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OPEN WOUNDS OF THE PANCREAS.

Gunshot- and stab-wounds of the pancreas are rare accidents, and for the reasons stated above injury to the pancreas is usually complicated by injury to the surrounding organs. A careful search through European medical literature since 1898 revealed the reports of 8 cases of direct wound of the pancreas, 4 of which were recovered from. All of these patients were treated by laparotomy. In 1 case the wounds were sutured, but the usual treatment was by tamponade. These cases show that in gunshot-wounds of the epigastric region the pancreas should always be examined. Küttner mentions a case of stab-wound of the pancreas in which immediate laparotomy and suture succeeded in saving the patient, although the stomach also was wounded.

If the abdominal wound is large, the tail of the pancreas may prolapse; the head of the organ is so fixed behind the duodenum as to be practically immovable. If such a patient is seen soon after the accident, and the organ appears clean and uninjured, it may be sponged and restored to its normal position. If there is any doubt as to its circulatory condition, it should be ligated and excised and the wounded surface reduced to a minimum by suture.

CHANGES IN POSITION OF THE PANCREAS.

The head of the pancreas is so firmly adherent to the movable duodenum that changes in its position are practically unknown. The tail of the organ is attached to the spleen, and it may be displaced with the spleen. In rare cases the pancreas has been found in the sac of a congenital or acquired umbilical hernia, or in a diaphragmatic hernia.

CHAPTER XXIX.

DISEASES OF THE PANCREAS.

HEMORRHAGE IN THE PANCREAS AND ITS VICINITY.

SPONTANEOUS hemorrhage may occur in the pancreatic tissue, producing distention of the organ and sudden death. This accident occurs chiefly among stout individuals and takes place suddenly without warning, so that a person apparently in perfect health is seized by an attack of intense epigastric pain with nausea and vomiting, followed by rapidly increasing collapse and death. The cause of such hemorrhage is not fully understood, for in certain cases the pancreas appears perfectly normal; in other cases, however, fatty degeneration of the gland or disseminated fat-necrosis, or degeneration of the vessel-walls exists before the attack of hemorrhage.

Slighter hemorrhages may also occur in the pancreas in connection with general circulatory disturbances. Hemorrhage from traumatism was spoken of in the preceding chapter.

The diagnosis of pancreatic apoplexy cannot be made with much certainty, and on account of the rapid course of the affection treatment has thus far proved useless. Operation and control of the hemorrhage by gauze packing are rendered difficult or impossible by reason of the intense collapse.

There are a few cases in which hemorrhage has ceased spontaneously after the first attack and a blood-cyst has formed in the pancreas. Rasunowski operated successfully several weeks after such an acute attack.

The patient may recover from the hemorrhage and suffer from the destruction of pancreatic tissue which is secondary to it. Operation may then be required on account of the pancreatic necrosis. This idiopathic hemorrhage should be carefully distinguished from the hemorrhage occurring in an inflammation of the pancreas, or acute hemorrhagic pancreatitis, as it is called. (See page 722.)

INFLAMMATIONS OF THE PANCREAS.

Inflammations of the pancreas have recently excited a great deal of surgical interest and many cases have been reported. It is quite likely that slighter forms of inflammation frequently accompany affections of the mucous membrane of the upper portion of the alimentary canal or of the biliary passages, but these milder forms escape notice.

The severe forms of inflammation leading to suppuration, necrosis, or induration often require surgical treatment.

The pancreas may become acutely inflamed from the blood in such infectious diseases as smallpox, puerperal fever, and typhoid, as well as in pyelophlebitis. The inflammation in such cases is a part of the general pyæmic process, and is therefore scarcely amenable to surgical treatment.

The gland may become inflamed from the intestine or common bile-duct if micro-organisms find their way into the pancreatic duct. Furthermore, ulcerative processes of the stomach and duodenum may permit the entrance into the pancreas of germs of inflammation. A calculus near the pancreatic duct may be the predisposing cause of inflammation. In such circumstances micro-organisms may either pass up the pancreatic duct, setting up suppuration which extends to its minute branches, or they may pass through the wall of the pancreatic duct and spread in the intralobular and periacinous tissue. (Dieckhoff.)

Inflammation has been set up experimentally by the injection of irritating substances and of bacteria. There may follow, according to the degree of irritation or to the virulence of the bacteria, sclerosing or suppurative or hemorrhagic or necrosing inflammation.

The occurrence of pancreatitis in connection with cholelithiasis, and especially in connection with a calculus of the common duct, has been repeatedly observed. Halsted cites a most instructive case. He operated for acute hemorrhagic pancreatitis but failed to save the collapsed patient. At autopsy Opie found a small calculus which closed the papilla of the duodenum. Bile had already made its way into the pancreatic duct. The injection of 5 c.c. (77 grains) of the bile from this patient into the pancreatic duct of a dog brought about an acute hemorrhagic inflammation.

In men injury of the pancreas and spontaneous hemorrhage are predisposing factors for inflammation, since the destruction of the gland-tissue forms a favorable soil for infection extending to it from the intestine.

Chiari and Pförringer speak of self-digestive processes in the pancreas. It is possible that they play a part in connection with inflammation and trauma.

DISSEMINATED FAT-NECROSIS.

Ponfick and others have called attention to the disseminated necrosis of fatty tissue which often accompanies traumatism, inflammation, or necrosis of the pancreas. In such circumstances there exist in the fat-tissue around the pancreas, behind the peritoneum, in the mesentery and omentum, numerous yellow spots varying in size from that of a flaxseed to that of a pea, which if examined microscopically show the necrotic changes of fatty tissue. The fat-cells break up, the fluid portions are resorbed, and the solid portions (fatty acids) unite with calcium to form fatty acid lime salts. (Langerhans.) This fat-

necrosis is most frequently seen in connection with hemorrhagic pancreatitis, gangrene and injury of the pancreas, and less often in connection with suppurative inflammation. Observers disagree on the question whether the fat-necrosis is the primary change or whether it is secondary to changes in the pancreas. Those who hold to the latter theory believe that the changes in the fatty tissue may be due to pancreatic juice which escapes from the injured or inflamed gland. Similar changes can be produced in animals by the action of the pancreatic juice.

On the other hand, it is to be noted that disseminated fat-necrosis is occasionally found at autopsy in persons whose pancreas seems perfectly healthy, so that it is conceivable that pre-existing fat-necrosis of the pancreas or in its vicinity favors the occurrence of hemorrhage or inflammation.

Fitz, who first studied inflammations of the pancreas extensively, divided them into suppurative, acute hemorrhagic, and necrotic. This classification serves for practical purposes, although cases are found which present combinations of these three forms of inflammation.

SUPPURATIVE PANCREATITIS

Inflammation of a suppurative character is usually due to the entrance of germs from the intestine or biliary tract. A diffuse suppurative infiltration of the gland results which often leads to secondary necrosis of a considerable portion of the organ. Sometimes a number of disconnected abscesses are formed, or there may be a single large abscess cavity. The pus breaks its way into the peripancreatic tissue and often perforates into the lesser peritoneal cavity; or it may work its way retroperitoneally and around in the loin; or it may burst above the lesser curvature of the stomach into the left subphrenic space. The abscess may also rupture into the stomach or intestine. Suppurative thrombi may form in the branches of the portal vein and lead to abscesses in the liver and spleen. Rupture externally rarely occurs. The process may go on extraperitoneally, but usually there will be set up a circumscribed or diffuse peritonitis. Various micro-organisms (pus cocci, diplococci, bacterium coli) have been found in the pus from these abscesses.

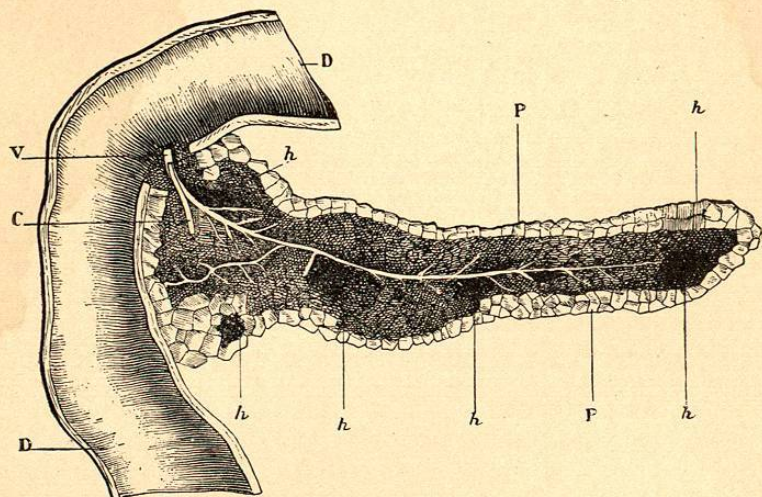
Some cases of suppurative pancreatitis begin acutely with pain in the epigastrium, nausea, vomiting, disturbances of digestion; or they may begin with chills and fever. In other cases the disease begins gradually with repeated attacks of pain and gastric disturbances. Attacks of biliary colic often precede the pancreatitis.

Suppurative pancreatitis in general is less acute than the hemorrhagic form. It is characterized by a circumscribed inflammation in the epigastrium which in many cases makes a distinct inflammatory tumor which can be recognized by palpation. It is seldom accompanied by glycosuria, although this symptom may develop as the disease progresses.

HEMORRHAGIC PANCREATITIS.

The second form of acute inflammation of the pancreas is associated with hemorrhages into the substance of the gland and leads to necrosis of portions or the whole of the pancreas. The onset of the trouble is usually most violent. The patient is suddenly taken with intense continuous or recurring epigastric pain, so that consciousness is often lost. There are nausea, vomiting, and cessation of peristaltic action. The abdomen is distended, especially in its upper portion; the pulse is small and rapid. There may be no fever whatever. This disease has frequently been mistaken for intestinal obstruction or perforative peritonitis. Its most marked symptom is the increasing collapse.

FIG. 335.



Hemorrhagic pancreatitis: D, duodenum; P, pancreas; V, canal of Wirsung; C, common duct; h.h., hemorrhagic areas. (Laboulbène.)

Operation has several times been performed in this acute stage of the disease, usually with fatal result. Several surgeons have, however, saved their patients by opening the peritoneal cavity and allowing the bloody or serous exudate to escape. If the patient dies in this acute stage of the affection, his pancreas will be found swollen and saturated with blood, while the cut section presents an appearance of marble. (Fig. 335.) The peritoneum is intensely reddened and the peritoneal cavity contains more or less bloody serum. Disseminated fat-necrosis frequently coexists. There may be desquamative inflammation of the pancreatic duct, and there are often thrombi in the surrounding veins. Microscopical examination of the pancreas shows hemorrhages in its tissue, intense infiltration with leucocytes, and commencing necrosis in the portions most affected. Cholelithiasis often coexists.

The diagnosis in this acute stage can only be a probable one, and there is little encouragement for operating on account of the strong tendency to collapse. If operation is performed, it should be done as quickly and simply as possible. Although there are symptoms of intestinal obstruction, no mechanical obstruction has yet been made out. The cessation of peristaltic action is probably due to a spreading peritonitis, or to an intense irritation of the nerve-centres of the solar plexus.

If the patient survives the first stage of the disease, partial or total necrosis of the organ results. The same effect may be caused by non-inflammatory spontaneous or traumatic hemorrhage into the gland or in its vicinity. The necrosis itself causes intense symptoms which often lead to collapse and death; but sometimes the acute stage passes into a chronic one with gangrene of the affected portion of the gland.

NECROSIS OF THE PANCREAS.

Pancreatic necrosis, whether it results from inflammation, or hemorrhage, or traumatism, gives rise to fairly characteristic symptoms and is amenable to surgical treatment.

The affected portion of the gland becomes separated from the living portion by a reactive inflammation. This inflammation is usually due to the bacteria which caused the original inflammation; or the germs may be introduced later from the intestine into the necrotic tissue. The necrotic focus is situated behind the peritoneum; and even though the peritoneum be not involved, there is a tendency to further extension of the affection, as is the case in pancreatic abscess. This extension may take place in the various directions mentioned under the head of pancreatic abscess, and which can be demonstrated by injections of coloring-matter in the cadaver. The process may break through the peritoneum into the lesser peritoneal cavity, or it may extend retroperitoneally to the right, especially if the head of the pancreas is affected, or to the left if the tail is the seat of necrosis, working its way in either case behind the colon to appear below the kidney in the loin. This gangrenous cavity, which contains the necrotic gland, may remain encapsulated; or it may rupture into the peritoneal cavity or into the intestine. In the latter case the necrotic pancreas may be discharged through the rectum. The neighboring veins are exposed to the risk of infection with subsequent abscess of the liver or spleen. In rare instances necrosis goes on without suppuration.

The symptoms of this stage of necrosis are those of a circumscribed inflammation in the upper portion of the abdomen. They are not so violent as those of the first stage. Fever is usually of an intermittent type. Gastric and intestinal digestion is affected, and the patient loses flesh and strength. The urine does not contain sugar unless it did so previous to the pancreatic attack (diabetes). The skin often becomes dry and has a grayish-brown coloration.

The diagnosis rests upon the sequence of symptoms described above and the existence of an inflammatory tumor in the upper abdomen. The latter is the chief point in diagnosis. This tumor can be shown to lie behind the stomach and colon by distention of these organs with air. In this manner empyema of the lesser peritoneal cavity can be recognized. It should be borne in mind that ulcerative processes in a stomach or duodenum (simple ulcer or carcinoma) may lead to suppuration in the same space.

SURGICAL TREATMENT OF SUPPURATION AND NECROSIS OF THE PANCREAS.

The object of surgical treatment in suppuration within or in the neighborhood of the pancreas is to open and drain the abscess cavity. If this is done before general peritonitis or suppurative thrombosis or hepatic and splenic abscesses have complicated the pancreatic condition, recovery may follow.

The operation varies according to the seat of the suppuration. If the pus is in the lesser cavity of the peritoneum, an incision should be made in the linea alba and then through the gastrocolic omentum. The gastrocolic omentum is surrounded by gauze and incised between ligatures or torn through. The pus cavity may be wiped clean or irrigated with saline solution, and drained with large tubes surrounded by gauze. If the cavity extends clear to the left, a counteropening for drainage should be made in the loin. Cases in which the cavity is best drained above the stomach or below the transverse colon are rare. If cholelithiasis and pancreatic abscess coexist, the abscess may be opened from the right side of the jejunum. This complication of cholelithiasis is sufficiently common to make it advisable to examine the head of the pancreas in every case in which a calculus is situated in the common duct. If the pus at the time of operation has already made its way along the colon to the lumbar region, incision and drainage should be made in that situation.

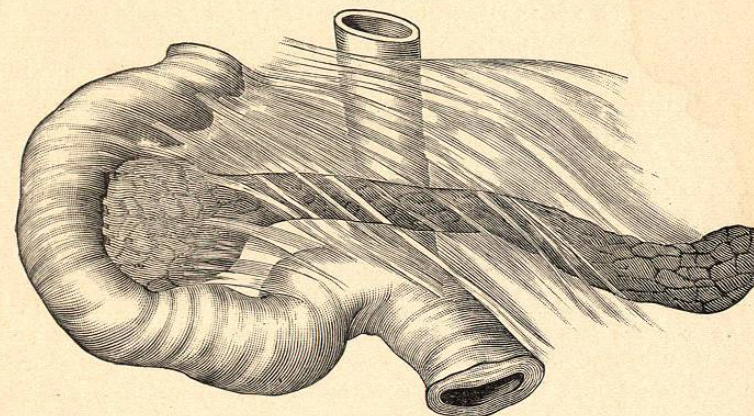
When the abscess cavity is opened, the pus and gangrenous material and necrotic portions of the pancreas forthwith make their escape. Such a patient is exposed to the risk of secondary hemorrhage from large eroded vessels, and to that of purulent thrombosis or embolism. If he recovers, there usually exists a pancreatic fistula in the site of the incision which may ultimately close spontaneously. One case is recorded in which a patient who recovered from operation suffered from symptoms of diabetes one and a half years afterward, from which he died seven years after operation. At autopsy only the head of the pancreas was found, the site of the body and tail being occupied by scar-tissue. There is doubt whether the diabetes in this case was due to the loss of a part of the pancreas. There are other cases in which sugar was found in the urine either at or immediately after operation, and in which this condition must be looked upon as the cause rather than the effect of the pancreatic abscess.

In recent literature there are numerous reports of successful operations for pancreatic suppuration either with or without necrosis. At least 18 such cures were reported up to the year 1901.

CHRONIC INTERSTITIAL PANCREATITIS.

There is an inflammation of the pancreas in which new-formed connective tissue surrounds the lobules of the gland and extends around the vessels and ducts and penetrates between the acini. The parenchymatous tissue atrophies and is replaced by connective tissue and fat. This process occurs especially in the head of the gland, where it can easily cause symptoms by pressure upon the common bile-duct or upon the duodenum. The affected portions of the gland are swollen, hard, and nodular. Incision into this tissue shows it to be abnormally firm. The inflammation frequently leads to the development of numerous small

FIG. 336.



Sclerosis and atrophy of pancreas following partial obstruction of the canal of Wirsung.

cysts. This interstitial inflammation may be due to infection from the bile-ducts, duodenum, or stomach (the ascending method of Dieckhoff); or it may be due to pancreatic lithiasis, or to an obstruction of the pancreatic duct by scar-tissue or a tumor (Fig. 336); or it may be due to traumatism. Finally, its origin may be hæmatogenous (syphilis, arteriosclerosis, alcoholism).

Chronic pancreatitis has been caused in animals by contusion of the gland, by obstruction of its duct, and by the injection of irritating chemical or bacteriological material.

The clinical symptoms of interstitial pancreatitis are rather indefinite. They are gastric disturbances, constipation or diarrhœa, dull pain in the epigastrium, sometimes with periodic exacerbations, emaciation, loss of strength, and in certain cases jaundice and symptoms of duodenal obstruction. None of these symptoms is by itself sufficient for a diagnosis of this disease. The head of the swollen gland can some-

times be felt as a hard, tender tumor in an emaciated patient whose ribs are not too long. But even under such circumstances the differential diagnosis from carcinoma is scarcely possible. The course of the trouble is usually very chronic. It may cost the life of the patient by disturbances of nutrition or by pressure upon the common duct, duodenum, or portal vein.

The experience gained by exploratory laparotomies and by operations upon patients in whom cholelithiasis and pancreatitis coexist have shown that chronic inflammation of the head of the pancreas may disappear if biliary obstruction or duodenal stenosis is relieved. Obstruction of bile due to calculus in the common duct does not ordinarily distend the gall-bladder. Obstruction due to interstitial pancreatitis usually distends the gall-bladder. The characteristic attacks of biliary colic are not apt to occur unless there are calculi. If the patient suffers at the same time from interstitial pancreatitis and calculi, a diagnosis is extremely difficult. The disappearance of swelling of the pancreas when biliary obstruction is overcome is supposed to be due to removal of the irritation set up by the presence of a calculus, or an accompanying inflammatory process.

Operation consists in the removal of calculi and inflammatory products from the gall-bladder and ducts, together with subsequent drainage. If no calculus is found, but a distention of the biliary passages, colostomy or cholecystenterostomy is indicated. The first operation is followed by a biliary fistula which may close spontaneously if the pancreatic swelling decreases sufficiently to relieve the pressure on the common duct. Anastomosis between the gall-bladder or ducts and the small intestine saves the patient from a biliary fistula, but it is a difficult operation, and there is a certain risk that intestinal bacteria will enter the biliary ducts and set up cholangitis. By palpation alone it is scarcely possible to distinguish carcinoma of the head of the pancreas from interstitial pancreatitis even after the abdomen has been opened.

CYSTS OF THE PANCREAS.

Pathological Anatomy.—Since Gussenbauer, in 1882, first called attention to the correct diagnosis and treatment of pancreatic cysts a great many operations for this condition have been recorded. Körte collected 177 up to the beginning of 1902.

The origin of pancreatic cysts has been carefully studied by Dieckhoff, Tilger, and Lazarus. They classify them into:

1. Retention-cysts of the pancreatic duct.
2. Proliferation-cysts, or cystadenomata.
3. Retention-cysts due to obstruction of the minor branches of the pancreatic duct the result of interstitial pancreatitis. The inflammation may be of traumatic origin or it may be an ascending inflammation from the intestine.
4. Cysts that develop by softening in tumors (carcinoma), by the

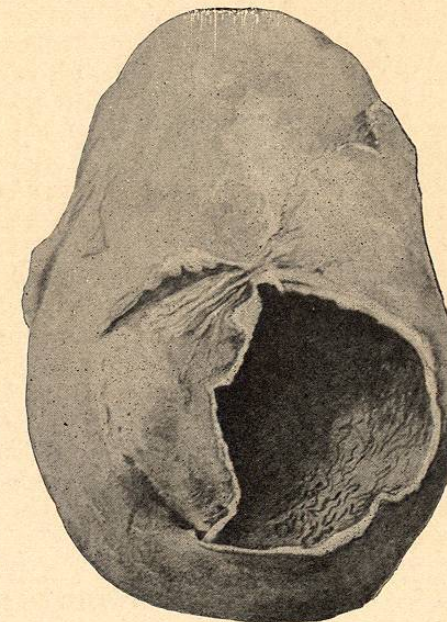
digestion of encapsulated hemorrhage, and by the degeneration of a part of the pancreas in acute pancreatitis.

5. An inflammatory or traumatic exudate may rupture into the lesser peritoneal cavity and so simulate a cyst of the pancreas. Such a false pancreatic cyst has also been observed after necrosis of the pancreas without gangrene.

Retention-cysts due to obstruction of the pancreatic duct have been observed for the most part only at autopsy. The other forms of cysts mentioned are met with at operation. As in most instances the cyst has been sutured in the abdominal wound and drained, its exact nature has not been determined; but there are many facts which go to show that true cysts of the pancreas frequently develop. Such a cyst is at first lined with epithelium, but these cells are often digested away in the course of time, so that they will not be found at the time of operation. The complete cure which follows the drainage of such a cyst is to be attributed to this fact. If the epithelial cells persisted, obliteration of the cavity of the cyst would be impossible. Many of these cysts contain more or less blood which has escaped from erosions in the cyst-wall due to the digestive action of the contents of the cyst.

The cysts which follow a traumatism of the upper portion of the abdomen have been ascribed by some writers to hemorrhage into the lesser cavity of the peritoneum; but experiments upon animals show that a hemorrhage into the pancreas will not be absorbed, but will give rise to cystic formation if the conditions are unfavorable for resorption (application of tincture of iodine to the injured parts). Thus there seems little doubt that true pancreatic cysts may follow hemorrhage into the human pancreas. On the other hand, some of the cysts which develop from hemorrhage into the gland or in its vicinity are so-called false pancreatic cysts and are situated in the lesser cavity of the peritoneum. In some of these cases the injury of the pancreas leads to a discharge of pancreatic secretion into the false cyst, so that its contents at the time of operation may have digestive powers, and a pancreatic fistula may even follow operation.

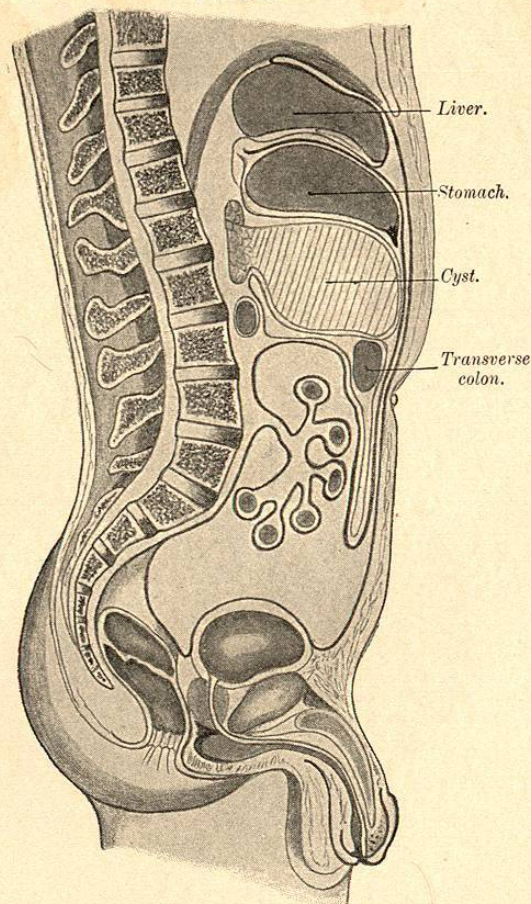
FIG. 337.



Pancreatic cyst. (Warren Museum.)

A lymph-cyst may develop in the vicinity of the pancreas although it has nothing whatever to do with this organ. Indeed, in some cases it is extremely difficult to determine the origin of a cyst unless at operation or at autopsy one is able to make a careful examination of the relations between the cyst and the pancreas. The presence of pancreatic ferments in the contents of a cyst, or in the secretion following drainage of a cyst, makes it clear that the cyst originated in the pancreas.

FIG. 338.



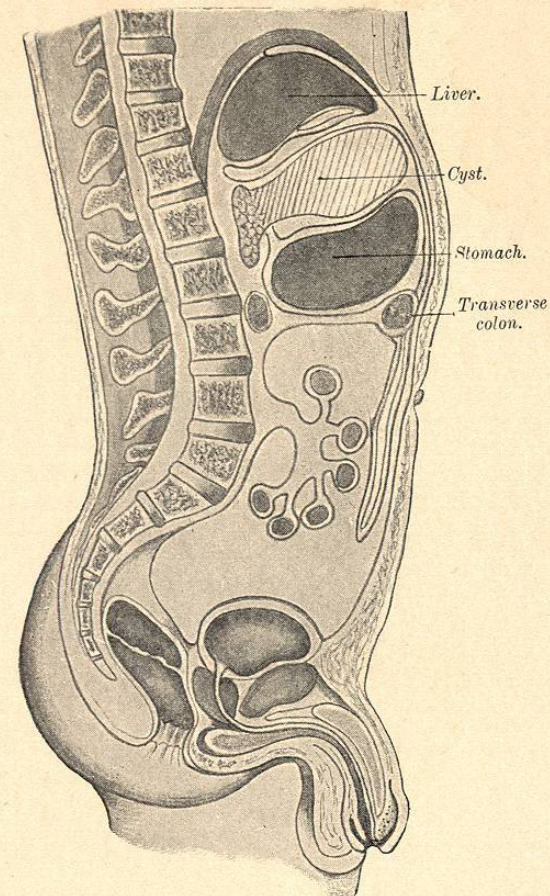
Cyst of the pancreas developing between the stomach and transverse colon. The gastrocolic omentum lies in front of the cyst.

Echinococcus cysts of the pancreas have been mentioned, but they occur with great rarity.

Symptoms.—Pancreatic cysts are usually seen during middle life, although they may occur at any age. Both sexes are equally affected. A pancreatic cyst usually develops slowly and does not attract attention

until it begins to press on the neighboring organs; but in about one-fourth of the cases it clearly follows a traumatism of the upper portion of the abdomen. The interval between the traumatism and the time when the cyst is first noticed varies between a few weeks and several years. If a cyst develops in a few weeks after injury, the fluid will usually be found in the lesser cavity of the peritoneum (false cyst).

FIG. 339.



Cyst of the pancreas developing between the stomach and liver. The lesser omentum, and possibly the foramen of Winslow, is crowded forward by the cyst.

The patients in whom a cyst is not noticed until many months after traumatism have generally suffered in the meantime from attacks of pain, etc., in the upper abdomen. Other cysts not due to traumatism are preceded by a series of inflammatory symptoms, gastric disturbance, and colicky pain.

Most of the symptoms complained of in case of pancreatic cyst are