Anatomical variations of the cystic duct

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Abstract

Introduction

Anatomical variations of the cystic duct often occur and may be encountered during cholecystectomy. Knowledge of the variable anatomy of the cystic duct and cysticocochepatic junction is important to avoid significant ductal injury in biliary surgery. We present here an unusual case with anatomical variation of the cystic duct in which the abnormality was found during surgery and subsequently confirmed by postoperative Magnetic resonance cholangiopancreatography.

Case report

A 75-year-old woman was admitted for surgery, with features of acute cholecystitis: right upper quadrant pain, vomiting and fever. Examination revealed a temperature of 38°C with tenderness in the right upper quadrant. Ultrasonography showed distension of the gallbladder with calculi. Cholelithiasis with acute cholecystitis was diagnosed, and an open laparotomic cholecystectomy was planned. The surgical procedure was followed at day 14 by Cholangiopancreatography. These techniques permit to confirm and document the variation of insertion of the cystic duct into the right hepatic duct. The patient was successfully cured.

Conclusion

Knowledge of the variable anatomy of the cystic duct and cysticocochepatic junction is important to avoid significant ductal injury in biliary surgery.

Discussion

Anomalous insertion of the cystic into the right hepatic has been observed in both animals and man. Boyden2 in the course of thousands of dissections of domestic animals noted this condition in a number of instances as indicated by his anatomical drawings. Similarly Thompson3 and Daseler et al.4 observed examples of this condition in the dissection of cadaver material. This anatomical variation occurs in 18%-23% of cases5.

Embryologically it would seem that this phenomenon could best be explained by variation in growth of the hepatic diverticulum in its formation of the biliary duct system. This outgrowth of the foregut in its primary division forms the common duct and the branchings therefrom the cystic duct and gallbladder, and the hepatic duct.

The germination of the hepatic duct then branches to form the right and left

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hepatic duct system in its secondary ramifications. An anomaly of the right hepatic entering the cystic could thus occur if an abnormality of the cystic duct bud extended into the liver substance. At the same time it would be necessary that the primary hepatic diverticulum failed to divide, and thus only formed the left hepatic duct.

Another possible explanation of the derivation of this anomalous situation could be found in unusual absorption of the many small secondary branches which project from the various buddings of the hepatic diverticulum. Leiter has suggested the additional possibility of an early branching of the primary duodenal bud into right, left and cystic ducts, with the cystic originating so far down as to arise from the right hepatic duct.

Unrecognized variant anatomy can be a source of confusion on imaging studies. Many variations of cystic duct can be found such as: the cystic and common hepatic duct are in parallel; low confluence of the cystic duct; insertion of the cystic duct in the left and right hepatic ducts, and bifurcation of the left and right hepatic ducts; anterior, posterior spiral types of insertion of the cystic duct on the left side of the common hepatic duct; parahaepatic duct insertion into the cystic duct; absent or short cystic duct (length < 5 mm); cystic duct hypertrophy, with a diameter > 5 mm; double cystic duct; right hepatic duct emptying into the cystic and hepaticocystic duct; the left, right, and common hepatic ducts are all defective, with the cystic duct draining the entire biliary system into the duodenum.

Misidentification of the cystic duct can lead to postoperative complications particularly major biliary ductal injury.

A number of technics permit depiction of anatomical variations of cystic duct such as: computed tomography, percutaneous transhepatic cholangiography, preoperative endoscopic retrograde cholangiopancreatography, magnetic resonance cholangiopancreatography and intraoperative cholangiography or cholangioscopy.

However, in many cases the anormal insertion of the cystic duct is revealed by surgery.

**Conclusion**

The cystic duct may be involved in a variety of anatomical variations. Diagnostic accuracy relies on a clear understanding of the normal anatomy and anatomical variants of the cystic duct. Knowledge of the variable anatomy of the cystic duct and cysticohepatic junction is important to avoid significant ductal injury in biliary surgery.

**Consent**

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

**References**

1. Sendrath DNA. Anomalies of the bile ducts and blood vessels as the cause of accidents in biliary surgery. JAMA. 1918; 71: 864-7