

creatic condition is diagnosed and the patient operated on while it is in its incipency, before the so-called catarrhal pancreatitis has really become a chronic interstitial interacinar lesion.

The choice of operation in dealing with chronic pancreatitis resolves itself into a decision between simple drainage of the biliary ducts or a cholecystenterostomy. I have used both methods, and each has its advantages in special cases. When gallstones are found in conjunction with pancreatic disease, or when the latter is found during a gallstone operation, I consider the drainage indicated by the biliary condition to be sufficient. Thus, if we have stones in the choledochus, a choledochostomy should be performed in the usual manner. The operation of cholecystostomy is to be preferred when we find a pancreatitis the result of a still active infection of the bile ducts or when the pancreatitis is discovered in its incipient or catarrhal stage.

Cholecystenterostomy is indicated when the pancreatic condition is well advanced and we wish to procure permanent drainage. This operation is not my choice when much biliary infection is present, as I always prefer surface drainage when marked infection is manifest. This operation also I consider to be more grave than ordinary cholecystostomy, and I have found it to be attended by a higher mortality in my own operative work. Especially does this become true when we are dealing with a gall bladder not well suited for the procedure.

The indications for surgical interference in chronic pancreatitis I consider to be found in the diagnosis itself, unless some circumstance prohibits it. Thus, I would not operate in the presence of marked organic disease of other organs, nor would I be prone to advise operation in patients who are *in extremis*.

Moderate anemia and glycosuria are not contraindications to operation in pancreatic cases, as both are often greatly benefited when the metabolism of the body is restored to its normal status. My results in chronic pancreatitis have been such as to encourage me to further operative work in this direction. The immediate mortality is still quite high, due in large part to the extremely weakened condition of the patients, the grave associated conditions, and especially the tendency in those patients in whom we find both jaundice and a pancreatic lesion, to uncontrollable hemorrhage.

The details of the operative technic are not matters of extreme difficulty, and improvement in results must come from earlier diagnosis. In gallstone cases the patients should be operated on before chronic pancreatitis supervenes, and other cases of pancreatitis unassociated with lesions of the biliary passages should be recognized sooner than they now are.

PANCREATITIS IN ITS RELATION TO GALLSTONE DISEASE.*

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The pancreas is the most sequestered organ in the body and has only recently yielded up, in part, the secrets of its incorrigible inflammations. The clinical knowledge of its pathology has been obtained in operations on the gall tracts. Its natural history has been

unraveled and, while in the past its recognition has been uncertain, it can now be identified during life in a considerable number of instances, both in its acute and chronic form. It is important in all operations on the upper abdomen that the surgeon should examine with detailed care the head of the pancreas, not only to determine the existence of pathologic changes, when present, but also to appreciate the "feel" of the normal gland. The fact that the Mayos found the pancreas to be involved in 6 per cent. of all the operations on the gall tracts is sufficient indication of its importance, as well as of the causal relation between gallstones and diseases of this neighboring gland. They further found 81 per cent. of pancreatic diseases to be the result of, or coincident with, gallstones. Egdaahl regards biliary lithiasis the most frequent single cause. Osler says that forty-five out of one hundred and five cases were associated with gallstones. Robson found pancreatic implication in 60 per cent. of cases in which gallstones were in the common duct. Out of 118 cases Quénu and Duval in 46 cases found stones in the gall bladder or cystic duct; in 20 cases in the common duct; in 8 cases in the ampulla of Vater; in 2 cases in the duodenum, near the ampulla; in 28 cases in the entire tract; in 10 cases undetermined, and in 3 cases in the stools. Mayo observed pancreatitis to be four times as frequent when the stones are in the ducts as when they exist in the gall bladder (18.6 to 4.45). The head of the gland is involved seven times as often as the entire gland (124 to 17). Nearly two-thirds of common ducts are surrounded by the head of the pancreas, which, if swollen, causes obstructive jaundice. In the other one-third an independent opening of the duct of Santorini may act as a safety valve.

Opie discovered the rôle which a small (pea-sized) stone lodging in the ampulla of Vater plays in converting the common and pancreatic ducts into a through channel, allowing bile to be injected directly into the pancreas and thus produce the acute type of infective and hemorrhagic pancreatitis.

Robson has established on an indefensible basis the relationship of gallstones in the common duct and chronic interstitial pancreatitis. It is probable that stones simply render the organ more vulnerable to bacterial invasion.

Flexner asserts that modified bile, with diminished salts and increase in colloid, sets up chronic pancreatitis. Fresh and unaltered bile gaining entrance to the pancreas begets acute changes. If an impacted gallstone does not cause bile to enter the pancreas direct, simple obstruction and retention of the pancreatic secretions, if infected, will cause inflammation.

Desjardins thinks that micro-organisms find their way through the duct of Santorini into the Wirsungian duct and back into the duodenum, thus causing infection in the "triangle of inflammation" when there is obstruction. This could not occur in one-third of the cases for in 21 per cent. the duct of Santorini is impervious and in 10 per cent. it does not communicate with the duct of Wirsung.

Regurgitation of fatty materials from the duodenum into the duct where it had been dilated from the previous passage of a gallstone has been suggested by Hess as a causative factor.

Robson operated in fifty-two cases of the chronic interstitial type which were due to gallstones and in forty-six cases in which there were no gallstones. Of this latter group it has been said that gastrointestinal disorder

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ders caused about 30 per cent., of which one-half are in alcoholics. Among other causes which have been mentioned are typhoid fever, pyemia, malaria, mumps, appendicitis, trauma, embolism, gastric or duodenal ulcer.

The acute type is so sudden and severe in its onset, attended with such agonizing pain and followed by such extreme prostration that it has been denominated "the pancreatic drama." The pulse is rapid with rise of temperature. Vomiting occurs at once and is persistent. First, the stomach contents are regurgitated, and then the intestinal, simulating acute obstruction, although gas is passed. The lips are livid, the extremities cold, the entire body of a cyanotic leaden hue. Dyspnea is often present and constant splitting backache has been observed (Erdman). The pain is excruciating, paroxysmal and deep seated and is uncontrollable with ordinary doses of morphia. Collapse is extreme. Tenderness is diffuse, and the whole picture is that of "the acute abdomen." There is some epigastric induration in the first twenty-four hours, but the consecutive distention soon obliterates it. There is no glycosuria. Erdman and Thayer found no sugar in five cases each. Patients die in collapse in forty-eight to seventy-two hours. This type occurs oftenest at about the age of 50, in fleshy subjects addicted to alcohol.

Acute peritonitis from perforation of viscera is closely simulated. The actual diagnosis is very inexact. Of fifty cases, twelve were diagnosed as perforating gastric ulcer; twelve as intestinal obstruction; four as acute peritonitis; two as appendicitis; two as cholecystitis; one as strangulated hernia; one as angina pectoris; in eleven no diagnosis was made and in the remaining five the diagnosis of pancreatitis was correctly assumed. Fortunately the operative indication is equally imperative in most of the conditions which appear to be in evidence. Owing to the extreme fatality the operation is urgently demanded. Ebner says that out of ninety-six patients 90 per cent. who were not operated on died, and of those operated on 52.8 per cent. survived. Körte saved six patients with fat necrosis.

The laboratory examinations of the urine and feces are so laborious and consume so much precious time in the acute cases and are really so inconclusive that it does not seem wise to delay exploration to have them made.

The distinctive tissue change is fat necrosis. It results (when there is obstruction) from penetration, into the tissues adjacent, of pancreatic juice and certain ferments, which split the fat into its component fatty acid and glycerin. The latter is absorbed and the former unites with the lime-salts to form yellowish-white non-elevated opaque spots about the size of a millet-seed that look like droplets of candle grease. Fat necrosis points as unerringly to the pancreas as jaundice does to the liver. There is also marked exudation. The colon and omentum are gorged with fluid. In the omentum there have been observed clumps as large as sausages (Brugsch and König).

In the subacute or suppurative form the onset is less sudden and severe. Chill, fever and leucocytosis are present and an epigastric tumor gradually develops. Although constipation is the rule, fatty stools and occasionally fragments of necrotic tissue may appear. A less violent course is pursued, sometimes ending in resolution. These cases frequently terminate in suppuration, which burrows in a bizarre way. Operation is not so immediately necessary in the subacute cases unless suppuration demands evacuation.

Chronic pancreatitis occurs in individuals with previous painful epigastric attacks which often declare their gallstone origin. There is midline tenderness, slight fullness, pain referred to the left side, to the kidney and left scapular region. There is extreme loss of weight which, with the pigmentation of the skin, frequently gives rise to the inference of malignant disease. Jaundice is commonly present and may exist for many months. Nearly all cases of so-called catarrhal jaundice are in reality pancreatic catarrh or actual chronic pancreatitis. The intense irritation of the skin in jaundice is indicative of pancreatic and not biliary origin. The common duct is surrounded in the lower third of its course by the head of the pancreas in 62 per cent., which when swollen produces obstructive jaundice. In 38 per cent. the duct runs behind the pancreas and, although it might be enlarged, no pressure jaundice will result.

Uncomplicated gallstones are most easily identified by their early history. Typical attacks, without jaundice, then attacks followed by jaundice and attended with ague-like symptoms with no tumor, betoken the lodgment of stone in the choledochus. In chronic pancreatitis induration is often made out, and the tenderness is central rather than under the right arch. Gallstones that do not encroach on the common duct do not give the pancreatic urinary reaction of Cammidge and the feces are alkaline. In pancreatitis the motions contain large quantities of undigested food and are greasy because of the unsaponified fat. They are light in color and bulky.

In chronic pancreatitis Schmidt's bag test is said to show the nuclei undigested in the meat fibers of a small cube which is sewn in a silk bag that is taken into the stomach and recovered from the stool.

In many instances the head of the pancreas has felt like cancer at the time of operation and has been so diagnosed, but the patients have really been cured by removal of the stones and drainage, showing the induration to have been an interstitial thickening of the pancreas. Still it is quite possible in many instances to detect the late cases of cancer without operation. The condition lacks the acute onset, pain and fever. The gall bladder rapidly becomes distended. The feces quickly turn white. There is hematemesis and melena and, lastly, the enlargement of the cervical glands, ascites and edema.

Degenerative changes in the pancreas may destroy its control of the metabolism of carbohydrates and produce diabetes. It rarely occurs in the interlobular form of pancreatitis, but almost uniformly in the interacinar form when the greater part of the gland is replaced by scar tissue which crowds out the cell-islets of Langerhans.

Sugar was found by Cammidge in 6 per cent. of Robson's sixty-five cases of common duct stone.

While diabetes is not a common result of gallstone pancreatitis, it may happen that delayed operation will permit an ordinary interlobular type to advance into the interacinar form with its tell-tale glycosuria.

The operative indication for the acute cases is unmistakable. Incision of the acutely inflamed pancreas with drainage often suffices. The peritoneum should also be drained when there is that peculiar beef-broth serum present. If the patient's condition permits the complicating gallstones should be rapidly removed and drainage instituted.

In the chronic cases drainage of the bile passages, while indirect, is most effective. It is an anomalous illustration of a palliative operation being also a curative

one. A thorough search with finger and probe after the removal of the obvious stones is essential to insure none being left. It is especially difficult to detect them in the pancreatic portion of the duct. The common duct is best drained temporarily with a catheter introduced up to the junction. Permanent drainage is to be established by cholecystenterostomy if there are no gallstones. Sidney Phillips observed a disagreeable diarrhea when the gall bladder was attached to the colon, but in two instances I have seen no unpleasant symptoms. The duodenum, instead of the colon, is undoubtedly more desirable, as it delivers the bile into its natural channel where it is physiologically needed.

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DISCUSSION

ON PAPERS OF DRS. DEAYER AND HAGGARD.

DR. ARTHUR DEAN BEVAN, Chicago: In the development of this new surgery of the pancreas, members of this Association have played the most active part. I refer to the memorable work on pancreatic cysts by the late Nicholas Senn; the splendid work on acute pancreatitis by Fitz, and the pathology of the pancreas by Opie.

In connection with injuries of the pancreas, two things have impressed me as being of great importance. First, the diagnosis can not, as a rule, be made without an exploratory laparotomy, which is best made under gas anesthesia. Second, we must provide for most thorough drainage and also for thorough protection of the abdominal wall against the digestive action of the pancreatic juice. The latter, I think, is best done by oxid of zinc paste.

In acute pancreatitis the diagnosis, although difficult, is by no means impossible. In a general way those cases which have a clinical picture midway between ileus and perforation, with a definite line of tenderness in the pancreatic region, and some swelling, are very suggestive of acute pancreatitis; but the diagnosis must be made by exploratory operation under gas anesthesia. It is not always necessary to interfere in these cases. In three of my cases the operation was purely exploratory. A definite diagnosis of acute pancreatitis was made. There was no definite swelling nor any evidence of suppuration in the region of the pancreas; no gallstones to remove, and I simply made the operations exploratory, with immediate closure of the wounds, and all three patients went on to recovery. On the other hand, where there are gallstones they should be removed, and if there is swelling and evidence of hemorrhage and suppuration, drainage should be instituted.

A most interesting group of cases are those in which it is impossible to differentiate between carcinoma and chronic interstitial pancreatitis. I think that here the rule should be to take the optimistic side. Three times in one winter I made the brilliant diagnosis in my service at the Presbyterian Hospital, after exploratory operation, of carcinoma of the pancreas and very gravely told the relatives of the diagnosis. We sent the patients home to die. Those three patients went on to perfect and complete recovery after cholecystenterostomy. That has been a most instructive thing to me, and now I take the optimistic side in these cases and do a cholecystenterostomy with the hope that the case may be one of chronic interstitial pancreatitis and not carcinoma.

DR. CARL BECK, Chicago: The coincidence of pancreatitis and gallstones is by no means rare or exceptional. The numerous reports of the coexistence of these two pathologic conditions, the large number of experiments on animals, and the clinical observations prove the truth of these two statements. The reason why of late we understand a little more about these conditions is that we now make our diagnosis of pathologic conditions at the operating table and not at the postmortem. The erroneous views of former times were due to the examination of this organ postmortem. The tissues of no other organs undergo such rapid changes as do those of the gall bladder and pancreas. The diagnosis of diseases of the pancreas is difficult, and we hailed the Cammidge test

with enthusiasm as a great help; but there is only one means of making a definite diagnosis, and that is by exploratory operation.

At the present time the position of the surgeon relative to this question of pancreatitis and cholelithiasis can be summed up in four points: First, knowing the great danger of acute pancreatitis, leading to abscess or fat necrosis, every time acute pancreatitis is suspected an exploration must be made, even during the attack. The dangers of hemorrhage and perforation are insignificant compared with the danger of acute pancreatitis. Second, in all cases of gall-bladder operation an examination of the pancreatic field should be made, and if a threatening abscess or necrosis is found, this part should be drained through the foramen of Winslow or gastrohepatic omentum backward, according to the nature of the case and the findings. Third, in all cases of acute pancreatitis and fat necrosis the gall tracts must be examined carefully for stone on account of the common existence of gallstones with pancreatitis. Fourth, there are no other means at present of saving the patient's life except thorough drainage forward toward the abdominal wall and backward.

DR. WILLIAM L. RODMAN, Philadelphia: It has been made very clear to us in these admirable papers that it is practically impossible by the clinical symptoms and signs always to diagnose diseases of the stomach, and that even after a laparotomy it is not always possible to differentiate between benign and malignant disease. We have all accepted these conclusions so far as the stomach is concerned, and we have practically agreed in view of this difficulty of making a diagnosis between the several affections of the stomach that it is better to err on the safe side in our practice, and do a more radical procedure when it can be done without materially increasing the risk. It seems that what is true of the stomach and gall bladder and ducts is just as true, and in a way truer, of the pancreas. I thoroughly agree that it is simply impossible to diagnose at all times either acute, subacute or chronic pancreatitis. In one case after exploring the pancreas and being positively certain that I was dealing with malignant disease of the stomach, I closed the abdomen, after establishing drainage of the gall bladder, and found a tumor the size of a fist at the head of the pancreas. The patient's jaundice soon passed away; he rapidly gained in weight, and now, three years after the operation, is perfectly well.

Chronic pancreatitis is a more common disease than we have thought it was hitherto. In the great number of operations that are being done at the present time on the gall bladder and ducts, we should take care lest too radical surgery be done in the way of removing the gall bladder, unless it is absolutely necessary, because the only successful way of treating chronic pancreatitis is by drainage. If cholecystectomy be done where cholecystotomy would have answered all indications, and the patient subsequently develops marked pancreatitis, what is to be done? Of course, we can, as Robson does, drain the common duct, which acts as a gall bladder, but this is a far more radical procedure than draining the gall bladder itself. Therefore, it seems to me that the lesson to be drawn from these papers and discussions is that we should practice more conservative treatment of the gall bladder in doubtful or borderline cases that come to us. Dr. Deaver has drawn particular attention to the fact that the two conditions are often associated and that they can not be differentiated. This is just what we ought to understand, when we reflect on the anatomy of the pancreas, and the fact that these stones often coexist in the pancreas and the gall ducts. A stone in the common duct will cause retrojection of bile into the pancreatic duct or the duct of Wirsung, and pancreatitis may follow. In a recent case of acute pancreatitis the symptoms markedly simulated those of acute intestinal obstruction.

DR. WILLIAM H. WATHEN, Louisville, Ky.: It is almost impossible to make a positive diagnosis of acute pancreatitis and differentiate it from some disease of the right hypochondriac region. Until we have made an exploration we may resort to an analysis of the urine and not find pancreatic disease. We may find pancreatic disease where there is a reasonably good digestion of the products of food by these secretions, but we

do know from what we have learned that the symptoms are sufficiently significant in every case to indicate an exploration; that by this exploration we can, as a rule, make a sufficiently accurate diagnosis to enable us to recognize these cases, and that the treatment is nearly always complete drainage. The practice of removing these structures is now rapidly becoming obsolete. Drainage and the removal of any obstruction in the duct are indicated. Hence the failure to make a perfect diagnosis of disease of one of these structures is not of much importance, provided that we know that the exploration is necessary, and that we institute the proper treatment.

DR. JOHN B. DEEVER, Philadelphia: Doctors must study their cases of indigestion more thoroughly. They must not be satisfied with diet and drugs in many of these cases. I called attention particularly to the class of acute pancreatitis, and especially the acute exacerbations occurring in the presence of chronic pancreatitis in which no drug is doing more harm than morphin given indiscriminately. Too many doctors when called to see a patient with pain in the abdomen are apt to resort too quickly to the hypodermic syringe. A physician might as well give his patient hydrocyanic acid. A prominent citizen of Philadelphia recently died of pancreatitis because he had morphin shoveled into him. That is the harmful effect of morphin.

DR. W. D. HAGGARD, Nashville, Tenn.: One of the diagnostic symptoms of acute pancreatitis is that you can hardly give enough morphin to stop the vomiting, backache and pain. It is one condition in which morphin does not absolutely mask the symptoms. I urge the withholding of the drug and the wisdom and importance of operating early in most acute abdominal cases. When the abdomen is opened and fat necrosis is found, it will invariably point to the presence of pancreatitis.

MAY NOT DRINKING WATER, WHEN POLLUTED WITH SEWAGE, BE ONE MEDIUM OF DISSEMINATION OF THE TUBERCLE BACILLUS?

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The tubercle bacillus may be introduced into the animal economy in various ways. The usual portals of entry are the mouth, nose, or an abraded surface. In cows it may obtain entrance through a milk duct or by way of the vagina. That it sometimes enters the fetus *in utero* through the medium of the circulation must be admitted, notwithstanding the opinion of many physicians to the contrary. Veterinarians tell us that it is not uncommon for cows to drop infected calves. This, of course, is entirely apart from a so-called inherited predisposition to tuberculosis, which may be either physiologic, consisting of such a condition of the tissues, and more especially of the mucous membranes, as will afford a receptive and favorable environment for the growth of the organism; or anatomic, depending on a conformation of the thorax, such as the deformities known as chicken-breast, winged chest or hollow chest, which interfere with the full and healthy development of the lungs. It may, of course, be introduced artificially by inoculation, as demonstrated on the lower animals. When it enters by the mouth and nose, it may as dust pass directly into the air passages and lungs, or, being detained in the mouth, be swallowed with the saliva and so reach the digestive tract. Contained in food or drink, it may pass directly into the stomach and intestines.

It has been definitely proved that it may penetrate the healthy mucous membrane of the intestinal tube, pass into the lymphatic circulation without leaving the

slightest lesion or trace of its passage, find its way into the thoracic duct, so into the general circulation and finally into the lungs. Therefore, its presence in the lung, coincident with its absence in the intestinal wall, does not all prove that it was not originally introduced in food or drink.

The early tuberculous affections of infancy, meningitis and tabes mesenterica, are generally due to the use of infected milk or to artificial feeding.

These considerations prepare us for the question whether, in view of the thousands of human beings who are expectorating tuberculous matter and depositing it with their urine and feces, great numbers of these bacilli must not find their way into our streams and constitute a source of pollution of our drinking water in many instances.

This inquiry is particularly pertinent in regard to the opportunity for dairy cattle to become infected themselves and to convey the infection to their milk if they drink from streams close to the source of pollution. Any one who has watched cattle drinking in a stream can readily understand how this might occur. Even when they do not wade in to a sufficient depth to immerse their teats and udders, in their efforts to drive away flies they throw the water dripping from their mouths and from the ends of their tails over their sides and udders. From the stream they usually go direct to the milking. With the carelessness which prevails on the average farm the milker finds no difficulty in mixing the milk which is distributed over the outside of the teats with any organic filth which may be clinging to them, as well as to his own hands, and allowing it, so contaminated, to drop into the milk pail.

EXPERIMENTS TO ASCERTAIN THE PRESENCE OF TUBERCLE BACILLI IN SEWAGE.

In order to remove this hypothesis of the possible contamination of water supplies from the realm of mere theory and place it on a substantial basis, I have been conducting a series of experiments, with the cooperation of Dr. Herbert Fox, chief of the laboratories of the State Department of Health to determine whether tubercle bacilli may be found in sewage, and, if so, to what extent. The pollution of water supplies by the excreta of typhoid fever, of dysentery, of cholera and of diarrhea, has been so evident and of such constant occurrence that it has filled our field of vision to the exclusion of the possibilities of such pollution by the poisons of other diseases. Tuberculosis is one which has been thus overlooked. I know of no investigations made or published in order to determine the facts in this matter up to the present time.

So far my researches have been limited to the examination of the sewage from the Rush Hospital for Consumption and Allied Diseases, West Philadelphia, the sewage from the White Haven Sanatorium for Consumptives, and the mixed sewage from the sewer outlet at South Street Bridge, West Philadelphia.

The sewage from the main outlet into the sewer from the Rush Hospital, taken November 24, was largely fluid, containing some solid fecal matter, and what was apparently refuse from the kitchen.

The sample was well shaken, the solid portions broken up with a rod and portions of 1, 2.5, 5 and 10 and 20 c.c. pipetted into centrifuge tubes, the first four being made equal to the bulk of the last one, with sterile water. These tubes were centrifuged for eleven hours, with one