

with it by secreting a corresponding amount of its alkaline juice, but the over-stimulation of the gland leads to degenerative changes, which are indicated by a marked pancreatic reaction in the urine, and eventually these bring about a diminished secretion. If the hyperchlorhydria continues it will cause an abnormally acid condition of the intestinal contents and so interfere with the activity of any pancreatic ferments that may be present, for these are quickly destroyed by free mineral acids, so that pancreatic insufficiency is again brought about but in an altogether different way. In either case the only certain way to diagnose the cause of the condition is by the administration of a test meal. Walko investigated the gastric functions of 16 cases of chronic pancreatitis in this way and found achlorhydria in eight, hyperchlorhydria in three, and a normal condition in five. He points out the danger of confusing chronic pancreatitis in which there is an epigastric tumour, achlorhydria, and cachexia with malignant disease, and particularly cancer of the stomach. It is obviously useless to treat the pancreas in cases of pancreatic insufficiency due either to achlorhydria or hyperchlorhydria. In the former condition the gland may be stimulated by the administration of secretin artificially prepared or more simply by the use of acid drinks, or dilute hydrochloric acid an hour after food. In hyperchlorhydria the excess of acid may be neutralised by alkalis after meals, or its formation may be prevented by the administration of oil before meals or of hydrogen peroxide each morning fasting.

2. I have already mentioned the part that the bile takes as an adjuvant in the digestion and absorption of fats, but it also appears to exert a very material influence on the digestion of proteids. It is therefore very necessary for satisfactory digestion that bile should be present in the intestine, and its absence is often a contributory factor in the production of pancreatic insufficiency. This is an additional reason why any cause of biliary obstruction should be removed as soon as possible, or failing that the bile should be enabled to reach the intestine by a cholecystenterostomy. In cases where for any reason operation is inadvisable, or is refused, the deficiency of bile may be made up by its administration in keratin capsules.

3. Another important adjuvant to the digestive action of the pancreatic juice is enterokinase, a ferment present in the succus entericus, which has the power of augmenting the activity of the pancreatic ferments, and more particularly the proteolytic, to a striking degree. This "ferment of ferments" is secreted by the intestinal mucous membrane, chiefly in the duodenum, apparently through the stimulus afforded by the pancreatic juice. In certain diseases of the intestine it is probable that its formation is interfered with, and there may consequently be defective pancreatic digestion, not from true pancreatic insufficiency but from a lack of the activating ferment. The diagnosis of such a condition is not easy, and its presence can only be inferred when an analysis of the fæces reveals imperfect digestion, particularly of proteids, and there is no evidence of pancreatic disease or true pancreatic insufficiency. The only possible treatment is to improve the condition of the intestine and to give enterokinase artificially prepared from healthy mucous membrane.

4. The fourth variety of pancreatic insufficiency is the true form in which, owing to lesions of pancreas or obstruction of the ducts, there is imperfect digestion from diminution or absence of the pancreatic ferments. This is seen in advanced cases of cirrhosis of the pancreas, in some cases of pancreatic calculi and cysts, in cancer of the pancreas, particularly of the head of the gland, and in occlusion of the ampulla of Vater by gall-stones, growths, or stricture. In cases where there is mechanical interference with the flow of pancreatic juice into the intestine surgery is obviously the first indication, but in some removal of the obstruction is impossible or inadvisable, and in others so much damage has been done to the pancreas that it is unable to fully regain its functions. In these circumstances the natural functions of the gland must be augmented or replaced by the administration of artificial ferments and the selection of easily digested and assimilated foods. Where there is an associated disease of the intestine and the activation of the pancreatic ferments is problematical, it is wise to combine enterokinase with the dose of pancreatic extract.

The diet in all cases of pancreatic insufficiency must be selected with care. A loss or marked diminution in the amount of the pancreatic ferments seriously interferes with metabolism, even when there is partial compensation by the

use of artificial preparations, but much may be done to mitigate this if the physiology of digestion and the results of experiments on animals deprived of their pancreas are borne in mind. It is advisable that the diet should contain a considerable proportion of milk and that other fats should be emulsified by the addition of desiccated bile or soaps. Solid fats, particularly those with a high melting point, should be avoided, as they are liable to undergo chemical changes in the intestine with the formation of irritating by-products and consequently give rise to discomfort. If the functions of the stomach are being carried out satisfactorily a considerable amount of proteid may be digested both in the stomach and upper part of the intestine, where the action of the gastric secretion will continue owing to the absence of the pancreatic juice, but even then less than half the albumin of the food is absorbed. Proteids which are digested with difficulty, such as pork, white of boiled egg, &c., must be excluded from the diet. The most useful proteid in cases of pancreatic insufficiency is casein. It may be used in all cases, whether the stomach is functioning normally or not, for it alone among the proteids appears to be broken down without any preliminary preparation by the ferment erepsin discovered by Cohnheim in the succus entericus. It may be given in the form of milk, or in larger quantities as one of the artificially prepared powders, biscuits, &c., which are now so numerous. In cases of pancreatic insufficiency the carbohydrate intake should be limited and should consist mainly of sugars and pre-digested starches which will be rapidly absorbed. Even these must be given with caution, however, for although they make no call upon the external digestive secretions of the pancreas they may readily over-tax its internal metabolic functions and give rise to alimentary glycosuria. The maximum amount that can be safely taken by each patient can only be learnt by experiment, and when this is found it is advisable that the diet should be arranged to contain slightly less. In cases where cane-sugar or dextrose is not well borne it is often found that lævulose can be assimilated with comparative ease. It is most important that in every case of pancreatic disease, and more especially in the chronic forms of pancreatitis, the possibility of alimentary glycosuria, and subsequently of frank diabetes, should be remembered and that the urine should be tested from time to time. The onset may be long delayed, eight or ten years in some cases that I have had under my observation, but once it is established the treatment can only be palliative. The better plan is to prevent such a serious complication by the diagnosis and rational treatment of the pancreatic disease in the early stages before serious and irreparable injury has been done to the gland.

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GANGRENOUS PANCREATITIS; OPERATION; RECOVERY.

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THE patient is 51 years old, and the history of the case, nearly in his own words, is as follows. His letter is dated April, 1909. "For the past two or three years I have been subject to a sort of spasm which would seize me quite suddenly. It would begin with flatulence and severe pain in the stomach, accompanied by vomiting. This would last from two to eight hours or longer. In a day or two I was apparently all right again. Towards the end of 1907 I had very frequent attacks, especially at the end of December and in

January and February. On March 1st, 1908, I was seized in London, on March 3rd in Brussels, and again on March 6th in London. I came home—i.e., to Cheshire—much shaken by these frequent attacks. I tried X rays, but radiographs gave poor or no results. I was better after a rest and change till April 27th, 1908, when about 5.30 P.M. I was suddenly taken ill, racked in pain and vomiting. Morphia was injected repeatedly, but with little benefit, and I was brought home on May 1st racked in pain night and day." With some verbal alterations and condensation the foregoing is the patient's report of himself.

On May 19th, 1908, he was seen by the writer in consultation with Mr. Luckman. Unfortunately, no detailed notes of the case have been preserved, but the patient was very ill with severe abdominal symptoms. In the epigastrium was a round tense swelling as large as a coconut. He was removed to the Altrincham Hospital the next day under the care of Mr. Luckman, and the writer (G. A. Wright) was asked to undertake the operation. The abdomen was opened in the middle line above the umbilicus. Many extensive patches of "fat necrosis" were at once apparent all over the great omentum. The swelling was found to be a tense cyst bulging forward between the stomach and the transverse colon. The cyst wall was laid bare by scratching through the omentum and the fluid was drawn off by a syringe. The fluid was turbid, brown, and flocculent, and in amount was probably more than a pint. The opening was then enlarged and a finger passed into a ragged cavity in the position of the pancreas. From this cavity masses of loose slough of pancreatic tissue were removed. The largest piece would be of the size of the last joint of an ordinary adult thumb, and in all the amount of necrotic tissue removed must have been fully equivalent to the bulk of a third of a normal pancreas. A large rubber drainage-tube was inserted into the cavity after all the large sloughs had been extracted. The wound was partially closed and the patient sent back to bed. After the operation the patient was very ill for some weeks and there was a profuse discharge of fluid and several masses of necrotic fat came away. However, he steadily progressed and left the hospital on July 4th.

The amount of discharge from July 4th to Nov. 17th, when the tube was finally removed, varied from about 2 oz. to about 17 oz. per day. It then rapidly diminished. While in hospital the amount varied from 6 oz. to 16 oz. During his stay in the hospital sloughs continued to come away from time to time until June 19th. Soon after his admission on May 20th his temperature was 99.6° F., pulse 103, and respirations 20. Afterwards the temperature was erratic, with a usual diurnal range from 97.5° to 99.5°. The highest recorded temperature was 101.2° a month after admission. The pulse remained rapid throughout and was seldom below 105, while it often reached 120–130 even up to the time of his discharge.

The wound was regularly washed out, and this, with injections of strychnine, aperients, and careful dieting, make up the sum of his treatment.

The urine on admission was of specific gravity 1020 and contained no sugar or albumin. Examination of the fluid from the tube on June 1st was made by Dr. A. Sellers at the Public Health Laboratory, Manchester. He reports:—

The fluid sent for examination was turbid, dirty brownish in colour, with a strongly putrefactive odour, and showed a brownish loose sediment. The sediment by centrifugalisation contained granular matter, some acicular crystals and round granular bodies. Nothing was found which could be distinctly recognised as faecal matter. No cholesterin, fat, starch, or blood corpuscles were seen. The fluid was strongly alkaline; specific gravity 1008. It contained mucin and serum albumin, but no globulin or albumoses were found. By suitable methods tyrosine could be demonstrated to be present. Attempts to prove the presence of pancreatic ferments gave a negative result. The precise origin of the fluid is not clear. It may possibly have been derived from an old pancreatic cyst.

On July 2nd the report as to fluid states:—

The fluid was opaque, pale yellow in colour, and had a foul odour. It became clear on filtering through a Chamberland filter, but was not completely cleared either by centrifugalisation or after passing through an ordinary filter. Reaction was alkaline, but not very strongly; specific gravity 1014. It contained albumin, some albumose and peptone, a small quantity of fat, and also leucine and tyrosine. No bile reaction could be obtained. The sediment obtained by centrifugalisation consisted of granular matter, crystals of fatty acids, and some imperfect crystals which appeared to be hæmatoidin. Nothing was found which could be clearly recognised as faecal matter. The fluid had a distinct amyolytic action when treated with starch; it had also a slight proteolytic action on fibrin.

On examination (July 2nd) the report was:—

The faeces were semifluid and yellowish in colour; bile pigment was

present. Microscopically they contained granular matter, crystals of fatty acids, a few fat globules, and some undigested food particles. The amount of undigested food was not large and consisted chiefly of striped muscle. No starch was found. A chemical examination gave the following results: Water, 87.5 per cent.; free fat, 1.4 per cent.; combined fat, 1.9 per cent.; total fat, 3.3 per cent.; non-fatty acids, 9.18 per cent. The faeces have not therefore the characters found in cases of complete pancreatic obstruction.

After his return home the patient reported to me the daily record of the amount of discharge as varying from 2 oz. to 17 oz. On April 7th, 1909, he wrote: "I take ordinary diet, feel no ill effects after meals, and enjoy my food."

There seems no doubt that this was an example of acute or subacute gangrenous pancreatitis, in which a large part of the gland was destroyed, though it is clear from the report that sufficient gland substance survived to keep the man going, and that one or other of the ducts remained patent and in connexion with acting gland. Recoveries from such a condition are not so frequent as to be unworthy of record.

I am much indebted to Mr. Luckman for the opportunity he gave me of being associated with him in dealing with such an unusual form of disease, and for the facilities which he and his colleagues at the Altrincham Hospital afforded for the management of the case. To Mr. Luckman and to the devoted care of the matron, Miss Symonds, the patient owes the greater part of his gratitude, and to them and to Dr. Sellers I owe most of the observations on which this report is founded.

In November, 1910, Mr. Luckman wrote: "It was at Christmas, 1907, that I first attended the patient for what appeared to be biliary colic—i.e., severe pain below and to the right of the ensiform cartilage. Vomiting and collapse were present, but this passed off in a day or two. There was a history of the passage of gall-stones some seventeen years previously. In one of the more recent attacks there was a little jaundice. The stools were carefully sieved, but no stones were found. The epigastric swelling appeared gradually. The patient's usual weight before his illness was 14 st. 10 lb.; it went down to 10 st., and now (November, 1910) it is 15 st. 7 lb., and he is enjoying good health."

Taking Mr. Luckman's account into consideration, there seems little reason to doubt that calculous cholecystitis had existed for a long time, and that either as a result of extension of inflammation from the common bile-duct to the pancreatic duct, or possibly of the presence of a calculus in the ampulla of Vater, an acute pancreatitis was set up. Whether this was hæmorrhagic or not it is impossible to say, but it was sufficiently severe to cut off the blood-supply of the gland and to cause gangrene. It would be interesting to know how much pancreatic tissue remains and the route by which the secretion reaches the bowel.

TOBACCO DYSPPNEA.

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IN these days of almost universal tobacco smoking it is as well to bear in mind—as the following case will show—that an alarming condition of dysppnea may attend the unconscious abuse of the drug; and though the person or persons so affected by it may not admit its extravagant use, yet on careful inquiry it may be found that, by reason of the particular materials employed in the indulgence of the habit, such persons are really using the drug to an excessive and even poisonous extent. I say "person or persons" because in my own experience at home and abroad as a moderate smoker for about 30 years, though I have met with many cases of tachycardia, I cannot remember a case presenting such features as this particular one. Very probably others in this country may have seen numerous cases of this sort, and the condition may be quite familiar to them; but to those who lack such experience it may not be out of place to bring this particular case to their notice.

The patient, aged 54, married, consulted me on Oct. 19th, 1910, complaining of dysppnea of long standing, much aggravated on going upstairs or on hurried walking. He described his dysppnea as a difficulty in drawing a full breath and a frequent necessity to do so. He looked quite healthy and robust, and certainly did not give one the idea of cardiac disease. He had acute bronchitis many years ago, which through carelessness and neglect lapsed into a