

ACUTE PANCREATITIS

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WHILE acute pancreatitis represents but a small number of the acute abdominal surgical emergencies admitted to the wards of the Mt. Sinai Hospital, New York City, it constitutes a definite proportion of those arising within the confines of the upper abdomen. It is a severe abdominal catastrophe, and one attended with a grave prognosis. It seems strange with the strides which general surgery has made within recent years that the mortality of acute pancreatitis should still be so high. The factors which are instrumental in producing this mortality have been fairly well recognized, but the present method of treatment is far from standardized and it is questionable whether it is either proper or adequate. It is only by a frank clinical discussion of this condition that some light may be shed upon this rather complex, intricate and obscure problem, and with this point in view, a series of fifty-four cases of acute pancreatitis were analyzed. This comprises fifty-one consecutive cases of acute pancreatitis and three secondary to operative interference.

A review of the literature of this condition is unnecessary, for this has been recently covered by Schmieden and Sebening¹ in a very excellent and comprehensive paper.

The etiological factors which cause this disease are still controversial and the methods of infection and portals of entry are open to debate. Innumerable researches have stressed either one or another mechanism, and, when all are considered, it is more than likely that each avenue of infection may be responsible for individual cases.

Theoretically, infection may take place through the ducts, via the common bile duct, the duct of Wirsung, or the duct of Santorini (abetted by direct infection from the duodenum); by way of the lymphatics; through the vascular system by embolism or thrombosis; by contact with suppuration in adjacent viscera; and, lastly, by direct or indirect trauma. Certainly any survey of cases emphasizes the ductal, the vascular and the traumatic etiology. But, pathologically, the œdema, hæmorrhage and pancreatic necrosis present at the time of operation or autopsy often obscure that which may have been the responsible etiological factor in the incipient stage of the disease.

The rôle of pancreatic and bile duct variations as responsible factors has elicited considerable comment and they certainly must play an important part in the production of innumerable cases of pancreatitis. There can be no doubt that in many instances the acute inflammatory changes are due

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to those variations which favor pancreatic retention and the retrojection of infected bile into pancreatic tissue. Opie² was the first to describe an autopsy of acute pancreatitis in which a small stone lodged in the papilla caused a retrojection of infected bile into the pancreatic duct. This mechanism has been questioned by Mann and Giordano³ who after a series of careful dissections concluded that the anatomical possibilities of such a mechanism were present in only 3.5 per cent. of their autopsy findings. They concluded that the number of instances is very small in which the anatomic arrangement of the two ducts would permit the passage of bile into the pancreas. Besides, in man the sphincter is located at such a point that when it does contract, both ducts are closed and not converted into a continuous channel. However, in a few cases, a small bundle of muscle fibres is found so located that when contraction takes place both ducts are converted into a continuous channel. While Mann and Giordano admit that experimental investigation has proved an anatomic and physiologic basis for the theory of pancreatic reflux, they believe that the physiologic possibility of infiltrating a pancreas with bile to cause acute pancreatitis must be exceedingly rare. In addition, any mechanism affording the passage of bile into the pancreatic duct will also obstruct the flow of pancreatic juice. Therefore, because of these reasons, the causation for most cases of pancreatitis must be sought elsewhere. Other investigators, however, were able to force bile into the pancreas experimentally by closing the papilla in from 20 per cent. to 66 per cent. of their cases.

No one can deny that gall-bladder disease bears an important relationship to acute pancreatitis. In this series about 85 per cent. of the patients presented pathological evidence of cholecystitis or cholelithiasis. In the fifty-one cases in which the pancreatitis was primary, (not secondary to operative and mechanical trauma) gall-bladder disease was present in forty-one of the forty-two cases in which the gall-bladder was described at the time of operation, and present in three of four autopsies on five unoperated cases. The gall-bladder at operation contained stones in twenty-eight, was enlarged in nine, shrunken and thickened in four, and in only three instances was it definitely described as normal, although two of these cases subsequently discharged stones through a cholecystostomy. On the other hand, in the ten-year period from 1917 to 1926 in which 1280⁴ patients were operated for gall-bladder disease, only thirty-four presented evidence of acute pancreatitis, about 2.66 per cent. This percentage falls well within the conservative 3.5 per cent. of the anatomic possibility of duct arrangement permitting biliary retrojection. In eight autopsies in which the finer anatomy of the ducts was given, six probably presented the variations possible for biliary retrojection. While Schmieden was able to demonstrate calculi at the papilla of Vater in seven of thirty-one cases of acute pancreatitis complicated by stone, in this series a papillary calculus was only encountered in one case although the common duct was dilated in seven instances. But the ampulla of Vater may be occluded either reflexly, or by the oedema and spasm in some cases incident

to the passage of a stone, and in others by inflammatory pancreatic enlargement. No better evidence of papillary spasm or oedema converting the bile and pancreatic ducts into one channel can be found than the occasional case of choledochal drainage attended by pancreatic reflux with the absence of duodenal contents.

Two cases in this series, as demonstrated by autopsy, were undoubtedly due to direct infection from the duodenum or the retrojection of the succus entericus, one via the duct of Wirsung opening separately and directly into the duodenum, and one by the way of Santorini. In the latter instance, the duct of Wirsung was found to be obliterated and the duct of Santorini opened directly into the duodenum.

The lymphatic origin of pancreatitis while defended by some^{5, 6} has never been satisfactorily proven experimentally, and certainly the weight of anatomical, experimental^{7, 8} and clinical evidence speaks against it. If lymphatic drainage is responsible for cases of acute pancreatitis, why is no instance of it recorded in our two hundred and thirty-five cases of acute gall-bladder disease, and why was it such a rare complication in 1045 cases of chronic cholecystitis and cholelithiasis?

There are a few cases in this series in which the disease occurred in localized areas of the gland. A few of these may have been due to either embolism or thrombosis engrafted on an arteriosclerotic basis.

Operative trauma is not an unusual cause for acute pancreatitis. It has been known to follow operations upon the stomach, duodenum and the gall-bladder. In two cases of subtotal gastrectomy, the injury was due to operative damage to the pancreas in dissecting an adherent perforating duodenal ulcer from the gland in one, and to infection of the tail of the pancreas by a contiguous secondary intraperitoneal abscess. In one case the pancreatitis followed a cholecystectomy with drainage, but the exact mechanism in this case was not discoverable.

The clinical picture of acute pancreatitis was often quite bizarre and the diagnosis was rarely made before operation by most surgeons because the greater frequency of other acute upper abdominal conditions invariably dominated the mind. The fact that most surgeons and clinics have their own individual pathognomonic symptoms and signs by which the condition is suspected proved quite conclusively that the symptomatology is extremely variable. Each case must, therefore, be judged on its own merits. A clinical analysis of the fifty-one primary cases in this series disclosed thirty-three of these sufferers were females and seventeen males. The fourth decade seemed to be the one in which the disease was most prevalent although it occurred in a patient as young as twenty-three and one as old as sixty-nine. The past history of these cases is extremely interesting. A symptomatology of gall-bladder disease was recited by almost half. The typical attacks of right upper abdominal pain occasionally radiating to the shoulder, often accompanied by nausea and vomiting and less frequently by signs of acute infection as manifested by chills and fever were not unusual. Occasionally the history was

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that of an ulcer and in fact a few were given medical treatment for this condition.

While 50 per cent. gave a past history of abdominal symptoms varying from weeks to years, the remainder stated their present attack was the first intimation of the disease. The duration of the present complaint varied from a few hours to several days.

The pain in acute pancreatitis was intense and oftentimes so severe as not to be relieved by morphine. In twenty-two patients it was described as originating in the right upper quadrant, radiating to the back in three, and to the umbilicus in one; in eighteen the pain was given as epigastric in nature, often substernal in origin; in nine it was depicted as cramp-like, generalized to the entire abdomen, and in one it was localized to the right lower quadrant, and in one to the left upper quadrant. Vomiting, which was usually severe, was present in thirty-four cases. Twenty-two patients suffered from severe obstipation, and the distention in a large percentage was unrelieved by enemata.

The general appearance of these patients which may be used as an index for surgical procedure seemed to vary directly with the extent and type of pathologic involvement. The average case appeared shocked and acutely ill, and four were in apparent collapse. The pulse though small was not extremely rapid, the temperature was not unduly elevated, in fact a high temperature was unusual, and the respirations were slightly increased. Clinical evidence of jaundice was rare. What the Van den Bergh tests might have shown is not known, but it may have thrown some additional light on the relationship of transient biliary obstruction to the etiology of acute pancreatitis. Cyanosis has been commented upon by others. In this survey it was noted four times. While cyanosis might be due to an anoxemia associated with insufficient aeration secondary to diaphragmatic paresis incident to acute pancreatic pathology, there is still another possible explanation. Inasmuch as the liberated lipase splits fat, there may be an increase in the amount of free blood fat with multiple fat emboli to the lung. As a matter of fact, the frequency of lung involvement in these cases is well known and it is barely possible that the bronchopneumonia occasionally present may be embolic. Three cases in this series were diagnosed on admission as primary pneumonia before it was apparent that the lung involvement was secondary to subdiaphragmatic pathology.

The abdominal examination disclosed tenderness in the right upper quadrant in seventeen, epigastric tenderness in two, localized about the umbilicus in five and generalized throughout the abdomen in eight. Tenderness in the left loin is supposed to be characteristic. This was noted in seven cases. It may be due to distention of the lesser sac with exudate or possibly to involvement of the tail of the pancreas or both. Rigidity was present in the right upper quadrant in thirteen, left upper quadrant in three, confined to the upper abdomen in two, and generalized in eight. Distention was noted in eighteen patients. In seven cases a mass was palpable in the

area of the right upper quadrant, and operation disclosed that this was an enlargement of the gall-bladder in six instances, and in one a pancreatic abscess. Free fluid by physical sign may or may not be present.

The leucocyte count was high. In 75 per cent. it was over 15,000, and in 36 per cent., above 20,000. The average was about 20,000 white blood cells with a leucocytosis of about 85 per cent. The urine examination was rarely of significance. Bile was present on four occasions and sugar twice.

Abdominal puncture⁹ which was employed several times when positive was really of great aid. The intraperitoneal aspiration of a characteristic oily beef juice fluid is almost pathognomonic of acute pancreatitis. It was performed seven times by Doctor Neuhof and Doctor Cohn and this was positive in six instances. This test as an aid in differential diagnosis has not been given the place it deserves in the evaluation of abdominal pathology.

This review of the clinical history and physical examination makes it quite clear that the diagnosis of acute pancreatitis must really be made by exclusion and it must be differentiated from the acute cholecystitis, gastroduodenal perforations, acute intestinal obstruction, acute appendicitis and other conditions. The text-book differentiations of these are well known and need no discussion here.

When once a diagnosis of acute pancreatitis is made or suspected, the question arises as to procedure. Recently several have advocated quite strongly the non-operative treatment, feeling that the mild cases invariably subside without any sequelæ and that many of the fulminating cases would do better if operated after the disease had localized and abscess formation had taken place and the period of shock had passed. The autopsies of four of five unoperated cases are silent witnesses as to the efficacy of this procedure. There is no doubt that some cases have recovered with the expectant treatment; a few have done well following the drainage of a localized abscess after an acute attack, and several would have died regardless of surgical intervention, especially in those cases in which the entire pancreas seemed almost immediately converted into an œdematous necrotic mass. But what harm is done by surgical exploration? There seems very little to be lost and much to be gained and when it is all weighed, many more cases have probably died from skillful neglect than from active intervention. Acute pancreatitis cannot be considered as a medical disease and the expectant treatment has no more a place here than it would have in acute appendicitis or perforated ulcers.

In this series, the majority of the cases were explored under general inhalation anæsthesia. Spinal anæsthesia, provided that the blood pressure is not too low, is probably the best. Inhalation anæsthesia is to be avoided if possible, especially if any credence is to be placed upon the frequency of embolic lung manifestations. Inasmuch as the majority were diagnosed as gall-bladder disease, an upper right rectus muscle-splitting incision was made, and as a rule this afforded adequate exposure. The findings in the main were quite characteristic. Free fluid varying from a clear amber exudate to the beef broth fluid so characteristic of this condition was present in 45 per

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cent. of the cases. It was serous in two, bloody in fourteen, and chocolate colored in four. Its general appearance and consistency may be taken as an index of the stage of pancreatic involvement. Fat necroses which are so pathognomonic of the condition were observed at operation in thirty-two cases and were not noted in fourteen. In one of these, the abdominal wound showed evidences of this after operation, in seven the necroses were intraperitoneal and in seven intra and retroperitoneal. Retroperitoneal fat necroses are a serious complication and their presence increases the degree of protein intoxication. In five autopsies the fat necroses were absent, although three of these were cases of secondary pancreatitis. As is well known, these are caused by the action of the liberated lipase on fatty tissues splitting them into fatty acids and glycerine. The lipase is freed during the digestion of the pancreatic cells by the activated trypsinogen. The free fat then combines with the calcium of the blood and tissue juices to form the characteristic lesion. Their extent, locations, number and size vary from a pin-head to a diameter of several millimetres, but their number and extent is no evidence of the severity of pancreatic destruction. They have been known to suppurate, but in the majority of cases they generally disappear. One case operated years later for chronic cholecystitis showed absolutely no evidence of this condition although at the primary operation the fat necroses were described as extensive.

The gall-bladder, as has been previously mentioned, invariably presents some pathology. The pancreas was described as hard and enlarged in the majority of cases, but after all it is always rather difficult to judge the pathology of this retroperitoneal organ simply by the sense of feel and to visualize it is rather a hazardous procedure in patients sick as these. Occasionally if suppuration was present, the pancreas gave the impression of being elastic or cystic, and in a few cases in which a localized abscess was present, fluctuation was felt.

However, the question of the proper operative procedure is still an open one and a problem which should receive serious consideration. What these patients are suffering from is really an acute protein intoxication, the result of the autolytic action of liberated pancreatic secretion and the toxic products from a necrotizing pancreas. The object of surgical intervention should be the free external drainage of the liberated pancreatic secretions and the products resulting from their digestive action, the possible protection of the pancreas against any further destructions and the removal, if possible, of the factor causing the pancreatitis.

The free drainage of the toxic protein products presents some difficulty.

A certain proportion of these poisons may be removed by a thorough and complete suction of the free fluid within the peritoneal cavity at the time of operation. At times, in mild cases, as evidenced by the clinical reaction of the patient and the operative findings, this may be all that is necessary. In severely toxic cases, however, this will not suffice. Ottenberg and Wilensky¹⁰ have suggested exsanguination transfusions to further reduce the protein

intoxication of the blood. But the problem of actual pancreatic drainage is not easily solved. The fact that there are fat necroses means that there must be some free drainage from the pancreas. In some cases, this is sufficient; in others, not. Drainage, however, could be theoretically augmented by a liberal and free incision of the capsule of the pancreas. This is impractical as a rule, not only because of the anatomical location of the gland, but mainly due to the peculiarity of the tissue, which, if traumatized, will digest itself. Pancreatostomy is a heroic procedure and, with the proximity of the splenic vessels, it is fraught with dangers disproportionate to the advantages derived. Three of the four cases in which it was done, died. While incision of the pancreas is not feasible, the peritoneum overlying the pancreas may be bluntly incised and rubber-dam drainage employed. This approach may be either through the gastrocolic or gastrohepatic omentum. This manœuvre not only relieves the tension of a swollen œdematous pancreas, but provides an exit externally for the liberated secretions and minimizes the danger of retroperitoneal invasion. This retroperitoneal invasion is a great menace and contributed greatly to cause of death in 33 per cent. of the autopsied cases in which it occurred.

In addition, in these severe cases, a cholecystostomy is usually indicated for more reasons than one. There is no doubt that the surgery of acute pancreatitis has been justly influenced by the association of this condition with gall-bladder disease, and for this reason in any case of acute pancreatitis the gall-bladder and its ducts should receive the most careful and painstaking exploration. In fact many surgeons claim that biliary disease is a precursor of acute pancreatitis, and the prophylactic treatment of acute pancreatitis is the early eradication of preëxisting gall-bladder pathology. As a matter of fact, in this series no case of acute pancreatitis was observed in a patient who had had a previous cholecystectomy. But the treatment of the acute disease should have little to do with the radical treatment of the chronically inflamed gall-bladder. In the majority of primary cases, although it is extremely difficult to prove, the pancreatitis is probably caused by the retrojection of infected bile up the pancreatic duct. This retrojection of bile is probably a transitory condition, for the common bile has never completely occluded as evidenced by the fact that clinical jaundice was present in only four cases even though the common duct was dilated in seven instances. However, it seems safer to afford external drainage of the bile. At the same time, it affords a means of removing stones from a gall-bladder, and in two instances in which the gall-bladder was described as normal and without stones, calculi were subsequently discharged through the cholecystostomy tube—in one case as many as twenty. It is barely possible in these two instances, as in many others, that the origin attack may have been initiated by a stone which was temporarily caught at the papilla and subsequently passed. In another instance in which no stones were found at operation and nothing further done than exploratory coeliotomy, a cholecystectomy was performed one year later for innumerable small stones. In addition, a cholecystostomy relieves tension

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and spasm on the papillary region of the duct, thereby promoting a more free drainage from the pancreatic duct, and in those cases in which the common duct is obviously dilated, the external drainage of bile decompresses a compromised liver and protects the pancreas from any further biliary irritation. It seems more than coincidence that the seventeen cases in which cholecystostomy was done for acute pancreatitis should have been productive of the lowest mortality, 35 per cent., while those cases in which exploration with simple drainage was done had a mortality of 55 per cent. While cholecystostomy is rather an indirect way of diverting a stream of bile from the pancreas, the simplicity of its performance has more to commend it than the better drainage obtained by a choledochostomy which is more time-consuming and dangerous. If, however, there is definite evidence of common duct obstruction and dilatation is present, the duct should be thoroughly explored, especially the papillary area, and whether calculi are present or not, choledochostomy is indicated.

Those cases seen late in the course of the disease and in which abscess formation has taken place may be treated as simple intraperitoneal abscesses. Drainage may be performed in either one or two stages. Some surgeons in an effort to avoid soiling the general peritoneal cavity pack down to the abscess and then, after sufficient adhesions have taken place, drain. In those instances in which the abscess has arisen in the tail of the pancreas, a retroperitoneal approach through a lumbar incision has met with success. In this series, four cases of pancreatic abscess were primarily drained, two through the loin, and two abdominally, three of which recovered.

The prognosis in all cases of acute pancreatitis is grave. In this series of forty-six operated cases, twenty-three survived. Seventeen of these made what may be called an uneventful recovery with the exception that one drained bile for rather a considerable period, and the other developed post-operative fat necrosis of the wound. The hospital stay of the average case in this series was about twenty-five days. Six of the cases had rather a stormy convalescence. One case in which a pancreatic abscess was drained through the lumbar route ran a septic course for days, but eventually cleared; another, in addition to signs of a generalized peritonitis, developed a definite left lower lobar pneumonia. Two cases in which the gall-bladder was described as normal at the time of operation subsequently drained stones through the cholecystostomy, and one case was accompanied by the picture of a Charcot fever. One patient sloughed away a great part of the pancreas and it was 110 days before the pancreatic fistula closed. The longest stay was that of over 300 days, in which the pancreatitis followed an automobile accident seven days before admission. Operation disclosed a large hæmatoma of the pancreas which was drained. The patient was acutely ill for months, developing many intraperitoneal abscesses, two of which required subsequent drainage. These abscesses probably followed a peritonitis, although it is barely possible that they resulted from suppurating fat necroses.

Of the cases which died, over half succumbed within the first twenty-four

hours. One case died in five days from an increasing blood sugar and uncontrollable acidosis. Others succumbed on the tenth, twelfth, thirteenth and twentieth days from peritonitis and pancreatic necrosis. One patient died thirty-three days after operation from what was clinically a subphrenic abscess. While the apparent cause of death in 50 per cent. of the cases was shock, autopsy findings in many revealed the picture of an acute hæmorrhagic pancreatitis. In fact a careful review of the seventeen autopsies in primary cases demonstrated quite conclusively that death resulted from the actual destruction of the pancreas, sixteen dying from pancreatic necrosis. In six cases the entire pancreas had completely sloughed and was lying in an abscess cavity.

Summary.—Acute pancreatitis in this series was coincidentally existent with disease of the gall-bladder as proven by operation or autopsy in 85 per cent. of the cases. However, in a series of 1280 cases of biliary-tract disease exclusive of malignancy or stricture, acute pancreatitis occurred in only 2.6 per cent. of the cases. It seems more than likely, then, that the etiology of acute pancreatitis was dependent in the main upon those variations of the pancreatic and bile ducts which favored anatomically the retrojection of infected bile into the pancreas.

The clinical picture and physical findings of this condition were quite variable, and the diagnosis in most cases must be made by exclusion. When the condition is suspected, a diagnosis might be greatly aided by an abdominal puncture and aspiration of the typical oily beef-juice exudate.

Acute pancreatitis is invariably a surgical disease and operation should aim to remove the toxic protein products, to relieve pancreatic tension and thereby lessen glandular necrosis, and, if possible, to remove the cause of the pancreatitis. Thorough aspiration of the peritoneal cavity, drainage down to the pancreas and cholecystostomy are invaluable procedures to cope with the condition at hand, and in extremely toxic cases, exsanguination transfusions might be of definite value.

Death is due in the majority of cases to the toxæmia of an acute pancreatic necrosis.

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