CHRONIC RECURRENT PANCREATITIS

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Chronic recurrent pancreatitis, also known as chronic relapsing pancreatitis, has always been a problem of some magnitude for the surgeon. In writing this article we have made an attempt to give a brief summary, from a practical point of view, of the anatomical and physiological background of the problem; to describe some of the many and varied approaches to the problem; and to formulate a new approach, which, we hope, may lead to further discussion and research.

Anatomy

The pancreas consists of a head and neck, with the uncinate process lying in front of the second lumbar vertebra, and the body and tail extending to the hilum of the spleen.

The following arteries contribute to the blood supply of the pancreas:

(a) The superior pancreatic artery—a branch of the coeliac axis, or the hepatic artery, or the splenic artery.

(b) The inferior pancreatic artery—a branch of the superior pancreatic artery, or the superior mesenteric artery.

(c) The anterior superior branch of the pancreato-duodenal artery.

(d) The posterior superior pancreato-duodenal artery. Both (c) and (d) are branches of the gastroduodenal artery.

(e) The supraduodenal artery which is also a branch of the gastroduodenal artery.

The principal venous drainage of the pancreas is into the superior mesenteric vein via the termination of the inferior mesenteric veins; though the termination of the left gastric vein, the splenic vein, the right gastro-epiploic vein, the anterior superior pancreatico-duodenal vein, the anterior inferior pancreatico-duodenal vein, the inferior pancreatic vein, the pancreatic caval vein, and through several tributaries directly into the splenic vein. It is noteworthy that no vein enters the anterior surface of the portal vein. The arterial supply to, and venous drainage from, the head and neck are entirely separate from those of the body and tail, thus constituting two separate entities.

The pancreatic duct system is composed of minor tributaries which enter the main duct at a right angle. This duct drains into the ampulla of Vater, and from it an accessory duct, the duct of Santorini, enters the duodenum on its own.

There are four principal variations in the mode of entry of the duct into the duodenum: (1) In 29%, of cases two separate ducts enter the ampulla to form the bile duct and common opening, (2) in 37% both ducts have a common opening which is short, (3) in 30% both ducts have a common opening which is long, and (4) in 2% there is a single opening for the common duct and the pancreatic duct draining into the common duct.

The diameter of the orifice of the ampulla of Vater varies from 1.5 to 4.5 mm., and the average width is 3 mm. The length of the ampulla from the duodenal surface to the tip of the papilla or the summit of the septum varies from 1 to 14 mm. This fact is of importance in regard to the reflux biliary theory as a factor in the causation of pancreatitis.

The musculature of the sphincter itself consists of circular fibres passing round each duct and some passing round both ducts, and Douillet and Mulholland demonstrated a common channel in 48 out of 49 operated cases; in these cases closure of the sphincter would close both ducts.

Histology

The pancreas is divided into lobes and lobules by septa consisting of connective tissue. It is covered on its anterior aspect by the posterior parietal peritoneum, but the gland itself possesses no true capsule. Neural elements arising from the sympathetic and parasympathetic systems traverse the interlobular septa. The functional components of the pancreas consist of two types of cellular elements. One of these is concerned with external secretion, (the excretion of the larger portion of the pancreas) and is arranged structurally in the form of acini consisting of a layer of pyramidal or cuboidal cells surrounding a central lumen which opens into a tributary of the ductal system. The lesser portion of the pancreas is taken up with internal secretion in which the cellular elements are arranged in insular fashion and known as the islands of Langerhans, numbering from 200,000 to 2,000,000 in the human gland. These islands are scattered irregularly throughout the gland and are more numerous in the tail than elsewhere. They are composed of several types of cells mostly containing granules in the cytoplasm. The alpha cells are acidophilic, while the beta cells are basophilic. There is also a group of cells in the islands that contains no granules. Islet cells are arranged in chains, separated by a generous network of capillaries. There is some speculation whether the mature acinar cell, under adequate stimulation, differentiates into an islet cell, thus permitting the number of islet cells to vary in proportion to the demand.

Physiology

The physiology of the pancreas is manifested by two secretions—an external secretion derived from the acinar cells and an internal secretion derived from the islet cells. Dragstedt has impotted to the conclusion that no vein enters the anterior surface of the portal vein. The arterial supply to, and venous drainage from, the head and neck are entirely separate from those of the body and tail, thus constituting two separate entities.

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not excrated. With regard to the internal secretion no further mention need be made of the well-known work of Banting and Best. The question of lipocaic is still under investigation, and we are not prepared at this stage to express a dogmatic view on this subject.

**Aetiology**

Chronic pancreatitis has been recognized for many years, but Comfort and his associates have first described it as a clinical entity in 1946. They described a syndrome characterized by attacks of upper abdominal pain with a variable degree of ascinit and ileal dysfunction followed by certain sequelae. It is now recognized as a separate clinical entity.

Chronic relapsing pancreatitis must be considered as a continuation or progression of acute pancreatitis, either in a mild or severe form—the recurrent attacks ultimately leading to persistent chronic symptoms and permanent physiological disturbance.

Sex. The ratio of male to female patients is 2:1, which rather minimizes gall-bladder disease as a causative factor.

Age. The ages of the 27 cases described by Comfort et al. vary between 10 and 75 years. In a group of 29 cases observed in the Lahey Clinic the ages vary from 20 to 64. We have had a child of 9 years with recurrent pancreatitis and a man of 87 with the same disease.

Obesity, whilst common in acute pancreatitis, is not the rule in the chronic disease, since patients with the chronic disease tend to lose weight rapidly.

Alcohol. It is common to find that chronic alcoholism antedates the history of pancreatitis, and it would be fair to state that chronic alcoholism is a concomitant in between 40-50% of cases in this disease.

**Trauma** is an uncommon but nevertheless definite cause of the disease, and has been reported in 3 out of 38 cases of a series by Cattell and Warren.4

**Disease of the biliary tract.** After a detailed analysis of their clinical material Comfort et al. concluded:

1. Inflammatory disease of the gall bladder was not a requisite of the development of chronic relapsing pancreatitis, and
2. When the pathological processes occurred simultaneously or in association, the preponderance of evidence suggested that the disease of the biliary tract is secondary to the pancreatic disease.

**Common channel.** Doublebit and Mulholland have more recently stated that the reflex of bile through a common pancreatico-biliary channel is primarily responsible for chronic relapsing pancreatitis. Archibald popularized the theory that spasm of the sphincter of Oddi caused reflex of bile into the pancreas and in this way generated the acute disease. Doublebit and Mulholland have found a common channel in most instances, and have also found that spasm of the ampulla of Vater can be induced by the application of dilute hydrochloric acid to the duodenal papilla.

Infection. There is no definite evidence that infection plays a part in the cause of this disease.

**Types of Chronic Pancreatitis**

There are 4 main types of chronic pancreatitis:

1. The diffuse type in which the entire gland is involved. This is often found on exploration of the abdomen.
2. Chronic pancreatitis with multicellular cystic changes.
3. Chronic pancreatitis with pancreatic lithiasis or calcinosis.
4. Localized chronic pancreatitis secondary to trauma. Pancreatic lithiasis represents the final stage in the progression of chronic relapsing pancreatitis.

The pathogenesis of pancreatic lithiasis is unknown, but the precipitating factors appear to be: (a) Obstruction, (b) stagnation, (c) infection (questionable), and (d) fibrosis and autodigestion with fat necrosis.

**Pathology**

Early in the disease the gland is enlarged, firm, and somewhat pale in appearance. The limits of the gland are indistinct and peripancreatic oedema is present. As the disease progresses the pancreas becomes larger and more indurated, and the body and tail lose their prismatic cross-section to become more rounded. The gland becomes fixed to surrounding structures and loses what little motility it had. Adjacent structures may become adherent. Pressure on the portal and superior mesenteric veins may cause portal hypertension, and the veins in the region of the stomach especially are engorged.
unnecessary procedure; (c) alterations in the glucose tolerance occur in approximately 1/3rd of the cases; and (d) fat and meat fibres are found in the stool. This is a most inconstant finding.

10. X-ray Findings
Pancreatic calculi may be demonstrated radiologically, but the principal features are distortions or displacements of adjacent viscera. The duodenal C is widened if the head is enlarged, or large cysts cause pressure deformities of the stomach. The most helpful sign is the presence of calcification in the pancreas, and it must be remembered in the radiological technique to scrutinize the control film carefully for a solitary stone in the region of the ampulla.

COMPLICATIONS
The following complications occur in chronic pancreatitis:
1. Diabetes mellitus, (2) pancreatic cysts, (3) pancreatic abscesses, (4) pancreatic haemorrhage, (5) portal hypertension, (6) biliary cirrhosis, and (7) carcinoma of the pancreas, which supervenes in a small percentage of cases.

1. Indirect methods of treatment
These include:
(a) Biliary tract procedures, i.e. (1) Cholecystectomy-choledochostomy, (2) biliary-intestinal anastomosis, and (3) sphincterotomy.
(b) Gastro-intestinal diversion, i.e. (1) gastro-entero­stomy, (2) pyloric exclusion, and (3) gastrectomy.
(c) Nerve interruption, i.e. (1) Sympathectomy (thoracolum­bar and splanchnicectomy) and (2) vagotomy.

2. Direct methods of treatment
These include: (a) Drainage of cysts, (b) lithotomy, (c) anastomosis (continuity and diversion), and (d) resection (distal pancreatectomy, pancreateoduodenectomy, and total pancreatectomy).

Comment
Cholecystectomy and choledochostomy are only indicated in the presence of biliary disease, and this, as stated earlier, is not a frequent accompaniment of pancreatitis. Biliary intestinal anastomosis may be necessary as a result of the pancreatic disease. It is, however, not of much value in the treatment of the disease.

Sphincterotomy is advised by Doubilet and Mulholland; it is also the procedure adopted by Rodney Smith. These authors report good results, but in our experience only 40% of patients obtain relief by this procedure, which should always be carried out by the transduodenal route. Cattell inserts the long limb of the T-tube into the duodenum, but we have had 2 cases where this produced acute pancreatitis.

Gastro-enterostomy is only indicated in obstruction. This procedure has been considered of value in some quarters because of the diversion of the food and gastric contents. Gastrectomy has been advocated in order to obtain a similar result, but we do not believe that this procedure should be attempted except where there is existing disease of the stomach or duodenum.

Sympathectomy and splanchnicectomy have been advised for relief of pain, and some favourable results have been reported in employing these procedures, but recourse to them should be the last resort since they are only symptomatic methods of treatment.

Vagotomy, in our opinion, is not a worthwhile undertaking. Cysts will require either internal or external drainage. Cattell is still of the opinion that external drainage is the most satisfactory procedure, but we have found that internal drainage, preferably to the stomach, has met with success.

Pancreatic lithotomy is indicated where stones are observed. Some workers have advised ligations of the pancreatic ducts to produce atrophy of the acinar portion of the pancreas, but if this is successful it will produce a chronic state of nutritional deficiency.

Anastomosis of the duct of Wirsung has been advised by Cattell. This procedure does not appear to have any appreciable applicability for the duodenal end of the duct, but is valuable for the distal end where there is obstruction anywhere between the neck and the tail; the procedure is then accomplished by distal pancreatectomy with anastomosis of the remaining portion of the pancreas to the jejunostomy by the Roux-en-Y technique.

Pancreateoduodenectomy may be indicated on rare occasions —usually in association with carcinoma or multiple calculi. The same applies to total pancreatectomy, but the control of diabetes after this operation is difficult, because of the patient's extreme sensitivity to insulin.

RECENT WORK
Having reviewed the position in regard to pancreatitis up to the date when we undertook the project which we are about to describe, we will now deal with the recent work in relation to this disease. This project was commenced in 1951 when we began doing cholangiography. We were impressed with the fact that on many occasions the pancreatic duct was visualized during this procedure. We felt that it was reasonable that if the pancreatic duct could be totally visualized there might be a better understanding of the depressing disease of chronic recurrent pancreatitis.

The first problem was that we had no established normal. At that time (1951) no such procedure had been undertaken and operative pancreatography was totally unknown. The problem was how to approach the pancreatic duct, and it was only with the advent of sphincterotomy in 1953 that we realized that this was the mode of access.

Cases were few and far between and, in 1956 when only 3 cases had been dealt with, an article was published by Doubilet and Mulholland describing a project similar to...
ours. Within a short while they published an evaluation of this work in March 1957.15

Our theory was that chronic relapsing pancreatitis was due, in the main, to causes within the pancreatic duct system, and all our investigations were related to this factor.

We felt that the following information could be obtained by pancreatography:

1. Obstruction at the entrance of the duct at the sphincter of Oddi.
2. Stricture of the pancreatic duct anywhere in its course.
3. The discovery and accurate pin-pointing of pancreatic calculi.
4. The demonstration of ductal ectasia.
5. Cyst formation, either large, small, single, or multiple.
6. The presence of an abnormal duct system.

It was also hoped that this procedure would be of value in demonstrating small tumours of the pancreas, and in demonstrating extrinsic pressure on the pancreatic duct system from outside sources. Furthermore, it was felt that the operation of distal pancreatico-jejunostomy or partial resection of the pancreas, as first described by Aird and Buckwalter16 in 1955, would be indicated after the demonstration of pathology in the duct system as shown in pancreatography.

**Fig. 1.** Visualization of the pancreatic ducts during operative cholangiography.

**Fig. 2.** Operative pancreatogram showing a grossly dilated duct with a terminal cyst.

The abdomen is opened by a Kocher's incision. The gall-bladder and biliary tract are explored, and a cholangiogram is performed on the table. If any disease of the biliary tree is found it is dealt with as required, and the common duct is in any event opened. Thereafter the duodenum is opened and a sphincterotomy is performed, whereby only the musculature of the sphincter is cut through at 12 o'clock, and the musculature of the duodenum is not disturbed.

At this stage the opening of the main pancreatic duct can usually be visualized in its position at 5 o'clock opening at the sphincter of Oddi. If the duct opening is not found in this position, it usually opens 1/2 inch above this into the common duct itself, and can be demonstrated in that position. The duct having been opened, a fine ureteric catheter is passed into it, and 3 c.c. of urografin 60% is introduced into the catheter. X-ray pictures are then taken. It is important at this stage to realize, as we have found from experience, that the maximum capacity of the pancreatic duct system is never more than 3 c.c. If any resistance is therefore met with when the injection is performed, it should be stopped immediately, otherwise the duct will be blown—usually at the terminal end, with the possible establishment of a localized area of pancreatitis.

If a stricture is discovered in the proximal portion of the duct, it is diluted with ureteric dilators, and at the completion of the dilatation a further pancreatogram is done. If the stricture is found in the distal end of the duct, then this together with the distal portion of the gland is resected. If the stricture is more towards the head and neck, then the distal portion of the duct is anastomosed to the jejunum by the Roux-en-Y technique. If calculi are discovered they are dealt with either by removal or by resection, and similarly, any local pathology in the gland itself can be handled according to what is discovered on X-ray.

If no pathology is discovered then the sphincterotomy has acted as a therapeutic procedure for the treatment of the pancreatitis.

The following case reports are of interest in this connection:

**Case 1**

Mr. L., aged 48, was seen on 17 April 1957. His history was that during the war, whilst on active service, he had had several attacks of pain in the abdomen, and an ulcer was diagnosed. He was X-rayed and no ulcer was found, but he was subsequently discharged from the army with the diagnosis of 'gastric trouble'. On the night that we were asked to see him he was a desperately ill man, with a history that 48 hours before this date he had an attack of pain in the left loin and the back, radiating across the upper abdomen. He had vomited incessantly for 36 hours, the pain was constant, and had become progressively worse. His blood pressure was 90/60 mm. Hg, his temperature was 100°F, his pulse rate was 68, his upper abdomen was distended, and the whole abdomen was completely rigid and silent. A diagnosis of acute pancreatitis was made, and he was admitted to the nursing home. At that stage, 48 hours after the commencement of his illness, his serum amylase was 640 Somogyi units, and his white-blood count was 21,000 per c.mm. He was treated conservatively with intravenous fluids and antibiotics, and he gradually improved and was discharged from the nursing home 9 days later. Sixteen days after his discharge from the nursing home he had a recurrence of the same type of pain, and was readmitted to the nursing home. At this stage his serum amylase was 1,600 Somogyi units, and his white-blood count was 9,000 per c.mm. He was treated conservatively again and was discharged from the nursing home approximately 10 days later. At this stage he was not entirely free of symptoms and, because of the persistence of his pain, he was readmitted a week later and operated on. The pancreas was large, swollen...
creatic tissue was found in the duodenum in the region of the ampulla, which was markedly engorged and oedematous. The sphincter was only found with difficulty, and a sphincterotomy was performed. The pancreatic duct was dilated, but the pancreateum was unsatisfactory because of a technical radiological difficulty.

He was returned to the ward, but developed a massive collapse of both lungs the same night. He died 3 days later. Autopsy revealed an extensive collapse of the lungs with bronchopneumonia, a complete fatty infiltration of the liver with a severe degree of interstitial fibrosis. Sections of the kidney showed tubular necrosis. The pancreas was still oedematous and showed evidence of chronic pancreatitis, and the duct itself was thickened and fibrosed and small foci of epithelium were embedded in the duct.

Whilst the literature on this subject is still very small, nevertheless, Pollock in a recent article reported on his experiences in doing 33 pancreatograms on cedavers and 11 on live patients, and he is prepared to condemn this operation. Other writers to date feel as we do that there is a future for this procedure.

CONCLUSION

It is too early at this stage to evaluate results, and the number of cases, viz. 8, is still too small, but we are satisfied that this procedure yields valuable information, and has added fundamental knowledge to a subject about which we are very ignorant. Its use, we are sure, will throw light on what was previously a valley of darkness.

SUMMARY

1. A brief summary is given, from a practical point of view, of the anatomical and physiological background of the problem of chronic recurrent pancreatitis.

2. A summary is given of the wide variety of therapeutic measures at present advocated for this disease.

3. The technique of operative cholangiography and pancreateography is described and 4 case studies are quoted.

4. It is concluded that the procedure described has added fundamental knowledge to a subject about which little definite information is available.

REFERENCES

10. Smith, R.; Personal discussion.