whether or not a complaint was made, if the groups were subdivided in terms of the severity of their skin trouble. Most had not the severe, or intractable, type of lesion which is common in skin clinics. However, it is *a priori* probable that if neurotic difficulties contribute directly to the development of acne they would do so in the milder as well as in the more severe types of the condition. A further study is planned to examine these points and to determine whether or not those subjects who observe exacerbations of their lesions in response to stresses differ from those in whom fluctuations in severity appear to be random.

Summary

A study is reported of a comparison between the personalities of students with acne who complained of it, students with acne who did not complain of it, and students free from acne. Personality was assessed by means of the Maudsley personality inventory. There was no significant difference between the mean score of the groups on neuroticism or extraversion.

To complement the psychological test, the number of the students who reported psychological symptoms during the year was ascertained. They were as frequent in the control as in the acne groups.

When a comparison was made between students who reported psychological symptoms and those who did not (regardless of whether or not they had acne), it was found that the group who reported psychological symptoms were significantly higher on neuroticism than the others.

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The National Council for the Care of Old People has compiled a register of research being done in the social and socio-medical fields of old people's welfare. *Old Age: A Register of Social Research* is divided into sections under "Universities"; "Research Institutions"; "Hospital Authorities"; "Old People's Welfare Committees"; and "Other Organizations." The information contained in the booklet is doubly indexed under organizations and subjects. The publishers are the National Corporation for the Care of Old People, Nuffield Lodge, Regent's Park, London N.W.1, and the booklet costs 10s.

Medical Memoranda

Severe Watery Diarrhoea and Potassium Depletion Associated with an Islet-cell Tumour of Pancreas

Verner and Morrison (1958) reported the association, in two patients, of severe watery diarrhoea, renal failure, and islet-cell tumours of the pancreas, and drew attention to seven other cases in the literature. The purpose of this paper is to report a further case that showed certain unusual features.

CASE REPORT

Six months after an operation for appendicitis in 1951, and coinciding with an emotional disturbance, this 19-year-old woman developed watery diarrhoea with six to eight stools daily, accompanied by much flatus. Investigation revealed no pathogens in the stool and no blood or excess fat. Sigmoidoscopy and a barium-enema examination showed nothing abnormal. A fractional test meal showed a low acid curve with a poor response to histamine. A provisional diagnosis of ulcerative colitis was made, and a course of tetracycline and dilute hydrochloric acid given. The diarrhoea decreased but did not disappear.

The patient was not seen again until 1956, when she returned with an exacerbation of diarrhoea. During the intervening years she had had continuous but variable watery diarrhoea and had never passed a formed stool. She had married, and during two pregnancies there was a marked reduction in the severity of the diarrhoea. On this admission a course of phthalylsulphathiazole and cortisone failed to influence the symptoms.

A further exacerbation of diarrhoea associated with abdominal cramps and vomiting occurred in January, 1957, and the patient was readmitted for investigation. An unexplained polymorphonuclear leucocytosis of 95% of 35,000/c.mm. was discovered, with hypokalaemia, the serum potassium being 2.2 mEq/l. (11 mg./100 ml.). A barium follow-through suggested some narrowing of the terminal ileum, and the possibility of Crohn's disease was considered. The large volume of the stools was noted for the first time. Prednisolone, 5 mg. t.d.s., and potassium supplements were given, but the bowel symptoms remained unchanged until June, 1957, when she was again pregnant, and for two months the diarrhoea decreased in severity.

When next seen, in January, 1959, there was further diarrhoea with colic and vomiting; muscle weakness was marked, and she experienced severe thirst, drinking up to 10 pints (4.5 litres) of water daily. Examination revealed some wasting of the musculature and generalized weakness with sluggish tendon reflexes; the abdomen was not distended. There were no other abnormal signs. Investigation showed Hb, 115%; W.B.C., 23,300/c.mm. (polymorphonuclears 79%). Serum electrolytes revealed a hypokalaemic acidosis, 2.1 mEq/l. (see Chart). An electrocardiograph showed ST and T wave changes compatible with hypokalaemia. Variable proteinuria was present, but the urine deposit was normal and the blood urea 40 mg./100 ml. Barium follow-through and enema examinations showed only dilated bowel and a normal rate of passage; no abnormality of small-intestinal mucosal pattern was seen. Sigmoidoscopy showed nothing abnormal. Oral potassium supplements relieved the muscle weakness and the serum potassium rose (see Chart). Severe tetany then developed, unrelieved by intravenous calcium gluconate or by breathing 5% carbon dioxide and oxygen.

The serum calcium level was then 5.6 mEq/l. and the potassium 3.1 mEq/l. Attempts to relieve the acidosis by oral sodium bicarbonate or lactate caused further tetany, which was controlled only by decreasing the potassium supplements.

Glucose absorption was normal; fat and protein adsorption were studied, using radioactive iodine-labelled triolein and albumin. Both gave similar results, with an excretion of 8.4 and 8.9% of the administered dose in 72 hours. The upper limit of normal excretion in these tests is 5%. Daily stool volumes remained large, varying up to 3 litres daily (see Chart). Surgical exploration was therefore advised, and a laparotomy was preceded by intravenous therapy. Despite potassium 120 mEq ($\equiv$ 13.25 g. KCl) daily intravenously and 160 mEq ($\equiv$ 17.6 g. KCl) orally, the serum potassium level remained at 3.2 mEq/l. At operation the stomach and duodenum were normal; the small and large intestine were dilated and filled with fluid, but otherwise normal. The kidneys,

Chart showing details of case. Hatched area: Cortisone 25 mg. twice daily, 9 α fluorhydrocortisone 0.1 mg. three times a day. Stippled area: Chorionic gonadotrophin, ethisterone 50 mg. daily, stilboestrol 1 mg. twice daily.

liver, spleen, and pancreas showed no abnormality. A biopsy of the ileum was normal and a renal biopsy showed a mild vacuolar nephropathy compatible with hypokalaemia.

Post-operatively the diarrhoea was unchanged, being uninfluenced by treatment with fluorhydrocortisone and cortisone. Later oestradiol, progesterone, and chorionic gonadotrophin were given without success, in an attempt to simulate the hormonal changes of pregnancy. An episode of severe mental confusion with euphoria and later depression was associated with a decrease in stool volume. The patient was discharged home, but, after a collapse, was readmitted with severe abdominal pain, vomiting, and signs of peritonitis. She failed to respond to resuscitation, and died on May 20, 1959.

Post-mortem examination disclosed a fibrous band causing small-intestinal obstruction with gangrene of the bowel wall and peritonitis. The stomach and the remaining small bowel were healthy. A 2-cm. encapsulated adenoma was found in the head of the pancreas. The tumour was not apparent on external examination before the pancreas was sectioned. Histological examination revealed an islet-cell tumour with no invasion of surrounding structures. Special stains failed to show whether the tumour cells were of alpha or beta type. No adenomata were present in the pituitary or other endocrine glands.

DISCUSSION

Since the reports of Zollinger and Ellison (1955) and of Ellison (1956) describing the association between

islet-cell adenomata of the pancreas and peptic ulceration, it has been noted that, in some patients, severe watery diarrhoea may be a feature (Donaldson *et al.*, 1957). Steatorrhoea may be present in association with ulcerogenic tumours of the pancreas. Maynard and Point (1958) have demonstrated that the excessive gastric secretion of hydrochloric acid results in a lowered pH value in the upper intestine, which may inhibit the action of pancreatic and intestinal lipases, thus causing steatorrhoea. Donaldson *et al.* (1957) noted that continuous gastric aspiration reduced the severity of the diarrhoea but gave rise to severe tetany in their patient.

The case reported above presented with a history of watery diarrhoea for eight years, yet at no time was peptic ulceration a feature. Hydrochloric acid secretion and the histamine response were poor. The later symptoms of electrolyte depletion, acidosis, and tetany were attributable to the massive intestinal electrolyte losses. The development of tetany during the correction of hypokalaemia in renal acidosis has been reported, but the mechanism remains obscure (Fourman and McCance, 1955). The remissions during three pregnancies are unexplained and could not be reproduced by oral treatment with oestrogens and progesterone; but they may result from pituitary influence on pancreatic islet-cell secretions. The association of multiple endocrine tumours with gastric hypersecretion has been noted in 6 out of 21 reported cases of ulcerogenic pancreatic tumours, and may indicate a primary pituitary abnormality (Donaldson *et al.*, 1957).

The above case illustrates the difficulty of diagnosis even at laparotomy unless the cause is suspected. The pancreas both at laparotomy and at post-mortem examination appeared normal externally. Only on cutting the organ was the adenoma in the head disclosed. Unless the tumour is visible on inspection the chances of relief by resection of half of the body and tail of the pancreas seem to be poor: in seven reported patients, where the site of the tumour was stated, the adenoma was found either in the head or the body of the pancreas, or in both.

The prominent features throughout the course of this case were the large volumes of stool yet small number of daily bowel actions over a period of eight years. Despite these large electrolyte losses, nutrition remained good and tests of intestinal adsorption of glucose were normal, while radioactive labelled fat and albumin gave results just above the normal range, suggesting that the defect in this patient was mainly confined to the failure to reabsorb water and electrolytes.

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