Acute and Chronic Pancreatitis

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INTRODUCTION

The pancreas is an elongated flattened gland that lies in the upper abdomen behind the stomach (1). The pancreas has exocrine and endocrine functions and is involved in the digestion of food in the human body (2). The exocrine (acinar) cells of the pancreas produce and secrete bicarbonate and enzymes that are secreted into the small intestine to digest carbohydrates, fats, proteins, and neutralize the acidic fluid dumped into the duodenum from the stomach. The enzymes produced by the acinar cells are secreted in their inactive form and are not activated until they enter the small intestine (1). Trypsinogen is activated by the brush border enzyme glycoprotein peptidase in the small intestine to trypsin. Trypsin activates all other enzymes secreted from the pancreas (1).

The Islets of Langerhans are the cells of the pancreas with endocrine function. Damage to the Islets of Langerhans, especially the beta cells, can result in problems with maintaining proper levels of blood glucose which can lead to developing diabetes mellitus (1).

Pancreatitis is inflammation of the pancreas as a result of damage to the acinar cells and later on to the Islets of Langerhans (1). Therefore complications of the disease are related to the exocrine and endocrine functions of the pancreas.

DISEASE DESCRIPTION

As mentioned above, pancreatitis is inflammation of the pancreas. There are two classifications of pancreatitis: Acute and Chronic Pancreatitis. Acute pancreatitis is a sudden episode of swelling and inflammation of the pancreas and most cases of acute pancreatitis result in a complete recovery (1). Chronic pancreatitis, however, is an ongoing process of permanent and irreversible damage to the pancreas (1). Both types of pancreatitis are characterized by
severe abdominal pain, clay colored stools, nausea and vomiting (1). Other symptoms of chronic pancreatitis are chronic weight loss, steatorrhea, and diabetes mellitus (1).

**Incidence and Prevalence**

Acute pancreatitis is a condition afflicting 4.8 to 38 persons per 100,000 people in the United States, England and Denmark (1). This statistic is not completely accurate because it does not take into account the diagnosis of mild cases that may be missed (1). In addition, this statistic doesn’t include the estimated 10% of people with pancreatitis that die before diagnosis (1). Acute pancreatitis causes 100,000 hospitalization and 2,000 people die per year from associated complications (1). In addition, acute pancreatitis is the 14th most common cause of GI related deaths (1). The incidence of acute pancreatitis is increasing as obesity increases. Obesity increases the incidence of gallstones, which is the number one cause of acute pancreatitis (1).

Chronic pancreatitis is a condition afflicting 3 to 9 persons for every 100,000 people (1). It is the cause of 56,000 hospitalizations and 122,000 outpatient visits per year (3). Two thirds of all cases are caused by alcohol and chronic pancreatitis is most common in men (1). Incidence of chronic pancreatitis is also increasing because the incidence of alcoholism, the major cause of chronic pancreatitis, is increasing (1).

**ETIOLOGY**

**Acute Pancreatitis**

There are many known causes of acute pancreatitis, but the two main causes are gallstones and alcoholism. Gallstones are the most common cause of acute pancreatitis in women. Most gallstones stay in the gallbladder but when they are small enough they can get out of the gallbladder, into the bile ducts, and obstruct the ducts (1). When gallstones travel through the cystic duct, common bile duct, and lodge themselves into the ampulla of vater, which is the
merging of the common bile duct and the pancreatic duct, they can cause acute pancreatitis (1). Gallstones, in the ampulla of vater, block pancreatic enzymes from being secreted into the duodenum, causing a buildup of enzymes in the pancreas. Enzymes are usually activated in the duodenum, with most being activated by trypsin, which is activated in the duodenum (1). There is always a little bit of activated trypsin in the pancreas at a time, but the pancreas has many mechanisms that get the activated trypsin out of the pancreas (1). When there is a buildup of enzymes in the pancreas, there is more trypsin that can spontaneously be activated in amounts that overwhelm the mechanisms to get the trypsin out of the pancreas (1). Therefore there is activated trypsin in the pancreas that can activate other pancreatic enzymes (1). The activated enzymes autodigest the pancreas, causing damage to the acinar cells. This leads to inflammation of the pancreas, and acute pancreatitis (1). Removal of the gallstones will usually correct the pancreatitis (1).

Alcoholism is the most common cause of acute pancreatitis in men due to the fact that men drink more than women (1). Alcoholism as a cause will be discussed more in causes of chronic pancreatitis. Other causes of acute pancreatitis are hypertriglyceridemia, trauma to the pancreas, toxic accumulates of certain medications, and as a complication of endoscopic retrograde cholangiopancreatography (1).

**Chronic Pancreatitis**

The most common cause of chronic pancreatitis is alcoholism (1). Chronic pancreatitis is most common in men due to the fact that alcoholism in more common in men (1). Alcohol causes 70% of case of chronic pancreatitis, however only 10% of chronic alcoholics develop chronic pancreatitis (1). Alcohol is mostly metabolized in the liver, however alcohol and many of its metabolites still have injurious effects on the pancreas. Alcohol and its metabolites injure the
acinar cells, promote inflammatory responses of the body, and injury ductal cells of the pancreas. Alcohol also stimulates stellate cells which are involved in the production of fibrotic tissue (1). In addition alcohol increases protein content of pancreatic secretions, increasing the presence of protein precipitates, which can cause calcification and ductal stones(1).

Other known causes of chronic pancreatitis are genetic mutations, autoimmune pancreatitis, obstruction, and recurrent episodes of acute pancreatitis (1). 10-30% of cases are labeled as idiopathic, however these have usually been mislabeled (1).

Risk Factors

Many risk factors have been linked to pancreatitis. One of the associated risk factors is high triglyceride levels (1, 4). High triglyceride levels are thought to cause damage to the acinar cells. Blockage of the pancreatic duct is another risk factors of pancreatitis (1, 4). Obstruction of the duct causes buildup of enzymes in the pancreas and autodigestion of the pancreas (1). Blockage of the ducts causes damage to all parts of the pancreas upstream of the obstruction (1). Another risk factor is damage to the ducts or the pancreas during surgery (4). Damage to the acinar cells can result in inflammation of the acinar cells which causes pancreatitis (1). Injury and trauma to the pancreas is another risk factor pancreatitis causing inflammation of, and injury to the acinar cells (1, 4). Other risk factors of chronic pancreatitis specifically, are complications of cystic fibrosis, hyperparathyroidism, and autoimmune problems (5).

PATHOPHYSIOLOGY

Acute Pancreatitis

Acute pancreatitis is initiated by injury to the acinar cells either by direct injury or impairment of enzyme secretion, resulting in autodigestion of the acinar cells (1). Injury to the
acinar cells leads to inflammation of the pancreas and associated complications. Complications of acute pancreatitis include vasoconstriction, progressive ischemia, activation of complement system, recruitment of macrophages and leukocytes, release of inflammatory cytokines, reperfusion, release of cytokines and free radicals into the bloodstream, thrombosis and hemorrhage, and pancreatic necrosis (1). Pancreatitis follows the sepsis continuum with inflammation of the acinar cells leading to systemic inflammatory response syndrome (SIRS) which can lead to sepsis and even severe sepsis (1, 6).

Acute pancreatitis has two stages: the inflammatory cascade and the necrotizing process (1). The inflammatory cascade includes the systemic inflammatory response (1). It also includes variable degrees of pancreatic and peripancreatic ischemia (1). Stage one stays mainly within the pancreas and nearby areas with little to no extrapancreatic dysfunction (1). Stage one of acute pancreatitis lasts about one week and is of mild severity (1). This stage either leads to resolution or irreversible necrosis, liquefaction, and development of fluid collections in and around the pancreas (1). Resolution of the disease means the pancreatitis stays within the pancreas, doesn’t enter stage two, and shortly ends (1). 75-85% of cases have resolution, however 25% progress to stage two (1).

Stage two is the necrotizing process (1). Patients in stage two have a more severe case of acute pancreatitis that includes extrapancreatic, and infectious complications (1). Complications include pancreatic and peripancreatic necrosis, multiple organ dysfunction (MODS), acute fluid collection, pseudocysts (walled off collections of fluid), abscess, and, walled off pancreatic necrosis (WOPN) (1). SIRS can also lead to sepsis and severe sepsis in this stage. Most patients that enter into this stage die within the second week of illness due to pancreatic infection associated with related complications (1). Patients, however, can survive necrotizing pancreatitis,
but many come out with a scarred pancreas that can result in strictures of the main pancreatic duct which can lead to obstructive chronic pancreatitis, permanent diabetes, and malabsorption (1). Therefore, severe necrotic acute pancreatitis, especially multiple episodes of acute pancreatitis with necrosis and fibrosis, can lead to chronic pancreatitis.

**Chronic Pancreatitis**

The pathophysiology chronic pancreatitis is not completely understood but it is thought to be related to the fibrosis of the pancreas which is what characterizes chronic pancreatitis (1). Acinar cells are surrounded and replaced by scar tissue (1). The morphologic changes to the pancreas can be seen by CT scans of the pancreas (1). Fibrosis progresses within lobules and between lobules, spreading throughout the pancreas (1). Pancreatic ducts are also damaged by fibrotic tissue, creating strictures and obstruction in the pancreatic ducts (1). The Islets of Langerhans have thought to not be severely damaged until later on in the disease (1). Sasikala et al. suggest that beta cell dysfunction develops in the early stages of chronic pancreatitis while clinical diabetes is not found to manifest until later on (13). Stellate cells that are activated by alcohol and inflammatory cytokines are involved in the formation of fibrous tissue (1). Damage to the acinar cells and ducts of the pancreas, results in exocrine insufficiency (1). This can lead to severe malabsorption.

**METHODS OF MEDICAL DIAGNOSIS**

**Acute Pancreatitis**

The best method for diagnosis of acute pancreatitis is serum levels of amylase and lipase. In pancreatitis, serum amylase and lipase are three times the normal amount (7). The signs and symptoms of pancreatitis are also used for diagnosis. If the patient has the abdominal pain that radiates to the back, clay-colored stools, other symptoms, the doctor will order the above serum
lipase and amylase test to confirm (1). Ranson’s Criteria is used to determine the severity of the pancreatitis to predict outcomes of the disease.

**Chronic Pancreatitis**

Chronic pancreatitis is diagnosed by chronic abdominal pain, recurrent episodes of acute pancreatitis, and clinical presentations of steatorrhea, malabsorption, chronic weight loss, vitamin deficiencies, and diabetes mellitus (1). The same labs used in diagnosis of acute pancreatitis are also used. The doctor will also order an abdominal ultrasound, CT scan, endoscopic ultrasound, or magnetic cholangiopancreatography in order to look at the inflammation of the pancreas (5,7).

**MEDICAL THERAPIES**

**Acute Pancreatitis**

Treatment of mild cases of acute pancreatitis, require a couple days stay in the hospital with IV fluids, antibiotics, and analgesics to relieve pain (7). The patient cannot eat or drink to limit activity of the pancreas (4). These treatments are effective in decreasing pain and treating the episode. Most cases of acute pancreatitis resolve after using these treatments and patients are able to go home in a couple days (7). In some cases therapy is needed to remove gallstones, relieve blockages in the pancreatic duct, or drain fluid collected in or around the pancreas (4). Exogenous supplementation of somatostatin or octreotide, have been found to be advantageous in acute pancreatitis because they reduce exocrine pancreatic secretions and act as an important anti-inflammatory peptide in acute pancreatitis (8). In severe acute pancreatitis, aggressive fluid resuscitation, and administration of oxygen is needed to treat the associated complications. Surgery has also been commonly been carried out in patients with necrotizing pancreatitis with
proven infection (12). However, a recent found a decrease in mortality when surgery in NP patients is avoided unless there are coexisting intra-abdominal complications (12).

**Chronic Pancreatitis**

Treatment of chronic pancreatitis uses some of the same treatments as for acute pancreatitis: IV fluids, analgesics, and supplementation of somatostatin/octreotide (5). Treatment for chronic pancreatitis also includes nasogastric suctioning to remove contents of the stomach and supplementation of fat-soluble vitamins due to presence of fat malabsorption (5). Pancreatic enzyme supplements are often given to make up lack of enzymes secreted due to exocrine insufficiencies (9). In individual studies, pancreatic enzyme supplementation have been found to have beneficial effects on abdominal pain, weight loss, analgesic use, fatty stools, and quality of life (9). However, no definitive conclusion of the benefits of pancreatic enzyme supplementation can be made from all related studies as a whole (9). Antioxidants have also been found to be advantageous in the treatment of chronic pancreatitis (10). Many of these compounds have been found to improve oxidative stress and therefore be beneficial (10). Treatment of chronic pancreatitis can help decrease the pain, however, it does not treat the disease. Most patients with chronic pancreatitis frequently come back to the hospital due to recurring pain and complications.

**APPROPRIATE TOOLS FOR NUTRITION ASSESSMENT**

Clinical and biochemical tools are most appropriate for pancreatitis. Anthropometric values can be incorrect due to ascities, and fluid pooling in pancreatitis (1). Biochemical tests of serum amylase and lipase are appropriate tools for diagnosis. Tests of WBC levels and glucose levels are appropriate for classifying severity and for diagnosing diabetes, a comorbidity of
pancreatitis (1). In addition, 72-hour stool fat tests are appropriate for determining level of fat malabsorption (2). Clinical signs of weight loss, severe abdominal pain, and clay-colored stools are also appropriate for diagnosis and determining nutrition needs (1). In addition degree of weight loss, however, is another important tool to determine caloric needs and degree of malabsorption.

**MNT**

**Acute Pancreatitis**

Patients are NPO for the first 5-7 days, and fluids are maintained intravenously (2). Many times this bowel rest will resolve the pancreatitis by itself (2). If the pancreatitis hasn’t resolved itself within five to seven days, patients are put on enteral nutrition with the feeding tube placed past the Ligament of Trietz, bypassing the Ampulla of Vater. As a result enteral feeding will not stimulate the secretion of pancreatic enzymes (2). A standard formula is used for the tube feeding. If the pancreatitis still isn’t resolved after this, an elemental formula is used (2).

In severe acute pancreatitis, the same process is followed as in mild (2). If enteral isn’t being tolerated in prolonged severe acute cases, then parenteral may be given, but only as a last resort (11). Patients in severe stress may experience glucose intolerance, therefore they should be given a mixed fuel system of dextrose and lipid to avoid complications and should be given an insulin drip (2). Patients with triglyceride levels less than 400mg/dL may be given lipids but triglyceride levels should be monitored. Patients with triglycerides greater than 400mg/dL should not be given lipids but should instead be given a dextrose-based solution(2).

Once oral intake is started, the oral diet should be low in fat and easily digestible (2). The diet should be low in fat to help decrease fat malabsorption. Patients should eat six small meals a
day (2). Patients need to eat adequate protein and have increased calorie needs due to inflammation and infection (2).

**Chronic Pancreatitis**

The PES statement for many chronic pancreatitis patients will be the following: impaired nutrient utilization related to chronic pancreatitis as evidenced by steatorrhea and severe weight loss. Due to the destruction of the cells of the pancreas, digestion and absorption of many nutrients, especially fat are decreased. This results in steatorrhea and severe weight loss.

Chronic pancreatitis patients should follow the same oral diet as for acute pancreatitis, however, they need supplemental pancreatic enzymes, fat-soluble vitamins, and bicarbonate (2). They should also be given insulin and diabetes education because many also develop diabetes mellitus (2). Chronic pancreatitis patients also need to stop their alcohol consumption because it is a major cause of pancreatitis and will only make the pancreatitis worse (2).

**LONG TERM PROGNOSIS**

Prognosis of acute pancreatitis is generally good. Most cases of acute pancreatitis go away within a week (1). 25% of cases are severe with most of these resulting in death due to necrosis and multiple organ failure (1).

Prognosis of chronic pancreatitis is not as good. Chronic pancreatitis can’t be resolved, it is an ongoing disease with irreversible damage to the pancreas (1). Many times the symptoms can be decreased, but the damage cannot be reversed (1). The long term prognosis is poor with most cases leading to disability and death.
REFERENCES


