by previous ulceration and cicatrization. Happily, there has been no opportunity of verifying this diagnosis by *post mortem* examination. She consented to let me try the siphon-tube, and feed her by the bowel, without any previous course of medicine except a dose of Carlsbad salt every morning for ten days; and I used the tube once a day for three days, and afterwards twice daily. Perfect toleration did not ensue in her case for a week; but she was able to use the tube herself at the end of a fortnight, when I discontinued the enemata, and recommended that she should take some liquid food in small quantities frequently during the day, choosing such things as cocoa, milk (with or without soda and lime-water), and farinaceous foods; and entirely avoiding tea, coffee, and alcoholic beverages. The progress of her case was uneventful. After two months' treatment, she was able to dispense with the tube and take ordinary food without pain or trouble, though only in small quantities at a time.

NOTE I.—For this operation, I use (a) a soft œsophageal tube two feet in length; (b) three or four feet of stout India-rubber tubing, three-eighths of an inch in diameter, weighted at one end with half an inch of leaden pipe. At first, I employed the ordinary red composition stomach-tube; but, finding that this became sodden and liable to crack with much wear, I substituted for it one made of blackish-green French composition, after the style of the French *cathèbres coulés*, as being more pliable, safer for the patient's own use, and of greater durability.

The patient sits on a chair, under a shelf a foot and a half above his head; on the shelf I place a pint glass graduated measure of solution, and immerse in it nearly the whole of the India-rubber tubing, coiling it inside the glass. To one end of the tubing is attached the lead-weight, to the other the œsophageal tube. Then in a couple of minutes withdraw the coiled tubing, allowing the lead-weight to retain the end of it inside the solution at the bottom of the measure, and simultaneously introduce the œsophageal tube into the patient's stomach. The solution being thus set in action by the siphon, soon finds its way into the stomach, until the glass measure is empty. Then at once, pinching the tube tightly just above the lead, I take the glass measure from the shelf and place it on the floor; then release my grasp on the tube, and the liquid returns by reversed action into the glass again, bringing with it any fermenting material that the stomach may contain. The operation may be performed once, twice, or three times at each sitting, until the solution returns clear and neutral. I use various solutions, the principal of which are:—1. Half an ounce of dilute sulphuric acid: 2. Two drachms of liquor potassæ permanganatis: 3. Two drachms of dilute nitric acid: or 4. Two drachms of salicylic acid—in either case, made up to a pint with pure water. The sitting is completed with a pint of good spring water. As a rule, after the first few sittings, the operation is performed without any nausea or inconvenience on the part of the patient.

NOTE II.—It has been questioned whether the siphon-tube is sufficient to remove the whole of the contents of the stomach, both solid and liquid. Some of the German writers maintain that liquids only are