uncommon in rural areas. Consanguinity was not admitted in any case. However, the tendency of farming or village populations to marry locally may be of importance.

This apparently high incidence in a rural population, if confirmed by a larger survey, would be additional evidence of a recessive genetic factor in the transmission of persistent ductus, and perhaps of congenital heart disease in general.

Summary and Conclusions

Details of four siblings with congenital heart disease are presented.

They include three cases with persistent ductus and one with cyanotic heart disease.

The aetiology of congenital heart disease is discussed and evidence indicating the importance of a genetic factor is presented.

Addendum.—Since this paper was sent for publication the diagnosis of persistent ductus in the boy aged 11 has been confirmed at operation.

REFERENCES

- Abbott, M. E. (1927). In Osler's *Modern Medicine*, 3rd ed., 4, 612.
Brown, J. W. (1939). *Congenital Heart Disease*. London.
Campbell, M. (1949). *Quart. J. Med.*, 18, 379.
Gregg, N. M. (1941). *Trans. ophthal. Soc. Aust.*, 3, 35.
Hale, F. (1935). *Amer. J. Ophthal.*, 18, 1087.
Swan, C., Tostevin, A. L., Moore, B., Mayo, H., and Black, G. H. B. (1943). *Med. J. Aust.*, 2, 201.
Taussig, H. B. (1947). *Congenital Malformations of the Heart*. Commonwealth Fund, London.
Walker, G. C., and Ellis, L. B. (1940-1). *Proc. New Engl. Heart Ass.*, p. 26.
Warkany, J. (1944). *J. Pediat.*, 25, 476.

PANCREATICO-DUODENECTOMY FOR RELAPSING PANCREATITIS

BY

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The following case is reported as an example of the excellent result which may be obtained in relapsing acute pancreatitis following a pancreatico-duodenectomy. Although such a result does not help to elucidate the problem of the aetiology of this disease, freedom from further attacks should follow that operation. However, it is not denied that excellent results, either temporary or permanent, may also sometimes be obtained by the use of splanchnectomy, choledochoduodenostomy, etc.

For a variety of reasons a number of surgical measures have been proposed for the treatment of relapsing pancreatitis. These include cholecystectomy and choledochostomy (Mowat, 1951); choledochoduodenostomy (Burt, 1953); choledochojejunostomy with total diversion of the bile (Barclay, 1950); splanchnectomy, unilateral (Mallet-Guy and de Beaujeu, 1950) or bilateral (Connolly and Richards, 1950); subtotal gastrectomy, to cut off the secretin mechanism (Richman and Colp, 1950); sphincterotomy (Doubilet and Mulholland, 1948); and pancreatico-duodenectomy (Cattell and Warren, 1952). There is no doubt that pancreatico-duodenectomy would be the accepted method of treatment in cases with demoralizing pain if it were not for the magnitude of the operation and the risks it entails. Nevertheless, whatever operation is performed it should allow the pancreas and other abdominal viscera to be explored. It is especially important to determine whether or not the gall-bladder and common bile duct are normal.

According to Horton (1950) the first successful pancreatico-duodenectomy for pancreatitis was carried out in 1944 by Clagett. Horton was of the opinion that pancreatitis should be treated by pancreatico-duodenectomy only in most exceptional cases. On the other hand, in 1952 Cattell and Warren concluded that of the procedures they had used pancreatico-duodenectomy had given the best results, and they considered it the current method of choice in the treatment of relapsing pancreatitis.

Case Report

A man aged 40 was referred to me by Dr. R. Jennaway and was admitted to Sydney Hospital on May 23, 1953. For 18 months he had complained of attacks of epigastric pain, often extremely severe and sometimes lasting for 24 hours, but not related to meals. The pain extended to both sides of the abdomen and was only partly relieved by morphine. Rarely, it radiated to the back. At first the attacks occurred every two to three weeks, but for the previous three months attacks occurred every two or three days. On a few occasions vomiting accompanied the pain. Between the attacks his appetite had been good. He had never been jaundiced, and Graham's test showed no abnormality in March, 1952. On February 10, 1953, laparotomy revealed an enlarged indurated head of the pancreas, and the surgeon considered this to be malignant. Other viscera, including the biliary tract, appeared normal, and there was no evidence of any metastasis. Three days later during a severe attack of pain the urinary diastase level was 100 units. Despite the severity of the attacks of pain there was no evidence of alcoholism or drug addiction.

On May 23 his general condition was still good despite the loss of 2 stone (12.7 kg.) in weight during the previous three months, and examination of the abdomen showed no abnormality. His serum bilirubin level was 0.1 mg. per 100 ml. On May 26 a barium-meal examination showed that the stomach was empty in four hours. A deformity with some constriction of the second part of the duodenum was present, and this was producing a mild partial obstruction. (Similar appearances have been reported by Cattell and Warren (1952) in relapsing pancreatitis.)

On May 28 a pancreatico-duodenectomy was performed. Through an upper midline incision the pancreas was palpated and the replacement of its head and body by a hard irregular mass was confirmed, but the consistency of this mass was not uniform. The terminal portion of the tail of the pancreas appeared normal. The mucosa of the duodenum was intact though slightly hypertrophic, and no obstruction of the lumen of the duodenum was demonstrable. The biliary tract and liver appeared normal. There were a few small soft lymph nodes along the upper border of the pancreas, but no definite metastasis was detected.

The peritoneum to the right of the second part of the duodenum was incised, the stomach was divided immediately proximal to the pylorus, and the supraduodenal portion of the common bile duct was divided. The duodenum, together with the head and the body of the pancreas, was dissected free from the superior mesenteric vessels and other structures, and the tail of the pancreas was divided through what appeared to be normal pancreatic tissue about an inch (2.5 cm.) to the right of the hilum of the spleen. Reconstruction was then carried out in the order shown in the diagram. The end of the jejunum was closed about a small tube and was sutured to the peritoneum at the upper end of the abdominal wound. The inner end of this tube (which contained several holes) was passed down the jejunum and into the common bile duct, while its outer end was brought out through the wound. The anastomosis between the common bile duct and the jejunum was made with an outer interrupted layer of cotton sutures and an inner continuous layer of 00 catgut. The cut end of the remnant of the pancreas was fixed into an incision in the side of the jejunum with two layers of interrupted cotton sutures. No

tube was inserted into the pancreatic duct, which did not appear to be dilated. The severed end of the stomach was anastomosed end to side to the jejunum with an outer interrupted layer of cotton sutures and two continuous inner layers of 00 catgut. A drainage tube was inserted down to the area from which the head of the pancreas had been removed.

The pathologist (Dr. L. R. Finlay-Jones) reported that the excised specimen consisted of a segment of duodenum

Diagram showing the order of reconstruction after pancreatoduodenectomy. The remnant of the pancreas was implanted end to side in the jejunum between the common bile duct (CBD) and the stomach. The end of the jejunum was closed around a tube and then fixed to the parietal peritoneum (P).

15 cm. long and 3 cm. in diameter, attached to which was a hard irregular piece of pancreas 8.5 cm. long and 5 cm. in diameter, and containing a cyst about 1.5 cm. in diameter. The ampulla of Vater and the main pancreatic duct were patent. Microscopical examination showed that the pancreatic parenchyma was traversed by bands of cellular scar tissue and granulation tissue. There were collections of inflammatory infiltrate consisting of eosinophils, plasma cells, and polymorphs; and pigment-containing histiocytes were conspicuous in many regions. The muscle coat of the attached duodenum showed similar inflammatory changes. The appearances were consistent with recent attacks of pancreatitis. No evidence of carcinoma was found.

For the first 48 hours after operation the stomach was aspirated, and at the same time 4% glucose in N/5 saline was given intravenously. Thereafter the diet was increased gradually. Only a few ounces of bile a day drained from the tube in the common bile duct. This tube was removed after eight days, and the wound was healed within a further five days.

On June 19 the serum bilirubin level was 0.5 mg. per 100 ml. and a glucose-tolerance test gave readings of 98, 105, 128, 117, and 120 mg. per 100 ml.; there was no glycosuria. On June 24 the dried faeces contained total fat 57% (unsplit fat 42%, split fat 15%); and the urinary diastase level was 5 units.

Convalescence was uneventful. The patient was discharged home on June 27 with the wound healed, and has remained symptom-free. He resumed work as a mechanic on July 13.

Discussion

Prior to operation the lack of jaundice, the recurrent attacks of severe abdominal pain, the well-being of the patient, and the elevated urinary diastase during an attack of pain all suggested a diagnosis of relapsing acute pancreatitis rather than carcinoma of the pancreas. At operation the small areas of calcification, which incidentally had not been shown by radiography, the lack of uniform hardness of the gland, and the absence of metastases were also in keeping with the former diagnosis.

Pain is a frequent accompaniment of carcinoma of the pancreas, but it is not usually in the form of intermittent severe attacks. Also, the urinary diastase level is rarely

more than slightly raised in the presence of a carcinoma of the pancreas. In this case the destruction of the pancreas had not been extreme and had not led to diabetes or to steatorrhoea. Even after operation no insulin or pancreatin had been required.

Biopsy of the mass in the pancreas was not performed, and is probably never indicated. There is always the doubt whether the portions selected for examination are representative; and biopsy may be followed by dissemination of malignant cells or a pancreatic fistula may develop.

Although the mucosa of the pyloric antrum was retained, its resection may be advisable, as the chance of jejunal ulceration would then be reduced. However, this patient has had the good fortune not to develop that or any other complication.

Because of the high operative mortality rate and the high recurrence rate doubt has been thrown on the possibility of cure of carcinoma of the pancreas by pancreatotomy (Cattell and Pyrtek, 1949). It is, however, reasonable to assume that the mortality rate for pancreatoduodenectomy will be much less in relapsing pancreatitis than in patients with carcinoma of the pancreas, and it may be concluded that pancreatoduodenectomy has a place in the treatment of relapsing pancreatitis whenever there is any doubt about the coexistence of a carcinoma or when the condition has failed to respond satisfactorily to other methods of treatment.

REFERENCES

- Barclay, S. (1950). *N.Z. med. J.*, **49**, 419.
Burt, L. I. (1953). *Med. J. Aust.*, **1**, 805.
Cattell, R. B., and Pyrtek, L. J. (1949). *Ann. Surg.*, **129**, 840.
— and Warren, K. W. (1952). *Gastroenterology*, **20**, 1.
Connolly, J. E., and Richards, V. (1950). *Ann. Surg.*, **131**, 58.
Doubilet, H., and Mulholland, J. H. (1948). *Ibid.*, **128**, 609.
Horton, R. E. (1950). In *Medical Annual*, edited by Sir Henry Tidy and A. Rendle Short, p. 218. Bristol.
Mallet-Guy, P., and de Beaujeu, M. J. (1950). *Arch. Surg., Chicago*, **60**, 233.
Mowat, J. K. (1951). *Med. J. Aust.*, **1**, 824.
Richman, A., and Colp, R. (1950). *Ann. Surg.*, **131**, 145.

PANCREATICO-DUODENECTOMY OPERATION ON TWO ELDERLY PATIENTS

BY

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The two patients with carcinoma of the head of the pancreas detailed below may be regarded as rather elderly to undergo pancreatoduodenectomy. They were aged 67 and 70 years, and their rapid recovery demonstrates that age alone is no bar to the performance of this operation in patients otherwise suitable. The second case has the additional interest that a subtotal gastric resection for haematemesis had been carried out six months earlier.

Case 1

A woman aged 67, with a four-weeks history of jaundice varying in intensity, had a dull pain deep in the right hypochondrium but no colic; no vomiting; anorexia. She enjoyed fatty food and had had no dyspepsia prior to the onset of jaundice. She had noticed that the stools were pale and the urine was dark in colour. There was no loss of weight. Appendicectomy had been performed in 1917.

On examination a moderately obese woman, deeply jaundiced but otherwise apparently well, was seen. Her blood pressure was 196/90, Hb 95%. Her heart was slightly enlarged; the respiratory system was normal. The abdomen was well covered; there was no tenderness or guarding. The liver was just palpable below the costal margin; the gall-bladder was tense and distended. A diagnosis of carcinoma of the head of the pancreas was made.

Operation.—On May 5, 1952, under general anaesthesia, the abdomen was explored through a right paramedian