Chronic Pancreatitis is an inflammatory disease that is characterized by permanent alteration of the anatomic structure of the pancreas and by progressive loss of pancreatic function. Clinically, its most notable and reported symptom is severe abdominal pain. Other signs and symptoms of progressive exocrine and endocrine deficiency such as diarrhea, fatty stools, and loss of glucose homeostasis from diabetes mellitus are also common. The initial treatment is medical and comprises pain control, oral supplementation of pancreatic enzymes, and diabetes management with oral hypoglycemic agents and insulin as needed. The most common indication for surgery is to relieve intractable abdominal or back pain. Surgical intervention is also indicated for suspicion of malignancy, presence of pseudocysts, and associated obstruction of the common bile duct or duodenum. The ideal surgical intervention would provide lasting pain relief and preserve exocrine and endocrine function. Despite the innovations and technical advances of the past century, no single procedure can achieve this goal because of the multiple facets and variations of this disease. Surgical therapy must be individually tailored to each patient.

The most common cause of chronic pancreatitis is alcohol abuse, which is the etiologic agent in 80% of all patients in the United States. Alcohol has a direct toxic effect on acinar cells and induces a microcirculatory perfusion change that alters epithelial permeability. This causes changes in acinar protein secretion and leads to protein plug and ductal stone formation. There are multiple causes of non-alcohol-induced chronic pancreatitis. Tropical chronic pancreatitis is common in areas of malnutrition. The disease is associated with inadequate protein and trace element nutrition, and intake of dietary toxins, tapioca, and cassava. Hereditary pancreatitis is associated with mutations in trypsinogen. Other causes include hypercalcemia, autoimmune diseases, and chronic obstruction of the pancreatic duct system due to tumors, strictures, or aberrant anatomy. As many as 20% of patients in some series have an unclear etiology and are categorized as idiopathic chronic pancreatitis [1].

The etiology of the pain of chronic pancreatitis is most likely multifactorial. One possible explanation for the severe pain of chronic pancreatitis is ductal hypertension and dilation due to progressive fibrosis and obstruction. Intraoperative ductal manometry has demonstrated pressures greater than 30 mmHg in chronic pancreatitis, whereas normal pancreatic duct pressure is 10–15 mmHg [2]. Elevations in pancreatic tissue pressure, much like a compartment syndrome, are another potential etiology. In chronic pancreatitis, pancreatic tissue pressure is elevated throughout the pancreas and is greater in areas of calcification. The increased parenchymal pressure will decrease tissue perfusion. The associated localized tissue acidosis may be a potential cause of pain [3]. Damage to pancreatic nerves is also a likely explanation for the pain in chronic pancreatitis. Inflammatory cell infiltration of the nerves within and around the pancreas and release of cytokines has been shown in this disease and occurs in patients with and without dilation of their pancreatic duct [4].

**Historical Perspective**

Goethe Link reported the first pancreatic duct drainage operation for chronic pancreatitis in 1911. After he inserted a catheter into the duct of Wirsung to drain the exocrine fluid out through the skin, the patient reported pain relief and return to normal weight [5]. Two procedures were developed in the 1950s. Duval reported a distal pancreatectomy, splenectomy, and caudal pancreaticojejunostomy in 1954. The caudal pancreaticojejunostomy was performed end-to-end and theoretically decompressed the pancreatic duct retrogradely [6]. However, if strictures were present throughout the ductal system, the entire duct would not be decompressed. Puestow and Gillesby introduced the lateral pancreaticojejunostomy, which was a longitudinal incision of the pancreatic duct and implantation of the tail of the gland into the Roux-en-Y limb of the jejunum [7]. This decompressed a great-
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Patient Evaluation and Selection

A successful result with the lateral pancreaticojejunostomy begins with appropriate patient selection. Preoperative assessment confirms the diagnosis and establishes the extent of disease, the severity of pain, the amount of exocrine and endocrine insufficiency, and the morphology of the gland. A complete history establishes the nature of the pain and the degree of disability. The severity of the pain should be quantified as objectively as possible using an analog scale. The patient’s need for narcotic pain control and the severity of alcohol abuse need to be established. If the patient is still consuming alcohol, the likelihood of postoperative pain relief decreases. Patients who are working, not drinking alcohol, and who have a supportive family structure fare well. Less favorable outcomes can be expected in patients who cannot be rehabsilitated from alcohol or drug use. Other potential sources of pain, such as peptic ulcer and calculous biliary tract disease, should be considered and treated. Malnutrition and weight loss are common features due to alcohol abuse, malabsorption, and pain induced by eating. In addition to routine laboratory studies, nutritional studies and tumor markers should also be evaluated. Hypoalbuminemia is present in approximately 30% of patients before pancreaticojejunostomy. Although tumor markers can be elevated in patients with chronic pancreatitis, CA 19-9 and carcinoembryonic antigen should be obtained preoperatively because of the possible presence of pancreatic cancer. If elevated, pancreatic cancer must be considered and ruled out before a diagnosis of chronic pancreatitis is accepted, even in an alcoholic patient.

Review of appropriate imaging studies ultimately indicates whether lateral pancreaticojejunostomy should be the procedure of choice. Patients with nondilated pancreatic ducts are unlikely to experience the benefits of lateral pancreaticojejunostomy. Recommendations for the minimum duct caliber for satisfactory decompression vary from 5 mm to 10 mm. We consider lateral pancreaticojejunostomy to be acceptable for patients with ducts larger than 5 mm.

Computed tomography (CT) and endoscopic retrograde cholangiopancreatography (ERCP) have been the most informative studies for the assessment of the ductal anatomy in chronic pancreatitis. We obtain a dynamic CT scan with 3-mm cuts through the pancreas as part of our preoperative evaluation. This study usually provides sufficient anatomic information for surgical decision-making. This imaging modality can demonstrate dilation of the pancreatic duct and is the most accurate method for detecting ductal and parenchymal calcifications. CT can also identify other abnormalities such as pseudocysts, mass lesions, and stricture or dilation of the bile ducts.

Due to its risk of acute pancreatitis or introduction of infection in the setting of established chronic pancreatitis, ERCP is no longer routinely performed before lateral pancreaticojejunostomy. Information regarding duct size and anatomy that an ERCP provides can often be obtained from the CT scan. ERCP may fail to visualize a dilated pancreatic duct when there is complete or tight ductal obstruction at or near the duodenum. ERCP can clarify biliary pathology in patients with bile duct strictures or choledocholithiasis that are not easily visible with CT scans. The “double duct sign,” localized obstruction of the common bile duct and the pancreatic duct, is suggestive of pancreatic cancer when seen with ERCP. In addition to its diagnostic use, interventions such as brush biopsy sampling, sphincterotomy, and stent placement can be performed during ERCP.

Magnetic resonance cholangiopancreatography (MRCP) and endoscopic ultrasound (EUS) are being used more frequently to evaluate the pancreas and the anatomy of the pancreatic duct. Both diagnostic modalities are less invasive than ERCP. While the aforementioned interventions are not needed, we rely on MRCP and EUS to clarify or give added information about the anatomy of the pancreas if needed after the initial CT scan. ERCP is used when a question remains about the ductal anatomy despite the use of the other noninvasive modalities, or when there is a need for its potential interventions.