

## THE ROLE OF SURGERY IN THE MANAGEMENT OF PANCREATITIS

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A review of reports on the value of surgical treatment in the management of pancreatitis reveals a striking discrepancy in the results obtained. Many varied surgical procedures have been used and, regardless of aetiology, successful results range from 50 to 90%.<sup>2,7,17,19</sup> Consequently, widely differing opinions are expressed on the indications for operation and on the most suitable type of surgical procedure to be employed.

### *Acute Pancreatitis*

There is not much controversy about the place of surgery in the treatment of acute pancreatitis. It is agreed that immediate surgical intervention during the acute phase is unwise, provided surgical emergencies such as peritonitis and perforation can be excluded. It is also agreed that if such patients are explored to establish a diagnosis, and acute pancreatitis is found, the abdomen should be closed with the minimum of disturbance in the region of the pancreas.<sup>18</sup> There are, however, two debatable issues requiring clarification. These are:

1. *The management of gallstones palpable in the gallbladder at laparotomy during an acute attack.* Recollection of the appalling mortality of acute pancreatitis in the days when immediate cholecystostomy was a fashionable method of treatment, has led to universal condemnation of this procedure and prompted the current common practice of leaving the stones and performing cholecystectomy later.<sup>18</sup> On the other hand, the hazard of leaving stones in the common duct is well recognized and is regarded by some as an indication for choledochotomy.<sup>1</sup>

2. *The treatment of early complications, such as severe haemorrhagic necrosis, suppuration, sloughing or formation of growing collections of fluid.* It is agreed that any of these conditions may be benefited by operation, but differing views are expressed on the timing of surgical intervention and type of procedure to be adopted.

### *Relapsing and Chronic Pancreatitis*

The role of surgery in the management of relapsing and chronic pancreatitis is less clearly defined. In recent years several authors have emphasized the value of surgical treatment.<sup>9,17,19</sup> However, the wide variety of surgical procedures advocated reflects dissatisfaction with the results of many workers.

The value of surgical correction of biliary tract disease is stressed by some,<sup>1,9,15,14</sup> while others have found it less satisfactory and suggest that direct surgical procedures on the pancreas will be necessary in most cases.<sup>8,11,17,19</sup> Doubilet<sup>2-8</sup> and Rodney Smith<sup>15-18</sup> place a great deal of reliance on sphincterotomy, but others have been less satisfied with the procedure.<sup>1,2,9,19</sup> Maingot<sup>11</sup> summed up the situation very well by stating that 'no single operation gives uniformly gratifying results', and Warren and Veidenheimer<sup>19</sup> have recently emphasized that 'the operation must be tailored to the specific pathological condition observed in each patient'. This objective has led Doubilet and Mulholland<sup>8</sup> to advocate a step-by-step programme whereby a number of procedures are performed in succession, depending on the findings. Similarly, Smith<sup>18</sup> recommends 'various more drastic procedures' when it is considered that the disorder is not curable by sphincterotomy.

Further confusion is added by conflicting opinions on the value of medical measures in preventing subsequent attacks and in halting the progress of the disease. Smith<sup>16</sup> has categorically stated that 'medical treatment has very little

place in the management of this disorder', and this has been reiterated by others.<sup>11</sup> Doubilet<sup>2-8</sup> claims excellent results with surgery, but always on condition that the patient avoids alcohol. Boyer and Mackay<sup>2</sup> have recently claimed that the natural history of the relapsing disease may tend towards recovery under a conservative regime.

### *Importance of an Aetiological Diagnosis*

In recent years a number of authors have pointed out that a solution to the problem can only be found if the value of various therapeutic procedures is measured on a basis of aetiology. Boyer and Mackay<sup>2</sup> point out that 'the further understanding of pancreatitis demands that efforts be made to determine the aetiology in every case and the precipitating cause in every attack'. Howard and Ehrlich,<sup>9</sup> who have demonstrated that it is possible to determine the aetiology in  $\frac{2}{3}$  -  $\frac{3}{4}$  of patients, regard an aetiological classification as a prerequisite to the evaluation of surgical therapy. Now Marks and Bank,<sup>12</sup> in an accompanying paper, re-emphasize the importance of establishing an aetiological diagnosis and point out that this was possible in no less than 91% of 243 patients referred to our Gastro-intestinal Service during the past 3 years.

### *Present Series*

It is the purpose of this paper to evaluate the results of surgical treatment in pancreatitis on the basis of aetiology. This has been done by analysing the results of our treatment in the 243 cases of pancreatitis reviewed by Marks and Bank.<sup>12</sup> As indicated by them, these patients have been classified into 4 aetiological groups, viz. alcoholic (61%), biliary (16%), miscellaneous (14%) and unknown (9%). The results of therapy are correlated with the clinicopathological findings in each group, and particular attention has been devoted to the 2 main aetiological subgroups, viz. 'alcoholic' and 'gallstone' pancreatitis, which together accounted for 198 (77%) of the patients.

Altogether 150 operations were performed on 113 of the patients in the series and included a wide variety of procedures (Table I). The most striking feature of our analysis has been the great difference in the results of surgery for 'alcoholic' and for 'gallstone' pancreatitis. In the former

TABLE I. OPERATIONS PERFORMED ON 113 PATIENTS WITH PANCREATITIS

Laparotomy	.....	.....	.....	.....	51
Indirect Procedures	.....	.....	.....	.....	
Gastro-intestinal diversion	.....	.....	.....	.....	7
Cholecystectomy with and without choledochostomy	.....	.....	.....	.....	39
Biliary diversion	.....	.....	.....	.....	6
Splanchnicectomy	.....	.....	.....	.....	2
Direct Procedures	.....	.....	.....	.....	
Drainage of cysts and abscesses	.....	.....	.....	.....	14
Pancreatico-intestinal anastomosis	.....	.....	.....	.....	7
Sphincterotomy	.....	.....	.....	.....	19
Pancreatico-duodenectomy (Whipple)	.....	.....	.....	.....	3
Total pancreatectomy	.....	.....	.....	.....	2
Total	.....	.....	.....	.....	150

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pancreatitis, Doubilet,<sup>2,8</sup> one of the greatest advocates of the operation, claims that 'in 90% of patients the results are considered good'. Although he states that 'the majority of failures are in chronic alcoholic addicts' he does not mention what proportion of his patients belonged to this category. Judging by other reports from the USA<sup>9</sup> the proportion may be anything between 6% and 57%, and it is therefore difficult to evaluate Doubilet's results in 'alcoholic' pancreatitis. One is left with the impression that sphincterotomy fails in all cases of alcoholic pancreatitis unless the patient is kept on 'an alcohol-free and low-fat diet' for a considerable period postoperatively. In 1957 Doubilet defined this period as 6-18 months, in 1958 as 6 months-2 years, and in 1961 as 2-3 years. He also admitted that fat or alcohol would precipitate relapses after 'other operations such as vagotomy, gastrectomy, choledocho-jejunostomy or caudal pancreatectomy'.

The mechanism whereby alcohol causes pancreatitis is not understood. Doubilet<sup>2</sup> claims that 'a normal pancreas does not react deleteriously to fat or alcohol', but that 'after initial injury as a result of reflux of bile, (it) becomes susceptible to the metabolic products of fat or alcohol'. He regards intolerance of fat and alcohol as 'the most common complication of pancreatitis' and claims that if the pancreas is given a chance to regenerate after sphincterotomy and alcohol withdrawal it will no longer respond deleteriously to alcohol.<sup>5</sup> He has indeed demonstrated that the pancreas has remarkable regenerative power, but his premise that both sphincterotomy and alcohol withdrawal are necessary to allow for regeneration with consequent disappearance of alcohol intolerance cannot be accepted without reservation. Firstly, his concept that reflux of bile into the pancreatic duct is in itself harmful and responsible for initiating pancreatitis, is largely discredited.<sup>10</sup> Secondly, several workers<sup>11,12,9</sup> have shown that alcoholic pancreatitis is a distinct entity and not merely a sensitivity reaction of a diseased organ to alcohol. This is confirmed by our own observations.<sup>12</sup> Thirdly, we have found that simple withdrawal of alcohol is just as effective in preventing further attacks as any surgical procedure plus alcohol withdrawal. In this connection the observations of Boyer and Mackay<sup>2</sup> on the natural history of relapsing pancreatitis indicate that if the patient goes into remission for a period of 2 years or more, he may be regarded as 'cured'. On this basis they found that 35% of their patients (an unselected group) were cured on non-surgical therapy. It would appear, therefore, that Doubilet's patients, 'cured' by sphincterotomy and an alcohol-free diet for 2-3 years, might have done equally well on restriction of alcohol alone.

In view of the above observations, we are satisfied that surgery *per se* has very little to offer in the prevention of the relapses of alcoholic pancreatitis, and that these patients should be treated on a medical regime. Implicit in this regime is total abstinence from alcohol, which can be achieved in a considerable proportion of patients.

#### 4. Late Sequelae and Associated Disease

These patients presented in three ways, viz.:

(a) *Recurrence of pain despite complete abstinence from alcohol.* Patients in this category pose a problem mainly because it is difficult to be sure of their alcoholic habits. However, if the pain persists while they are under close observation, and particularly if the sedimentation rate remains elevated, full investigation is indicated, and laparotomy may even be necessary to establish the cause.

Ten of our patients who belonged to this category were operated on. In all of them the pancreas was clearly abnormal. Two had developed pseudocysts which were drained into the stomach, but biopsy of the cyst wall in both cases revealed the presence of unsuspected carcinoma. In 1 patient the pancreas appeared to be infiltrated by carcinoma, but biopsy and follow-up failed to confirm this. In 3 patients there was extensive pancreatic calcification,

but no definite procedure was carried out. In 2 patients with non-calcific pancreatitis, sphincterotomies were performed with some relief. Three patients including 1 of the 3 with pancreatic calcification who had had laparotomies, had associated gastroduodenal disease which was treated by appropriate surgery.

Our findings underline the need for laparotomy in this group of patients, to exclude the possibility of pseudocyst or carcinoma of the pancreas. The importance of biopsy of the wall of the cyst or any suspicious area in the pancreas is illustrated by the discovery of an unsuspected carcinoma in 2 of the patients. In both of them the lesion was in the tail and clearly not responsible for the pancreatitis, which affected the whole organ. It therefore appears that chronic pancreatitis may carry an increased risk of malignant change and that biopsies should be done in all such cases subjected to laparotomy.

The surgical procedure to be carried out will obviously depend on the findings, and if there is no evidence of carcinoma or associated disease, the step-by-step programme advocated by Doubilet and Mulholland<sup>8</sup> is a rational method of dealing with the problem. The first step is an operative cholangiogram. If this demonstrates reflux to the tail of the pancreas without evidence of obstruction, a sphincterotomy is performed. These authors recommend concomitant cholecystectomy, but Rodney Smith<sup>18</sup> points out that this is unnecessary if the gallbladder is normal. If the cholangiogram fails to demonstrate reflux the pancreatic duct should be dilated and 'manipulated', after section of the sphincter, and a pancreatogram should be performed. If the pancreatogram shows no obstruction, nothing further is done unless the duct communicates with a cyst, in which case it should be drained by means of a plastic tube. If the pancreatic duct is obstructed by calculi or stricture, retrograde drainage of the duct is the best procedure. Doubilet and Mulholland<sup>8</sup> recommend 'split pancreatico-jejunostomy', but Rodney Smith<sup>18</sup> prefers distal pancreatectomy and anastomosis of the duct to the stomach. Cysts in the tail beyond an obstructed duct may be treated by 'split' pancreatico-jejunostomy<sup>8</sup> or anastomosis of the cyst to the stomach.

(b) *Persistent jaundice.* Although transient jaundice with bile in the urine was a common finding during acute attacks and relapses, more persistent but mild jaundice associated with a raised alkaline-phosphatase level was present in only 5 patients, and in 2 of them cholecystenterostomy was performed, but this had no effect on the pancreatitis. Gallstones were present in only 3 of the 148 patients; in none of them were the stones of aetiological significance, and cholecystectomy did not alter the course of the disease. One patient who presented with long-standing painless jaundice was treated by pancreaticoduodenectomy (Whipple) because the pancreatic lesion was mistaken for carcinoma, and the result has been excellent.

While severe jaundice in alcoholic pancreatitis may demand surgical intervention to exclude the possibility of carcinoma, ablative surgery should seldom be necessary. Our experience shows that biliary diversion and cholecystectomy are unsatisfactory, and this agrees with the findings of others.<sup>9</sup> Division of a fibrosed sphincter of Oddi will relieve the jaundice and may have a beneficial effect on the pancreatitis, but attacks of pain are very likely to con-



tinue if the patient continues taking alcohol. On the other hand, alcohol withdrawal by itself may lead to a 'cure'. This was well illustrated in one of our patients who was subjected to laparotomy. Operative cholangiography revealed a normal biliary system and no stenosis of the sphincter. Nothing further was done. She continued to have relapses of pain with distinct jaundice until she gave up alcohol, but since then has been completely symptom-free.

(c) *Chronic pain with overt pancreatic insufficiency.* Patients who reach this stage are physical and mental wrecks, and present the most difficult problem; in many of them the clinical picture is further complicated by drug addiction. The pancreas is almost completely destroyed, with gross scarring, disorganized parenchyma and a stricture duct. Calcification and calculi are often present. Indeed, chronic pancreatic pain eventually supervened in many of the 37 patients with calcific alcoholic pancreatitis in our series, and in addition 18 were known diabetics and 14 had clinical steatorrhoea. In the non-calcific group of 111, only 11 were diabetics and only 4 had steatorrhoea.

In our series 7 operations were carried out on 5 patients with calcific pancreatitis who suffered severe pain and had gross pancreatic insufficiency. Sphincterotomy was performed on 1 without relief. Subsequent distal pancreatectomy with retrograde drainage was equally ineffective and finally total pancreatectomy was performed. Splanchnicectomy was performed on 2 occasions with disappointing results. Pancreatico-duodenectomy was performed in 1, but the result was also unsatisfactory, and primary total pancreatectomy was performed in 1.

It is agreed that sphincterotomy and splanchnicectomy usually fail to give relief in these patients.<sup>11,15</sup> Pancreatic resection is the only procedure that can offer any hope of relief, and either distal pancreatectomy or pancreatico-duodenectomy are recommended, depending on the part of the gland which is most seriously disorganized.<sup>18</sup> Total pancreatectomy may be resorted to when the whole gland and its ductal system have been hopelessly compromised, and the pancreas is a useless organ.<sup>11</sup> These resections, however, carry a considerable operative hazard. Smith<sup>15</sup> claims that the late results are uniformly good. It should be remembered, however, that although ablative procedures relieve the pain, they invariably aggravate the pancreatic insufficiency and create new problems with regard to nutrition and insulin sensitivity.

Both our patients treated by total pancreatectomy survived the operation and were relieved of their pain, but 1 of them died 18 months later as a result of uncontrollable pyelonephritis.

#### PANCREATITIS AND BILIARY DISEASE (40 PATIENTS)

In this group 44 operations were carried out on 35 patients. The procedures included 5 laparotomies, 36 operations on the biliary tract, and 3 sphincterotomies (Table III). The overall results of surgery were excellent. Apart from the favourable response to biliary surgery, gallstone pancreatitis differs from alcoholic pancreatitis in 2 other major respects, viz. (a) the acute attack tends to be more severe with a higher mortality, and (b) both early and late complications, such as pseudocysts, calcification, chronic pain, diabetes and steatorrhoea, are uncommon.<sup>9,12</sup> On the other hand, like alcoholic pancreatitis it tends to be a relapsing disease.<sup>9</sup>

In view of the above, this discussion will be concerned

TABLE III. OPERATIONS PERFORMED ON 35 PATIENTS WITH GALLSTONE PANCREATITIS

Laparotomy	.....	.....	.....	.....	.....	5
<i>Indirect Procedures</i>						
Cholecystectomy	.....	.....	.....	.....	.....	20
Cholecystectomy and choledochostomy	.....	.....	.....	.....	.....	15
Biliary diversion	.....	.....	.....	.....	.....	1
Sphincterotomy	.....	.....	.....	.....	.....	3
Total	.....	.....	.....	.....	.....	44

mainly with the management of the acute attack and the prevention of relapses.

#### 1. The Acute Attack

Acute attacks occurred in 19 patients. One gave a history of an acute attack some months after cholecystectomy; 2 developed acute pancreatitis after sphincterotomy, and 16 presented with acute gallstone pancreatitis. In 13 of these 19 patients the attacks were extremely severe. One of the patients who had had sphincterotomy died of fulminating pancreatitis and the other remained extremely ill for several weeks. Eight of the patients who presented with acute attacks were so ill that other intra-abdominal catastrophes could not be excluded and emergency laparotomy was performed. All had gallstones, but these were overlooked in 5. In the remaining 3 the stones were removed, but 1 of them died of fulminating pancreatitis. Among the 8 in whom the acute attack was treated conservatively, 1 died of fulminating pancreatitis and 2 who had common duct stones remained extremely ill and had to be operated on after 2 weeks (see below).

Our experience serves to emphasize that, although gallstone pancreatitis is often mild and subsides within a week, it may produce a lethal necrosis.<sup>1,9</sup> Statistics reveal that gallstones are present in  $\frac{1}{3}$  -  $\frac{1}{4}$  of patients who die of pancreatitis.<sup>9</sup> The mortality rate in our patients who developed acute attacks was 16%, which should be compared with the 2.5% mortality in the alcoholic group and the average mortality of 15% in unclassified acute pancreatitis reported in the literature.<sup>1</sup> No doubt if a series is weighted with acute gallstone pancreatitis the overall mortality will approximate the higher figure.

In the management of these cases there can be no doubt that the initial therapy must be conservative, because the added stress of a surgical operation in a severely ill patient must necessarily increase the mortality. This is borne out by the appalling mortality of 50% and over encountered in the days when immediate operation was the accepted method of treatment.<sup>1</sup> On the other hand it must be appreciated that 'delayed' surgical intervention may be necessary (see below) and every effort should be made to establish that gallstones are responsible for the attack. It is therefore necessary (a) to establish a positive diagnosis of pancreatitis, and (b) to establish that the precipitating factor is not alcohol. We have found that a positive diagnosis is usually possible after careful clinical assessment aided by biochemical and radiological investigations. Acute gallstone pancreatitis should be suspected in all females and elderly patients, particularly if the attack is very severe and associated with an excessively high serum-amylase level and significant jaundice. A history of previous operations on the biliary system or the presence of radiopaque gallstones will obviously assist in making the diagnosis.

A difficult problem arises in the patients who are operated on immediately because of uncertainty about the diagnosis. As already indicated, gallstones may be overlooked, particularly when the surgeon has not thought of the possibility. On the other hand, if gallstone pancreatitis is given the serious consideration which it merits in the differential diagnosis of every 'acute upper abdomen', less unnecessary laparotomies will be performed and, if the patient should be operated on, the surgeon will be in a position to know whether he should search for gallstones or not. We are convinced that if there is a reasonable suspicion that gallstones may be responsible, no effort should be spared to find them and remove them. In such cases operative cholangiography is regarded as an essential step in the operation. Stones confined to the gallbladder should be treated by cholecystectomy or cholecystostomy, depending on the condition of the patient. Stones in the common duct pose the most difficult problem. It may be argued that the risk of choledochostomy is not justified, but this should be weighed against the risk of lethal pancreatic necrosis, which is particularly liable to occur when stones are impacted in the ampulla of Vater. Every case must be judged on its own merits, but we believe that less lives will be lost if the stones are removed forthwith.

As already indicated, the acute attack may fail to subside on conservative treatment, and in 2 of our patients 'delayed' surgery was necessary after 2 weeks. Both of them had extensive pancreatic necrosis from stones impacted in the ampulla, and in 1 a small necrotic cyst had formed in the pancreas. Both responded rapidly to removal of the stones, cholecystectomy and T-tube drainage of the common duct, but the operations were difficult and hazardous. (In 2 subsequent cases not included in the series, the patients were not operated on until the end of the third week, when definitive surgery was virtually impossible because of oedema and adhesion of surrounding organs.)

In view of the above, we are convinced that if acute non-alcoholic pancreatitis fails to subside within the usual course of a week, the possibility of a gallstone impacted in the ampulla should be considered. If this diagnosis is supported by the presence of well-marked jaundice, and the patient continues to remain ill with pain, fever and signs of duodenal obstruction, surgical intervention should be seriously considered before it is too late. In contrast to the patients suffering from acute alcoholic pancreatitis, these patients remain ill not because of the development of early 'complications', but because of persistent obstruction of both the common bile duct and the pancreatic duct. The operation, which should include cholangiography and exploration of the common bile duct, is a serious undertaking, but once again the operative hazard should be weighed against the very real risk of a possible fatal outcome.

## 2. Relapses

It is well recognized that gallstone pancreatitis is a recurring pancreatitis and that relapses will continue until the stones have been removed.<sup>9</sup> On the other hand, correction of the biliary disease will almost always result in a permanent cure. This was clearly illustrated in our patients who responded very well to definitive biliary surgery. When symptoms of pancreatitis persisted there was usually evi-

dence of residual biliary disease. This included 7 patients who had clinical and/or biochemical evidence of pancreatitis after cholecystectomy; 3 of them were relieved by subsequent removal of common duct stones, 2 improved on conservative management, 1 failed to respond to subsequent sphincterotomy and common duct drainage, and 1 refused further surgery. One patient who had a choledochal cyst and gallstones continued to have recurrent attacks of pancreatic pain after cholecystenterostomy. In the final analysis, therefore, only 3 patients were not relieved by definitive biliary surgery.

This agrees with the results of others in gallstone pancreatitis, e.g. Howard and Ehrlich<sup>9</sup> report that only 3 out of 160 patients were not relieved; Raker and Bartlett<sup>12</sup> reported 2 failures in 50 cases, and Sanchez-Ubeda *et al.*<sup>14</sup> reported 2 failures in 25 cases. This excellent response to biliary tract surgery lends further strong support to the view that gallstone and alcoholic pancreatitis are different entities.

## Comment

Because of the excellent prognosis of gallstone pancreatitis treated by biliary tract surgery, every effort should be made to establish the diagnosis in suspected cases. These include all non-alcoholics and most women and elderly patients, as well as patients who have presented with a particularly severe attack, even if gallstones were not detected at laparotomy. The same applies to patients who suffer from post-cholecystectomy symptoms which may be due to pancreatitis secondary to residual common duct stones. The investigations should include not only oral and intravenous cholecystography, but also pancreatic-function tests and examination of the duodenal aspirate for cholesterol crystals.

The wisdom of this approach is well illustrated by our experience. In 5 patients submitted to laparotomy because of acute gallstone pancreatitis the stones were overlooked, and it was only after the diagnosis had been suggested by biliary drainage that cholecystography and subsequent cholecystectomy were carried out. Also, 3 non-alcoholic patients in whom initial cholecystography was negative were subsequently shown to have stones after cholesterol crystals had been found in the duodenal aspirate.

The operative procedure will obviously depend on the findings. Cholecystectomy alone may suffice, but great care should be taken to exclude common duct stones and establish patency of the ampulla. We therefore perform operative cholangiography as a routine. In cases where choledochotomy is deemed necessary, particular care should be exercised to establish that the ampulla is not stenosed; if it is, transduodenal sphincterotomy should be performed.

There is much difference of opinion about the value of sphincterotomy. Doubilet<sup>2-8</sup> believes that the operation is of value because it eliminates biliary-pancreatic reflux. He states that 'a common passageway is always present in recurrent pancreatitis', and that 'sphincterotomy destroys this common passageway, abolishing further severe inflammation resulting from reflux of bile'. Rodney Smith<sup>7</sup> states that 'the view that reflux of bile into the pancreatic duct is in itself harmful, is largely discredited', but believes that 'a minor degree of stenosis here will lead to stasis in the bile passages, the pancreatic duct or both, and a vicious circle is easily set up, stasis leading to infection, infection to oedema, and oedema to increasing obstruction and stasis'. He points out that oedema and fibrosis of the sphincter are often found at operation, and claims that 'sphincterotomy is effective in a fair percentage of cases of relapsing pancreatitis, probably because it relieves stasis in the pancreatic duct'.

Doubilet and Mulholland<sup>8</sup> claim 90% good results for sphincterotomy in the treatment of relapsing pancreatitis in general, but many others have failed to emulate their results. In a recent publication Warren and Veidenheimer<sup>10</sup> report good results in 50% of cases, but point out that sphincterotomy combined with dilatation, manipulation and intubation of the duct of Wirsung gave excellent results in 56% and good results in 25%. It should be remembered, however, that the procedure is one of some magnitude and may precipitate severe postoperative pancreatitis.

Our own experience with sphincterotomy for gallstone pancreatitis has been negligible because of the excellent results obtained by the standard operations to correct biliary tract disease. It should also be pointed out that one of our patients subjected to sphincterotomy developed severe postoperative pancreatitis and another a fatal retroperitoneal leak.

Since chronic complications are rare in gallstone pancreatitis the need for pancreatic resections and pancreatico-intestinal anastomoses should seldom arise, and in our cases none of these procedures were required.

#### MISCELLANEOUS CAUSES (34 PATIENTS)

In this heterogeneous group no less than 13 different aetiological factors were responsible for the pancreatic disease and treatment was directed primarily at the cause.

Twelve of the patients underwent 13 operations, but about half the operations were diagnostic laparotomies (Table IV). In only 2 of the patients was the operation performed to deal with the pancreatic pathology, viz. resec-

TABLE IV. OPERATIONS PERFORMED ON 12 PATIENTS WITH PANCREATITIS OF MISCELLANEOUS AETIOLOGY

Laparotomy	6
Gastro-intestinal diversion	4
Cholecystectomy and choledochostomy	1
Biliary diversion	1
Distal pancreatectomy	1
<b>Total</b>	<b>13</b>

tion of the tail of the pancreas for traumatic rupture of the organ and biliary diversion for carcinoma with secondary inflammatory changes. *Ascaris infestation*, which is a common cause of pancreatitis in childhood in Cape Town, was responsible for only 3 of our cases in this series, and 2 of them were in 13-year-old children. The adult was operated on and a worm was removed from the common duct, but in the children the attacks settled down on conservative treatment.

#### PANCREATITIS OF UNKNOWN ORIGIN (21 PATIENTS)

The main problem in these patients was to exclude the 2 principal aetiological factors, alcohol and gallstones, because, as indicated above, alcoholic pancreatitis should be treated conservatively while gallstone pancreatitis requires surgical intervention. Particular care was exercised to exclude gallstones by cholecystography, biliary drainage and even laparotomy. The duodenal aspirate revealed biliary pigment in one case and cholesterol crystals in another, but cholecystography was normal in both. Laparotomy revealed an apparently normal biliary system in the former and the latter had painless calcific pancreatitis.

Fifteen operations were performed on 13 of the patients (Table V). Ten of the patients presented with acute attacks

and laparotomy was performed on 7 of them mainly because of the absence of an aetiological factor to sup-

TABLE V. OPERATIONS PERFORMED ON 13 PATIENTS WITH PANCREATITIS OF UNKNOWN ORIGIN

Laparotomy	8
Sphincterotomy	4
Distal pancreatectomy	2
Pancreatico-duodenectomy (Whipple)	1
<b>Total</b>	<b>15</b>

port a diagnosis of pancreatitis. One of these patients died of fulminating pancreatitis, and gallstones could not be excluded with certainty. Of the remaining 6 none had recurrence of symptoms. Of the 3 who were treated conservatively during the acute attack, 1 continued to have attacks of pain which were relieved by sphincterotomy and dilatation of the pancreatic duct.

Five patients presented with typical relapsing pancreatitis. One was treated by distal pancreatectomy and pancreatico-jejunal anastomosis with complete relief, and 1 by sphincterotomy with partial relief which was not improved by subsequent removal of a non-calculous gallbladder. In this connection it should again be mentioned that Doubilet and Mulholland<sup>8</sup> advise removal of the gallbladder when sphincterotomy is performed, but Rodney Smith<sup>17</sup> advises leaving the gallbladder if stones are not present; Howard and Ehrlich<sup>9</sup> point out that removal of a non-calculous gallbladder is useless in the treatment of pancreatitis.

Three patients presented with chronic pancreatic pain. Two of them were operated on. One succumbed after pancreatico-duodenectomy. The other was temporarily relieved by sphincterotomy, but when subjected to distal pancreatectomy 3½ years later because of persistent pain, was found to have histologic evidence of carcinoma in the resected portion.

Three patients presented with painless pancreatitis complicated by diabetes and steatorrhoea, with calcification of the pancreas in 2. None of them was operated on.

#### SUMMARY AND CONCLUSIONS

1. The treatment of acute and relapsing pancreatitis depends largely on the causative factor, with particular reference to alcohol and gallstones. In alcoholic pancreatitis therapy should be primarily conservative, while in gallstone pancreatitis surgical intervention is necessary. The results of surgery in any particular series will depend largely upon the relative incidence of these 2 main groups. In the overall treatment of pancreatitis the value of surgery appears to be limited, but in gallstone pancreatitis it constitutes the only effective therapy, and may be life-saving.

2. The initial treatment of the acute attack should be conservative in all cases and this depends on the establishment of a definitive diagnosis by clinical and biochemical methods. Sometimes surgical exploration may be necessary to make the diagnosis, but this increases the morbidity and mortality considerably and every effort should be made to reduce the number of fruitless laparotomies of this kind.

3. Subsequent therapy will depend primarily on the aetiology, and it is therefore of paramount importance to determine the cause as soon as possible. We have found that an accurate aetiological diagnosis can be made in



over 90% of cases, at least in the South Western Cape, and are convinced that a proper understanding of the disease and its response to treatment demands that efforts be made to determine the aetiology in every case and the precipitating cause of each attack.

4. In cases submitted in error to diagnostic laparotomy during the acute attack it is usually best to close the abdomen with a minimum of disturbance in the area of the pancreas. However, if it is suspected that alcohol is not responsible, careful examination of the biliary system, including operative cholangiography, should be carried out and if gallstones are found they should be removed.

5. If the acute attack fails to subside on conservative treatment in the usual period of about a week, it may be necessary to operate, and once again the decision will rest to a large extent on the aetiology. In alcoholic pancreatitis complications, particularly pseudocyst formation, are usually responsible, and although surgical treatment is then often necessary, it may be deferred until the condition has declared itself. In gallstone pancreatitis, on the other hand, an acute attack may fail to subside because of impaction of a stone at the ampulla, and urgent operation may be necessary to prevent lethal pancreatic necrosis.

6. The treatment between attacks depends partly on the cause and partly on the presence of complications which, in turn, depend largely on the cause:

In uncomplicated *alcoholic pancreatitis* treatment should be conservative, and implicit in the regime is complete withdrawal of alcohol. The results of operation are uniformly poor, regardless of the type of procedure, unless accompanied by total abstinence from alcohol. If symptoms persist despite alcohol withdrawal, however, the presence of hidden complications, pancreatic carcinoma or associated disease should be suspected and full investigation, which may include laparotomy and pancreatic biopsy, is required. In such cases there may be a place for sphincterotomy, dilatation of the pancreatic duct, or pancreatico-intestinal anastomosis. When alcoholic pancreatitis has become complicated by intractable pain, calcification, diabetes and steatorrhoea, radical resection of the diseased organ should be considered. Pancreatico-duodenectomy (Whipple), distal pancreatectomy or total pancreatectomy may be performed, depending on the extent of the disease, and bearing in mind the operative hazard as well as the risks of subsequent pancreatic insufficiency.

In *gallstone pancreatitis* definitive biliary tract surgery gives uniformly good results provided stones in the common duct are not overlooked. Sphincterotomy may be necessary if there is stenosis of the ampulla, but it should be remembered that the procedure is not without hazard. If symptoms recur or persist after definitive biliary surgery the presence of a stone in the common duct should be strongly suspected, and every effort should be made to establish the diagnosis, even to the extent of resorting to laparotomy and operative cholangiography. Since chronic complications seldom occur, there is hardly ever an indication for direct procedures on the pancreas.

In *pancreatitis from other causes* removal of the cause, if possible, is usually all that is required, e.g. the treatment of penetrating duodenal ulcers by gastric surgery, extirpation of roundworms by medical treatment, etc. Sphincterotomy and direct procedures on the pancreas are only rarely necessary.

In the small group of patients in whom *no definitive cause* can be established, it is essential to exclude the possibility of gallstones. Initial therapy should be conservative, but if symptoms persist laparotomy combined with operative cholangiography and pancreatography and even pancreatic biopsy, may be required. Some of these patients will be relieved by sphincterotomy with or without dilatation of the duct, but in others distal pancreatectomy with pancreatico-intestinal anastomosis may be required to relieve ductal obstruction. The possibility of carcinoma must be kept in mind and biopsy performed of any suspicious lesion.

7. The above policy has evolved from our unique experience in the management of 243 cases of pancreatitis over a period of 3 years. In this series 148 (61%) patients suffered from alcoholic pancreatitis. Twenty-eight (12%) of the 243 patients died during the period of study, but only 17 (7%) of the deaths could be attributed to the pancreatitis. Severe acute attacks occurred in 121 patients, and 6 (5%) of them died. This low mortality rate was due in part to the fact that 82 of the 121 acute cases suffered from alcoholic pancreatitis and only 2 (2.5%) of these 82 died. Nineteen patients had acute pancreatitis associated with gallstones or following surgery; among these 19 patients there were 3 (16%) deaths.

Altogether 150 operations were performed on 113 of the patients. Only 4 deaths were directly attributable to surgery; 3 patients died from complications of pancreatic surgery and the fourth developed acute pancreatitis and a retroperitoneal leak following sphincterotomy. The remaining 7 deaths following pancreatitis resulted from inanition, difficulties in insulin control and the development of carcinoma. The long-term results in the patients who survived depended on the cause of the pancreatitis and the presence of associated disease.

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