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Long-term follow-up of thoracoscopic splanchnicectomy for chronic pancreatitis pain

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Abstract
Background: Thoracoscopic splanchnicectomy (SPL) has been reported to give excellent short-term pain relief in chronic pancreatitis. This study prospectively evaluates the long-term efficacy of SPL in pancreatitis patients.
Methods: Chronic pancreatitis patients with severe pain unrelieved by standard therapy completed a standard 10-point analogue pain scale prior to surgery and at postoperative visits. Midline and left-sided pain was treated with left SPL; right-sided pain was treated with right SPL. If pain recurred on the contralateral side, contralateral SPL was done.
Results: Fifteen patients underwent SPL. Eleven of them required narcotics preoperatively. Follow-up is complete and ranges from 4.2 to 6.1 years (median, 5.75). All patients had constant pain prior to surgery. Following SPL, it decreased in the short term to a mean of 3.9 attacks a month. At long-term follow-up, the mean number of attacks was 8.6 per month. Preoperatively, the mean score for worst pain within the last 2 months was 9.1. This score decreased to 3.9, but at long-term follow-up it had increased to near preoperative values (8.6). Current severity of pain decreased from 7.2 preoperatively to 2.9 at short-term follow-up, but at long-term follow-up it had increased. The degree of disability decreased from 9.1 preoperatively to 5.1 at short-term follow-up, but in the long term it increased toward preoperative values. Although eight patients were narcotic free at early follow-up, only three remained narcotic free in the long-term.
Conclusion: Thoracoscopic SPL offers short-term relief of pain from chronic pancreatitis, but the relief is not durable in most cases. Similarly, there are short-term improvements in degree of disability, mood, and freedom from narcotic use that are not sustained in the long-term. Nevertheless, two-thirds of patients stated that they would have the surgery again.

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Key words: Thoracoscopic splanchnicectomy — Splanchnic nerves — Celiac ganglion block — Pancreatitis — Pain

Chronic pancreatitis rarely presents with acute life-threatening complications. Severe nutritional insufficiency and diabetes occur predominantly in advanced cases. Pain control is the most pressing problem. The pain initially mimics an acute attack, but as the disease progresses the painful attacks increase in frequency and pain-free intervals decrease, so that constant severe abdominal pain is the endpoint. The pain can nearly always be controlled by the administration of narcotics; however, patients often become addicted, and the sedative effects of the narcotics often prevent them from pursuing the normal activities of daily living.

Many methods have been advocated for control of the pain, including enzyme replacement [3, 12], the use of nonnarcotic analgesics, pancreatic duct decompression, and varying degrees of pancreatic resection [9, 10]. Unfortunately, these methods fail to control the pain in 20–50% of patients. Moreover, there is considerable long-term morbidity as well as a small risk of immediate operative mortality.

Surgical resection of the splanchnic nerves and celiac ganglion has produced results that have varied from excellent [6, 11, 15] to disappointing [14]. Thoracoscopic splanchnicectomy has been reported by a number of authors [1, 2, 5, 13, 16]; however, in most studies, the degree of pain relief has not been quantified in an objective way. The purpose of this study was to evaluate the short-term and long-term effect of thoracoscopic splanchnic nerve resection on pain of pancreatic origin quantitatively, using serial evaluation of the pain by a visual analogue pain scale.

Methods

Patients

Eligibility requirements included chronic pancreatitis with severe pain unrelieved by standard medical and surgical methods. All patients had pre-

viously undergone a percutaneous celiac ganglion block, resulting in temporary improvement in their pain pattern. During the study period, all patients who had a positive response to celiac block were offered splanchnicectomy. The type of pancreatitis (i.e., alcoholic, gallstone, idiopathic) was not used as a selection factor. Informed consent was obtained.

All patients were required to complete a standard 10-point visual analogue pain scale, as described by Lillemoe et al., both prior to surgery and at each postoperative visit beginning 6 weeks following surgery [4]. Questions included (a) the number of attacks within the previous month (constant pain was arbitrarily assigned a value of 11), (b)the worst severity of pain within the previous 2 months (10 = unbearable), (c) the current severity of pain (10 = unbearable), (d) the degree to which pain was interfering with the activities of daily living (10 = completely disabled), and (e) a detailed analysis of the need for and use of narcotics. Patients were also questioned as to whether they felt they had achieved worthwhile pain relief from the surgical procedure and whether or not they would have the procedure again.

Surgical technique

The side chosen for splanchnicectomy depended on the site of the pain. Centralized and left-sided pain was treated with left splanchnicectomy. Right-sided pain was treated with right splanchnicectomy. If the pain was bilateral, the side with the most debilitating pain was chosen. If pain recurred on the contralateral side and the patient desired contralateral nerve resection, this procedure was performed ≥4–6 weeks later.

General endotracheal anesthesia was induced in the supine position, and single-lung ventilation was achieved using either a split-lumen endotracheal tube or a bronchial blocking balloon. The patient was then placed in right or left thoracotomy position, and the position and proper selective ventilation function of the tube was confirmed by flexible bronchoscopy.

Splanchnicectomy was performed using a four-port technique. The 10-ml ports were placed in the midaxillary line, third and ninth intercostal spaces, and in the anterior and posterior axillary lines in the sixth intercostal space. A video camera attached to a 0° or 30° telescope was placed in the sixth intercostal posterior port. The third intercostal port was used for lung retraction; the anterior sixth and ninth intercostal ports were the working ports.

The splanchnic nerves could usually be visualized through the pleura, along with the sympathetic chain. On the left, a pleural incision was made just posterior to and parallel to the aorta. At the diaphragm, the pleural incision was turned laterally for a 1–2 cm length, and the resulting flap of pleura was elevated using blunt dissection.

The greater splanchnic nerve was the most medial nerve encountered; the lesser splanchnic nerve was slightly lateral to it. The greater nerve, which parallels the aorta on the left and radiates multiple branches to the sympathetic chain, is sectioned prior to its branching. The lesser nerve has two branches; both these branches and the main trunk are excised. The least splanchnic nerve was not visualized in any patient. A 1–2-cm segment of each nerve was isolated, hemoclipped, excised, and sent for pathologic examination. On the right side, the greater and lesser nerves cross the azygos vein; they were excised lateral to this vein to avoid the vicinity of the thoracic duct. The lung was then reinflated by the anesthetist. A 28-Frh chest tube was inserted. A chest radiograph was obtained in the recovery area. If it demonstrated lung expansion, the tube was removed.

Patients were usually begun on a diet the following morning. They were discharged when pain control was adequate with oral medications. Patients were seen in the clinic at intervals of 1 week, 6 weeks, 3 months, and 6 months following surgery and at 6–12-month intervals thereafter. All patients were interviewed again in February 2000 when this manuscript was in preparation.

Pain scores before and after surgery were compared using a paired *t*-test.

Results

Fifteen patients have been evaluated and operated on since December 1993. There were four men and 11 women with an age range of 16–62 years, (median, 41). Six have undergone staged bilateral splanchnicectomy. Follow-up is 100% and ranges from 4.2 to 6.1 years. Median follow-up is 5.75 years (mean, 5.5). Twelve of the 15 patients have been followed for >5 years.

Only three patients had a history of alcohol abuse. One patient with longstanding chronic pancreatitis was later found to have pancreatic cancer. Two patients had documented pancreas divisum as the etiology of their pancreatitis; in the remainder, the etiology is idiopathic. All had their pancreatitis documented by endoscopic retrograde cholangio pancreatography (ERCP). All patients had undergone multiple endoscopic and surgical interventions that ranged from laparoscopic cholecystectomy, endoscopic sphincterotomy, and pancreatic ductal stenting to subtotal pancreatectomy. Eleven patients required narcotics for the relief of pain preoperatively. Seven of them were receiving constant patient-controlled analgesia (PCA) infusions or parenteral narcotics as inpatients in the preoperative period (four-PCA and three parenteral).

There were no complications either intraoperatively or in the initial hospitalization. There were no deaths within 30 days. The patient with pancreatic cancer died 7 months postoperatively of advanced disease. He was pain free until <1 week before he died. Nearly all patients stated that the character of their pain had changed on the morning following surgery; however, many complained of significant transient intercostal neuralgia. In most patients, it had resolved by the 6-week follow-up visit. Two patients had intercostal symptoms that lasted >6 weeks; however, the symptoms ultimately resolved in both patients with intercostal nerve blocks. One patient returned to the hospital 1 week after her right-sided splanchnicectomy with shortness of breath due to a chylothorax. This resulted in a prolonged hospitalization; however, she ultimately sealed the leak and later requested and underwent contralateral splanchnicectomy with an initially good result. Four patients suffered from orthostatic hypotens ion in the first 4 months following surgery; this has remained a problem in one case. A urine screen in this individual demonstrated furosemide; we now think that this finding represents factitious hypotension.

Pain scale results

Mean visual analogue pain scale results are summarized in Table 1. Both early (~18-month) and long-term (~5-yr) mean values for the group are shown.

The mean number of episodes of pain per month decreased from a mean of 10.5 ± 2.1 preoperatively (11 = constant) to 3.8 ± 4.4 at the early postoperative follow-up. This decrease was significant ($p < 0.001$). At the time of the long-term follow-up visit, the number of attacks of pain had increased to 8.6 ± 4.2 per month. This represented a significant increase in number of attacks per month from the early follow-up ($p < 0.05$) but it was still statistically less than the preoperative values. Three patients had constant pain. Four of them had one or fewer attacks in the previous month.

The mean values for worst pain within the previous 2 months decreased from 9.1 ± 0.9 before surgery to 3.9 ± 3.3 at the early follow-up after surgery. This decrease was significant at the level of $p < 0.002$. Nevertheless, at the long-term follow-up, the worst pain within the previous 2 months had increased to 8.6 ± 3.0, which was not significantly different from the preoperative values.

Table 1. Results of visual analogue pain scale

	Before surgery	Short-term	Long-term	*p* value
No. of episodes of pain in the last month (11 = constant pain)	10.5 ± 2.1	3.8 ± 4.4	8.6 ± 4.2	Preop vs short-term $p < 0.001$ Preop vs long-term $p < 0.05$ Short-term vs long-term $p < 0.05$
What is the worst your pain has been in the last 2 months (10 = unbearable, 0 = no pain)	9.1 ± 0.9	3.9 ± 3.3	8.6 ± 0.9	Preop vs short-term $p < 0.002$ Preop vs long-term $p > 0.05$ Short-term vs long-term $p > 0.1$
How severe is your pain now? (10 = unbearable, 0 = no pain)	7.2 ± 2.4	2.9 ± 2.6	4.5 ± 3.8	Preop vs short-term $p < 0.0005$ Preop vs long-term $p < 0.05$ Short-term vs long-term $p > 0.5$
How much is pain now interfering with your activities? (10 = completely disabled, 0 = not at all)	9.1 ± 2.3	5.1 ± 3.0	8.2 ± 3.4	Preop vs short-term $p < 0.0001$ Preop vs long-term $p > 0.05$ Short-term vs long-term $p < 0.05$
What's your mood like now? (10 = worst I ever felt, 0 = best I ever felt)	6.3	3.4	4.2	Preop vs short-term $p < 0.0002$ Preop vs long-term $p > 0.2$ Short-term vs long-term $p > 0.06$

Results given as mean ± standard deviation (SD)

Current severity of pain decreased from a mean of 7.2 ± 2.4 prior to surgery to 2.9 ± 2.6 at the early interval following surgery ($p < 0.0005$). However, at long-term follow-up, current severity of pain had increased to 4.5 ± 3.8, although this level was still significantly lower than that recorded before splanchnicectomy.

The degree to which pain was interfering with the activities of daily living before splanchnicectomy was 9.1 ± 2.3 (10 = completely disabled). Five patients rated themselves as a 9 or 10, (9 = one patient, 10 = four patients). At early postoperative follow-up, only one patient considered himself to still be completely disabled. The mean degree of disability had decreased to a value of 5.1 ± 3.0 ($p < 0.0001$). At long-term follow-up, the degree of disability was not significantly different from preoperative values.

An improvement was noted in the patient's mood following splanchnicectomy from a preoperative value of 6.3 ± 2.1 to a postoperative value of 3.4 ± 3.0 ($p < 0.0002$). At long-term follow-up the mood scale did not differ significantly from the values registered prior to surgery.

Narcotic use

Eleven of our 15 patients were using narcotics prior to splanchnic nerve resection. Six of them no longer took narcotics at the short-term follow-up. The total number of patients who were narcotic free at short-term follow-up was eight. Four of the five patients who were taking narcotics preoperatively and who still took narcotics at the short-term follow-up visit had reduced their narcotic intake by ≥75%. At long-term follow-up, only three of 15 patients are still narcotic free.

When asked at long-term follow-up whether they would have had the surgery if they knew in advance what the long-term result would be, 10 of the 15 patients answered yes.

Discussion

Surgery plays a very limited role in the therapy of chronic pancreatitis. The role of the surgeon in the treatment of life-threatening complications of pancreatitis—common bile duct stenosis and pseudocyst (bleeding, rupture or infection—is quite clear. But the surgeon's role in the treatment of chronic pain from pancreatitis is, in most cases, controversial. The therapy for pain is clear only if calculi and ductal strictures and dilatation are present. In this situation, anastomosis of the pancreatic duct to the intestine is the only procedure that should be performed. This approach has proved so successful that other procedures are seldom used.

Unfortunately, many patients do not fit this pattern. The current wisdom suggests that these patients should undergo pancreatic resection and that, in general, the more extensive the resection, the better the result. Nevertheless, it is also apparent that increasing degrees of resection are associated with higher rates of diabetes mellitus and an immediate mortality that is small but not insignificant. Relief of pain varies from 50% to 75% in the long term [9, 10].

The morbidity and mortality associated with resection has stimulated the development of alternative therapies. Some authors have reported relief of pain with the administration of large quantities of exogenous pancreatic enzymes; however, this method has not been consistently successful [3, 12]. Denervation of the pancreas was first advocated almost 50 years ago [7]. The results have varied markedly from those of Mallet-Guy and Jaubert de Beaujeu [7], who reported that not only was pain relief >90%, but these people were also cured of their pancreatitis, presumably through interruption of the deleterious effects of splanchnic innervation on the development of pancreatitis. Few authors have matched their experience.

Perhaps the most convincing data regarding the efficacy of splanchnic denervation were reported by White et al. [15]. During a sabbatical in Lyon, White reviewed the results in Mallet-Guy's patients, who were available for 5-year follow-up. He was able to identify 146 cases of patients with pancreatitis, 116 of whom had undergone left splanchnicectomy and celiac ganglionectomy for gallstone pancreatitis (44 patients), fibrotic pancreatitis (39 patients), and other causes (33 patients). Results in the patients with chronic fibrotic pancreatitis were 48.7% good to excellent, 20.5% fair, and 30.8% failures. Overall, the results were

68.9% good to excellent, 14.7% fair, and 16.4% failures. Despite these encouraging results, White reported in 1983 that only 20% of his own patients considered themselves cured at long-term follow-up, a figure identical to our own [14]. The disparity between our results and White's review of Mallet-Guy's patients is not cle ar. Perhaps the open approach with celiac ganglionectomy results in a more complete pancreatic denervation.

Denervation procedures were used only infrequently and there was little mention of the technique in the literature until the report of Stone and Chauvin in 1990 [17]. They reported that left transthoracic splanchnicectomy and bilateral truncal vagotomy relieved pain in two-thirds of their 15 patients with alcoholic pancreatitis. When the five failures were subjected to right transthoracic splanchnicectomy, four of them achieved relief. Drug addiction was cured in 10 of the 11 patients who took narcotics before surgery.

Case reports describing the use of video thoracoscopy to perform splanchnicectomy began appearing in 1993 [5, 8]. The authors of these reports advocated adding vagotomy to splanchnicectomy to limit the direct stimulation of the pancreas and reduce the release of secretin produced by contact of duodenal mucosa with the acidic gastric contents. It is arguable as to whether it is advisable to submit patients prone to malabsorption and malnutrition to vagotomy.

In 1993, Stone et al. reported their results with 27 patients who underwent thoracoscopic splanchnicectomy to the Pancreas Club [13]. Good to excellent results were noted in all patients with pancreatic cancer and 87% of patients with pancreatitis. However, they did not provide an objective definition of what constituted an acceptable result; moreover, the length of follow-up was not specified.

Lin et al. [5] used bilateral thoracoscopic splanchnicectomy to relieve pain from upper abdominal cancers. The results were good in six of their seven patients; however, follow-up did not extend beyond 3 days.

Cuschieri et al. [2] have described bilateral splanchnicectomy through a posterior thoracoscopic approach with the patient in the prone position. This position apparently eliminates the need for single-lung ventilation, since gravity causes the lungs to fall away from the posterior chest wall. Their technique of placing traction on the sympathetic chain and dividing all of the medial branches may be helpful in avoiding branches of the thoracic duct. Good short-term results were achieved in all patients with pancreatic cancer and three of five patients with minimal chronic pancreatitis; however, the maximum follow-up was only 8 months.

Using the same bilateral approach advocated by Cuschieri et al., Andren-Sandberg et al. [1] employed a visual analogue scale to evaluate pain relief in their patients. They found marked reductions in pain in their patients with chronic pancreatitis (14 patients) and cancer (16 patients). All but three of the chronic pancreatitis patients reduced their need for narcotics, and two became completely pain free. Six of nine patients were considered to have good results or were improved at 1-year follow-up. The authors believed that there was no change in results after the 1-month follow-up interval.

In our series, the patients achieved significant early improvement in pain, as measured by the visual analogue pain scale. Forty-six percent of them were able to eliminate their need for narcotics in the short term. A further third reduced their narcotic intake by >75% and took less potent drugs. At early follow-up, most patients considered themselves vastly improved and thought that the operation was worthwhile, but only a minority considered themselves cured. Unfortunately, these early results do not appear to be durable. At 5-year median follow-up, only three patients (20%) appear to have obtained long-term reductions in their pain and disability scores. Initial improvements in their feelings of well-being were not sustained. Despite these discouraging results, two-thirds of them would have the surgery again and thought that even short-term relief was worthwhile. For several years during the hiatus from their pain, many were able to return to productive employment and engage in active family lives.

Splanchnicectomy appears to result in significant short-term reductions in both pain and narcotic usage in patients with chronic pancreatitis. Morbidity is low. However, long-term pain relief is achieved in only 20% of cases. Patients being considered for this type of temporizing procedure should understand that in most cases, the relief of pain and disability will be short-lived.

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