THE SURGICAL SIGNIFICANCE OF AN ANOMALOUS CHOLECYSTOHEPATIC DUCT

CASE REPORTS

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THE SURGICAL SIGNIFICANCE of variations in the anatomy of the biliary system has been the subject of numerous contributions. Concerning the incidence of abnormalities, Flint[1] has shown in a study of 200 consecutive autopsies that there were only 69 cases in which the anatomic pattern of the extrahepatic biliary system (and its associated vascular tree) conformed to the textbook description. An anomaly to which attention has been directed, only infrequently, and which is the subject of this paper is an accessory hepatic duct draining a varying segment of hepatic parenchyma directly into the gallbladder. This biliary pathway, which we shall term the "cholecystohepatic" duct, is found regularly in fish, reptiles and birds (Owen[2]). According to Quain,[3] it is not an unusual finding in some mammals.

Both the occurrence and the surgical significance of the duct in man can be appreciated by a consideration of the embryology of the biliary system.[4] The latter begins with the appearance of the hepatic diverticulum, a saccular pouch from the ventral foregut. The distal end of the pouch is the source of solid cellular strands of tissue from which the glandular portion of the liver is formed. The cellular cords assume, gradually, the pattern of adult hepatic architecture chiefly as the result of invading blood vessels and biliary capillaries. Parallel to, but separate from, the foregoing development is the evolution of the extrahepatic biliary system from a hollow pouch immediately proximal to the developing liver. The distal portion of the pouch becomes the hepatic duct, which sprouts numerous small ducts that enter the substance of the liver. The proximal segment of the pouch (derived from the primitive duodenum) becomes the choledochus. At a variable point between the proximal and distal portions of the pouch is the special offshoot from which the gallbladder and cystic duct are derived. Thus, the gallbladder and hepatic duct are essentially distal segments of the same diverticulum. Presumably because of some error of development small ducts may sprout from the gallbladder as well as the hepatic duct to drain glandular buds of liver tissue. The latter, merging with the fetal liver would, nevertheless, continue to drain into the gallbladder. This appears to be the manner of development of the cholecystohepatic duct which, of necessity, drains a segment of the liver.

It is quite impossible to determine from the literature the incidence of an aberrant duct in man. There are individual case reports, such as an early

one (1913) by Kehr,[5] and one by Schnacher[6] in a review of extrahepatic biliary anomalies. Eisendrath,[7] in a basic paper on anatomic variations of the biliary tree, mentions no instance. The anomaly was not noted apparently in Flint's[1] study, or in 194 dissections by Luge.[8] On the other hand, bile capillaries and often larger bile ducts were found in the gallbladder bed in 15 to 25 per cent of cholecystectomies.[9] Mentzer[10] believes that the duct can be frequently overlooked at operation because of its (usually) insignificant caliber and, also, the reduction of biliary secretion under anesthesia.

Although the incidence of cholecystohepatic ducts remains doubtful or unknown, and the question of postcholecystectomy biliary discharge resulting from severance of such ducts remains open, there can be no doubt as to the hazard of an overlooked severance of a duct of substantial proportions. The excessive loss of bile by external drainage or the likelihood of bile peritonitis from internal drainage need only be mentioned. The obvious management of a small duct which is encountered at cholecystectomy is ligation or sealing by electrocoagulation. When, however, the diameter is large enough to indicate that the duct drains a substantial section of hepatic parenchyma there can be some doubt as to procedure. Thus, Flint[1] believes that intrahepatic collateral biliary circulation is sufficient to prevent liver damage following ligation. He concedes, however, that, in the case of an already damaged liver resulting from prolonged obstruction of the common duct, further insult to a substantial segment of liver by ligation of a large aberrant duct might lead to death. On the other hand, external drainage from an aberrant duct invites local complications, excessive biliary deprivation, and prolonged morbidity. A number of years ago we encountered an aberrant cholecystohepatic duct at cholecystectomy, and employed external drainage. Another case was seen recently, and this time the duct was treated by ligation.

CASE REPORTS

Case 1.—(A. R. 431484): A 58-year-old female entered the Mt. Sinai Hospital with a four-day history of right upper quadrant abdominal pain and jaundice. Abnormally dark urine was noted but the color of the stools was not observed. The patient had not suffered previous episodes of abdominal pain or icterus, but had had dyspeptic symptoms for a long time. Aside from frequent attacks of bronchial asthma, her past history was not noteworthy.

Physical Examination: The patient was obese and moderately icteric. Her abdomen was distended. There was marked tenderness and spasticity in the right upper quadrant where an orange-sized, tender, ballotable mass was palpable, moving with respiration. There was slight fever. *Preoperative Diagnosis:* Common duct obstruction and a distended gallbladder. After preliminary preparation with intravenous glucose solution operation was undertaken.

Operation: A right upper abdominal incision disclosed extensive pericholecystic adhesions arising from an enlarged, tensely distended gallbladder. The foramen of Winslow was obliterated by adhesions. Indeed, the diseased gallbladder was quite completely walled-off from the free peritoneal cavity. Cholecystectomy was performed, subserosally, from the fundus downwards. The cystic duct was about three millimeters in diameter, and, after its severance, several cubic centimeters of dark, very viscid bile containing numerous fine crystalline particles, but no stones, escaped from its stump.

Thereafter only thin yellow bile welled-up from the common duct. Exploration of the common duct by palpation and by probe revealed a duct of normal diameter containing no calculi. Since compression and distortion of the duct system by the gallbladder mass appeared capable of producing the icterus of a few days' duration, and exploration was negative (although a stone could of course have been overlooked), the common duct was not opened. A No. 20 F. soft rubber catheter was sewn into the open cystic duct for drainage.

During the course of the dissection of the gallbladder from its bed, an orifice, about two millimeters in diameter, was noticed in the upper portion of the bare area. It was surrounded by a thin but well defined greyish wall. From the mouth of this duct in the gallbladder bed there escaped freely dark, viscid bile, identical with that in the

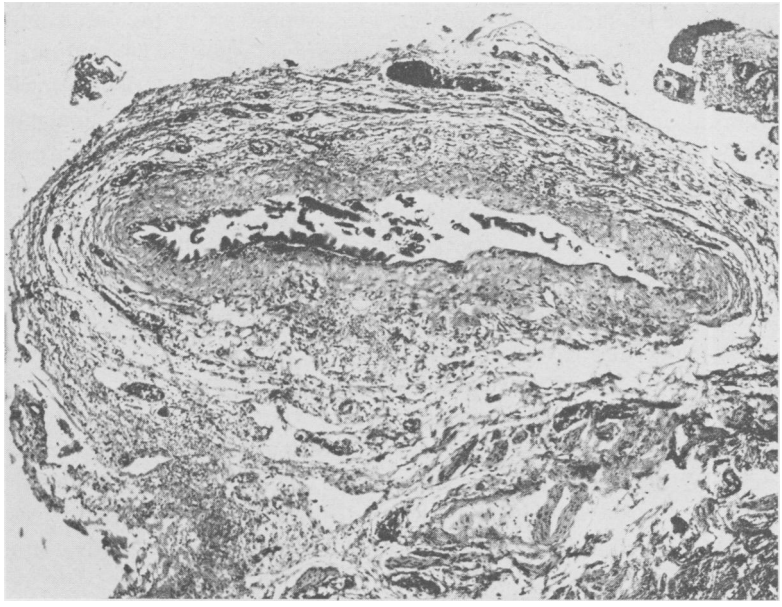

FIG. 1.—Path. No. P14919: Section of cholecystohepatic duct described in Case 1. Structural details are typical of small bile duct.

gallbladder and cystic duct. Following the escape of this dark fluid, thin yellow bile appeared. A fine probe was passed into the orifice and entered a duct in the liver substance for a distance of two to three centimeters in the direction of the porta hepatis. Sections of the duct were removed for microscopic examination. No other anomaly of the extrahepatic biliary system was noted.

The orifice of the anomalous duct was left open. Rubber dam drains were placed in Morison's pouch and also to the mouth of the aberrant duct, in order to insure external drainage of any biliary leakage that might occur. The wound was then closed in layers.

Microscopic examination revealed the specimen to be a typical bile duct (Fig. 1).

Postoperative Course: The immediate postoperative course was uneventful. By the fifth day fever had subsided, icterus had disappeared, the urine was free from bile, and stools were of normal color. The tube in the cystic duct drained thin yellow bile for one week. It was then spontaneously extruded, and some bile discharged into the dressings. The rubber dams were withdrawn several days later.

Eleven days after operation the temperature rose to 102° F. In the absence of any other apparent cause for pyrexia, the fever was assumed to be due to retained infrahepatic biliary seepage. Accordingly, a tube was placed into the small sinus that

remained, and bile discharged freely. The temperature returned to normal in 36 hours. *It was not until the forty-fifth day after operation that the biliary drainage*, which often was profuse, ceased, and was followed by permanent closure of the wound.

For three weeks after operation the patient complained of anorexia, lassitude, and extreme general asthenia. On several occasions there were brief episodes of marked weakness and vertigo, during which the patient became pale, cold, and clammy, the pulse rapid and thready, and the blood pressure fell to 80/40. There was no associated precordial distress, and no other abnormal physical findings to lead to a diagnosis of pulmonary embolization. The generally debilitated state which existed at the end of three weeks was thought to be due to bile deprivation. The acute episodes were referable either to exaggerations of this state or to pulmonary embolization. Treatment was instituted three weeks after operation. Calcium lactate, yeast, halivar oil, and bile salts were administered, according to the recommendation of Doubilet.[11] Improvement soon followed despite the continuation of biliary discharge; appetite and strength returned; there were no further acute episodes, and the patient was convalescent by the end of the fifth week.

The patient was discharged from the hospital in good condition, seven weeks after operation, with a healed wound. *Follow-up:* There has been no recurrence of symptoms referable to the biliary tract.

COMMENT: The precise nature of the anomalous duct discovered at operation can be inferred from the location of its orifice in the liver bed, and the direction of its course. Because of the features which were noted, the structure can be properly termed a cholecystohepatic duct. Its integral relationship to the biliary system is established not only by the flow of bile from its orifice but also by its histologic appearance.

The abnormal appearance of the bile first noticed in the duct, similar to the pathologic fluid in the gallbladder and common duct, is an interesting feature. It suggests a concurrent stasis and infection of the tributary portion of the liver, conceivably of ascending origin from the gallbladder.

In the absence of common duct obstruction, and in accordance with usual experience, drainage of bile from the cystic duct should have ceased within a week or two. The prolonged biliary discharge may, therefore, reasonably be ascribed to leakage from the open cholecystohepatic duct.

The pronounced asthenia after operation, and perhaps the recurrent episodes of mild shock, can be attributed to prolonged continuous drainage of bile, with consequent loss of electrolytes and faulty vitamin absorption. This etiologic relationship is suggested by the prompt response to a regimen of high salt and vitamin content. Biliary deprivation due to leakage from a severed anomalous duct may, therefore, be of serious import *per se,* aside from possible intra-abdominal complications that might ensue.

Ligation of the duct was discussed at the time of operation. The decision to leave the duct open was made because its caliber was relatively large, the amount of tributary hepatic tissue was in doubt, and the functional state of the liver in this icteric patient was unknown. In retrospect, it can be assumed that ligation would have been safe, and that the postoperative complications would not have ensued.

Case 2.—(C. F. 462649): A 63-year-old female entered the Mt. Sinai Hospital with a history of recurrent right upper quadrant abdominal pain for 40 years. These

attacks had become more frequent during the past two months, and, two weeks before admission, for the first time, were associated with chills and fever for several days. At no time had jaundice been noted. The patient's past history was otherwise not contributory.

Physical Examination: The patient was obese. There was no evidence of icterus. Admission temperature was 100.6° F.; blood pressure 130/86. The abdomen was obese and pendulous. Tenderness and spasticity were present over the right upper quadrant, and an enlarged gallbladder was palpable, moving with respiration. Examination disclosed

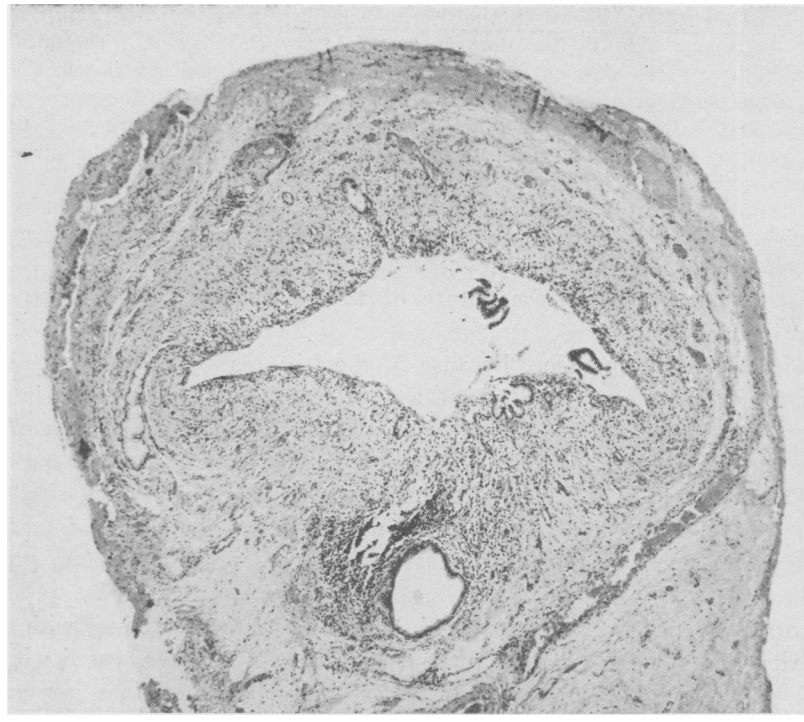

FIG. 2.—Path No. P19088: Section of cholecystohepatic duct described in Case 2.

no other abnormalities. *Preoperative Diagnosis:* Hydrops of the gallbladder. After suitable preparation operation was undertaken.

Operation: A transverse right upper quadrant incision disclosed an enlarged, chronically inflamed gallbladder containing numerous stones. There were many dense adhesions including the cystic and common ducts. A subserosal dissection of the gallbladder was carried out. In the course of the separation of the gallbladder from the liver bed, a sudden escape of bile was noted. Examination of the under surface of the liver, at this point, showed the biliary leakage to occur from the lumen of a duct apparently running into the gallbladder from the liver. A section of the walls of this orifice was taken for microscopic study, and the lumen was then closed with a suture.

Microscopic examination of the aberrant duct section revealed a typical bile duct (Fig. 2).

Postoperative Course: The postoperative course was uneventful. Sutures and drains were removed on the eighth postoperative day. The patient was discharged from the hospital four days later, afebrile, with wound healing well. *Follow-up:* There have been no symptoms referable to the biliary tract.

COMMENT: From the gross appearance of the aberrant duct leaking bile in the liver bed, and its microscopic appearance, there can be no doubt of its nature. The similarity in size and location of this duct with that described in Case 1 suggested the probability of a complicated convalescence, unless ligation was performed. In the absence of evidenct icterus, to suggest hepatic dysfunction, no hesitancy was felt in doing so. Closure was, therefore, done—and an uneventful postoperative course ensued.

CONCLUSIONS

The existence and surgical significance of an anomalous duct between liver and gallbladder (to which we have attached the term "cholecystohepatic" duct) can be understood best by a consideration of its embryology.

Although a duct of substantial proportions probably is a rare anomaly, its presence at the operation of cholecystectomy creates an important problem.

Since the duct is inevitably severed during cholecystectomy, its nonrecognition, because of uncontrolled leakage of bile, may lead to peritonitis, localized infection, or the symptoms of prolonged biliary deprivation.

Ligation of the duct is probably a safe procedure in most cases. In the presence of stasis and infection within the segment of liver drained by the duct, drainage and not ligation may be indicated despite the complications which are invited.

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