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Pancreatic denervation for pain relief in chronic alcohol associated pancreatitis

To denervate the pancreas of sensory afferents, 15 patients with intractable pain of chronic alcohol induced pancreatitis underwent left transthoracic splanchnicectomy with concomitant bilateral truncal vagotomy. All were malnourished and 11 were addicted to opiates. No respite had been obtained from 33 previous operative procedures. Each patient experienced almost immediate pain relief. Five, however, later had return of pain, but only to the right epigastrium. These five then underwent right transthoracic splanchnicectomy, after which four noted complete and apparently permanent disappearance of pain. In those 14 with a successful outcome there has been a 29 per cent mean increase in body weight, break of hard drug addition in ten of the 11 so afflicted, and return to gainful work or a relatively normal lifestyle in all 14 at a mean follow-up of 16 months. Although 11 of the 14 do have delayed gastric emptying, only one has required a drainage procedure. There have been no other late complications. This approach for control of incapacitating pain in chronic pancreatitis is both safe and simple and at the same time it appears to be reasonably reliable.

Keywords: Chronic pancreatitis, intractable pain, pancreatic denervation, transthoracic splanchnicectomy

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Once established, chronic pancreatitis rarely precipitates an acute crisis that might warrant urgent surgery[1]. Its real threat is a protracted and unremitting drain on patient nutrition which in turn leads to such severe debilitation that life expectancy is significantly shortened with a poor quality of life. The pain provides an additional burden and the patient tries one therapy after another until addiction to opiates characterizes the final stage.

Many methods of providing pain relief have been advocated. These include non-addicting analgesic drugs, pancreatic duct decompression[2–4], partial or complete pancreatic resection[5–9] and pancreatic denervation[10–12]. No one approach is uniformly successful without causing some degree of permanent major morbidity, imposing a high risk of operative mortality, or often both. The major differences in outcome between these procedures have been in duration of pain relief when and if it is achieved and the price to be paid for such benefit in terms of immediate mortality and long-term morbidity.

For patients who have not gained a lasting pain-free state from pancreatic duct decompression or for those whose pancreatic ducts are not appropriately dilated a choice must be made between total to near-total pancreatectomy and pancreatic denervation. The latter procedure presents a less morbid subsequent course with a low surgical mortality rate.

Patients and methods

Patients

Of 21 patients seen for control of intractable pain due to chronic alcohol induced pancreatitis, 15 initially were considered to be good candidates for a denervation procedure. Two of these patients, however, refused operation. Five other patients had segmental dilatations of the main pancreatic duct on endoscopic retrograde pancreatography and therefore were deemed to qualify instead for a lateral pancreaticojejunostomy as described by Puestow and Gillesby[3]. Two of these five failed to obtain the desired pain relief and subsequently were offered pancreatic denervation. The final patient had such severe psychiatric problems that true evaluation of the denervation procedure was believed to be impossible and accordingly operation was not advised.

Ten men and five women were selected for pancreatic denervation. Their ages ranged from 22 to 57 years, with a mean of 41 years. They had a mean of 18 years of alcohol abuse, with a range of 7–29 years. Between two and 21 attacks of acute alcohol induced pancreatitis had been documented, with a mean of almost eight episodes for each patient. A history of recurrent bouts extended for as brief a time as 1 year and for as long as 17 years. The mean duration of recurrent attacks was 8 years. Eleven of the 15 had been addicted to opiates for between 2 and 9 years, with a mean of just over 4 years.

Eleven patients had diabetes mellitus. Four required insulin and two were managed on diet, while five essentially refused to participate in any efforts at control. All the patients were malnourished, weighing a mean of 22 per cent less than ideal for age, sex and height. The weight deficit varied between eight and 47 per cent of ideal. Pain was so severe on oral ingestion of a diet that one patient had been totally dependent on parenteral nutrition for >1 year.

All 15 patients had undergone at least one previous operative procedure for pain relief. Of the total 31 operations, 13 were lateral pancreaticojejunostomies[3], 11 were some form of internal drainage of a pseudocyst, six involved transduodenal sphincteroplasty and three were distal resections of the pancreas up to an estimated 70 per cent of gland mass. In addition, five patients had received from one to 13 coeliac ganglion blocks, with a mean of four per patient. Two of these patients had obtained temporary relief for as long as 3 months; yet after the third or fourth block, benefit lasted at most for 1–2 days.

Each patient subjected to the pancreatic denervation procedure had undergone preoperative computed abdominal tomography and endoscopic retrograde cholangiopancreatography. Neither study demonstrated an undrained ectatic pancreatic duct or pseudocyst of >2 cm diameter in any of the patients. No patient had symptoms or clinical findings suggestive of common bile duct or duodenal obstruction, ascites or gastrointestinal bleeding. Pancreatic malignancy could not be excluded with absolute certainty but absence of duodenal and bile duct obstruction and the absence of a finite pancreatic mass on computed tomography were taken to rule out such a possibility.

Operative procedure

The transthoracic approach to pancreatic denervation was used because of reported inconsistent results with transabdominal and extraperitoneal coeliac ganglionectomy and only short-term benefit from coeliac ganglion blocks. A left-sided thoracotomy was used for the initial operation to make concomitant bilateral truncal vagotomy technically easier. The Clinical Trials Committee of Emory University School of Medicine, where the study was started, suggested that bilateral truncal vagotomy should be included because of the noted reduction in

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incidence of recurrent attacks of alcohol induced pancreatitis following this procedure[13]. Division of the nerves proximally assured a more complete denervation and avoided the need to dissect in tissues extensively scarred by previous pancreatic inflammation, operation or nerve block injection.

With the patient in the right lateral position, a left posteriolateral thoracotomy was performed through either the seventh intercostal space or through the bed of the seventh rib. To guarantee easy identification of the splanchnic nerves and to avoid injury to the corresponding sympathetic ganglia, a generous incision was considered to be an absolute necessity.

The greater and lesser splanchnic nerve plexuses were noted to pass inferiorly from their respective thoracic ganglia in first a medial and then an anterior direction. After the posterior parietal pleura had been incised, the plexus of the greater splanchnic nerve (generally with branches arising from as high as the fifth thoracic sympathetic ganglion and as low as the tenth) was clipped at its origin, divided and then traced down to the diaphragm, where it was clipped and divided again. A similar technique was used for the lesser splanchnic nerve (usually involving branch excision from the ninth to the 11th thoracic ganglia). Only twice was the lesser splanchnic nerve identified with certainty. Care was taken not to damage any of the sympathetic ganglia or their interconnecting trunks. A standard bilateral truncal vagotomy was carried out.

The pleura was left open and the chest was routinely closed without drainage. Four patients had obvious retropleural chronic oedema and scarring and because of serous drainage from the pleural incisions, one patient required closed thoracotomy tube drainage in the recovery room. The other three patients, therefore, had chest tubes inserted prophylactically. The tubes were removed without subsequent incident on the second postoperative day. For those patients requiring right transthoracic splanchnicectomy, an identical procedure was carried out.

The mean duration of surgery was 41 min, with a range of 32 to 59 min. There were no immediate operative or postoperative complications. Blood transfusion was not needed. Hospitalization varied from 4 to 13 days, with a mean of 7 days, if one patient with insurmountable psychiatric problems is excluded. There were no deaths.

Results

Each of the 15 patients experienced immediate and complete relief from their abdominal and back pain following left greater and lesser splanchnicectomy with bilateral truncal vagotomy. Five, however, noted a return of the pain confined to the right side of the epigastrium. Pain recurrence was sudden on the fourth postoperative day in the woman patient with severe psychiatric problems, and she was considered to represent a poor candidate for the denervation procedure. The other four patients had a gradual return of pain beginning at 3–8 months after the first operation. Within a further 3–4 months the recurrent pain was so severe as to justify right greater and lesser splanchnicectomy. Four of the five patients then gained immediate and apparently permanent pain relief. The one exception was the psychotic woman who had obtained only a 4-day respite following the first operation. The second procedure caused no change in her pain pattern and surgery was assumed to have been of no benefit.

On a follow-up ranging from 5 to 28 months, with an average of 16 months, the 14 successful patients remained pain-free after unilateral denervation alone in ten cases and bilateral operation in four cases. The woman who had obtained no benefit died many months later still dependent upon total parenteral nutrition. The only other known death occurred at 11 months as a result of a high-speed automobile collision.

Excluding the psychotic patient who obtained no pain benefit, there was a 29 per cent mean increase in body-weight over the preoperative weight, with a range of 11 to 41 per cent. Ten of the 11 patients broke their addiction to opiates and one has returned to making his livelihood as an illicit hard drug dealer. If that way of life is taken to represent self-sufficiency(!) then all 14 were gainfully employed at last contact. Thirteen have resumed varying degrees of alcohol abuse.

The only late complication has been delayed gastric emptying. This was confirmed by barium or isotope studies in 11 patients. Symptoms have been sufficiently troublesome to require a draining pyloroplasty in only one patient.

Discussion

The role of surgery is limited in chronic pancreatitis[1]. Metabolic derangements arise because of pancreatic insufficiency, both exocrine and endocrine, and dietary restrictions, specific vitamin, mineral and digestive supplements and occasionally insulin regulation of an accompanying diabetes mellitus become dominant considerations. Approximately 10 per cent of patients with chronic pancreatitis will develop one or more complication requiring surgical correction: common duct and/or duodenal obstruction due to pancreatic cicatrix, pseudocyst formation, a leaking pancreatic duct causing ascites or splenic vein thrombosis. Other complications relate to alcohol abuse and choledocholithiasis.

An unremitting supraumbilical pain, boring into the back, made worse by eating characterizes the syndrome. Various analgesics become less and less effective and addiction to opiates may become the most prominent feature.

Before the pain becomes refractory to analgesics, the identification of an anatomical lesion is always indicated[1,4]. Once defined, its surgical correction is an important part of the strategy for pain control.

First to be considered is the possibility of pancreatic duct obstruction or a pancreatic pseudocyst[1,4]. The results of surgical decompression, however, are not uniformly good[1–4]; one-third of patients obtain complete relief, one-third are considerably improved and one-third never experience any benefit.

For those patients who fail to gain relief from a drainage procedure or in whom no dilated duct or pancreatic fluid collection can be delineated, a choice must then be made between surgical ablation of all or a part of the gland and some method of pancreatic denervation.

Results obtained from pancreatic resection correlate well with the percentage of the organ excised[5–8] (*Table 1*). At the range of 80–95 per cent resection, almost 90 per cent of patients eventually become pain-free[6,7]. Beyond this amount of excision, results worsen[5,9,14]. Complications relate to the brittle diabetic state created by complete removal of the pancreas and those arising from the anastomosis between the common bile duct and the alimentary tract.

Pancreatic denervation provides an alternative approach[15–17] but pain control by coeliac ganglion blocks becomes less complete and lasts for shorter periods with the passage of time[18–21]. After a fifth or sixth session, the pain pattern is seldom modified for longer than 1–2 days, and coeliac ganglionectomy may be carried out[10,11]. With the exception of consistently good results obtained at one clinic[10], true benefit has been reported in only about half of the documented cases[11] and this lack of reliability has reduced enthusiasm for the procedure. Incomplete ganglion excision, failure to divide all of the responsible pain fibres and nerve regeneration may well account for variable results. To avoid these possibilities it has been suggested that the pancreas be converted into a denervated free flap[22] but this represents a major surgical undertaking and its reliability and duration of benefit are uncertain.

Since the greater and lesser splanchnic nerves contain afferent fibres specifically from foregut and midgut organs, a

Table 1 *Pancreatectomy for pain relief in chronic pancreatitis*

Extent of resection (%)	Total (*n*)	Pain relief: Excellent (*n*)	Good (*n*)	Fair/poor (*n*)
<40	40	20	6	14
40–80	98	75	6	17
80–95	124	110	–	14
Total (100)	24	10	2	12

Data from selected published reports[5–8]

Table 2 *Left splanchnicectomy for pain relief in chronic pancreatitis*

Splanchnicectomy	Total (*n*)	Pain relief: Excellent (*n*)	Good (*n*)	Fair/poor (*n*)
Left alone	10	9	1	–
Left plus thoracic sympathectomy	8	4	3	1
Left plus coeliac ganglionectomy	39	19	–	20
Total left splanchnicectomies	57	32	4	21

Data cited in published reports[10–12,23–29]

Table 3 *Bilateral splanchnicectomy for pain relief in chronic pancreatitis*

Splanchnicectomy	Total (*n*)	Pain relief: Excellent (*n*)	Good (*n*)	Fair/poor (*n*)
Bilateral alone	0	–	–	–
Bilateral plus thoracic sympathectomy	20	17	1	2
Bilateral plus coeliac ganglionectomy	10	8	0	2
Total bilateral	30	25	1	4

Data cited in published reports[10–12,23–29]

transthoracic approach would appear to be a reasonable way to accomplish the desired denervation[12,14–17]. Other than a small series of right splanchnicectomies with indifferent results, the majority of reports describe either a left or a bilateral splanchnicectomy, usually coupled with a thoracic sympathectomy or a coeliac ganglionectomy[10–12,23–29] (*Tables 2* and *3*). Since the procedures were carried out transabdominally or through a confined flank incision, how totally the splanchnicectomy is done is open to question.

Results obtained from the present study suggest that left transthoracic splanchnicectomy offers a chance for permanent freedom from pain in approximately two-thirds of patients. If pain returns then a similar right-sided denervation might provide a lasting pain-free state.

The role of vagotomy is unclear. Because of the uncertainty that all pain fibres pass along the splanchnic nerves and because of the documented decreased incidence of recurrent attacks of alcohol induced pancreatitis following bilateral truncal vagotomy[13], this additional component to the operation seems worthwhile.

The late consequences of splanchnicectomy and a bilateral truncal vagotomy are unknown. Delayed gastric emptying occurred in most patients but in only one did surgical intervention become necessary. The postoperative morbidity rate associated with pancreatic denervation is significantly less than that following a total or a near total pancreatectomy.

In conclusion, denervation of the pancreas via a transthoracic splanchnicectomy appears to offer relief from the incapacitating pain of chronic alcohol induced pancreatitis. It is indicated for those individuals who have failed to gain relief from an appropriate internal drainage procedure or whose pancreatic duct system is not sufficiently dilated.

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