Importance of Biliary Anomalies during Laparoscopy
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Congenital anomalies and normal variants of biliary tree are not common but may be of significance during laparoscopic surgery as failure to recognize these leads to iatrogenic injuries and can increase morbidity and mortality. The presence of any congenital anomaly or mere suspicion of its existence demands that we exercise surgical prudence, limit the use of electrocoagulation and ensure that no structure be divided until a clear picture of the bile ducts and blood vessels is obtained and if necessary, we must perform intraoperative cholangiography to further define the biliary system¹.

Variations in the anatomy of gall bladder, bile ducts and arteries that supply them and the liver are important to the surgeon, because failure to recognize them may lead to inadvertent ductal ligation, minor or major biliary leaks and strictures after laparoscopic cholecystectomy²-⁴. Thus severance of an anomalous or accessory hepatic duct, without ligation of its cut end, would lead to biliary peritonitis, while inadvertent ligature of an abnormally placed right hepatic artery might produce fatal hepatic infarction.

Isolated agenesis of the gall bladder is a rare anomaly and is frequently mistaken with an excluded or scleroatrophic gall bladder and there is high chance of mistaking the common bile duct for supposed gall bladder scleroatrophy, with the danger of injuring or cutting it⁵.

Congenital anomalies of extrahepatic biliary tree have long been recognized but are rare and may be of clinical importance because they may provide surgeons with an unusual surprise during laparoscopic cholecystectomy⁶-⁹. These anomalies include aberrant or accessory bile ducts, aberrant cystic duct, bile duct cysts, alteration of biliary tract associated with situs inversus and anomalous junction of bile duct to pancreatic duct along with vascular anomalies⁸.

Adapted from Blumgart LH. Surgery of the Liver and Biliary Tract. WB Saunders.
The use of laparoscopy for gallstone disease with high resolution and magnification reveals clear anatomy of biliary tree as compared to open cholecystectomy. Therefore extrahepatic biliary system can easily be assessed for its anatomical variations and congenital anomalies during laparoscopic cholecystectomy. It is important to emphasize that it is often difficult to obtain the diagnosis of these malformations preoperatively by routine ultrasonography, however, they can sometimes be seen by special radiological evaluation such as magnetic resonance cholangiopancreatography (MRCP).

The course and pattern of entry of cystic duct is extremely variable, however it classically joins common hepatic duct below the confluence of right and left hepatic ducts on right lateral side in 58–75% of cases, whereas in the remainder it runs parallel to common hepatic duct for a variable length or may even spiral around common hepatic duct joining it on left side\(^{10-12}\). Three common variants of cystic duct insertion are in the form of low cystic duct insertion, medial cystic duct insertion and parallel course of cystic duct with common bile duct. Other cystic duct anomalies seen are short cystic duct, long cystic duct with low insertion and accessory cholecystohepatic duct. True congenital absence of cystic duct is very rare, however most cases may be due to severe fibrosis, impaction of stone in the duct and Mirrizi’s syndrome. Double cystic duct anomaly is also very rare, but well described in literature and can be responsible for post operative bile leaks\(^{13,14}\).

The incidence of accessory bile ducts varies. They can arise from right lobe of liver in majority of cases but occasionally from left or caudate lobe and may join right hepatic, common hepatic, cystic duct or even gall bladder. Other variations include the right
posterior sectoral duct joining the gall bladder or cystic duct and segment six duct joining cystic duct\textsuperscript{15,16}.

The arterial anomalies should be recognized during laparoscopic cholecystectomy to prevent arterial bleeding and hence iatrogenic injury during torrential hemorrhage. The most dangerous anomaly is tortuous course of common hepatic or right hepatic artery in front of origin of cystic duct from common hepatic duct known as Caterpillar turn or Moynihan’s hump\textsuperscript{12}. Most important is the short cystic artery arising from the looped right hepatic artery making it most vulnerable to injury during surgery. In 15\% of cases, right hepatic artery and cystic artery cross in front of the common hepatic duct and cystic duct, whereas accessory cystic artery is found in 20\% of cases\textsuperscript{12}. Variations in the course of cystic artery were artery crossing anterior to cystic duct, posterior and right to cystic duct. Variations in the number of cystic artery, like double cystic artery is seen in 15\% of cases whereas single cystic artery is seen in 85\% of cases\textsuperscript{17,18}. Due to these anatomic variations complications commonly seen are torrential bleeding and bile leaks.

Adapted from Blumgart LH. Surgery of the Liver and Biliary Tract. WB Saunders.

It is concluded that the prevention of ductal injury at laparoscopic cholecystectomy relies on accurate dissection of the cystic duct and artery and avoidance of major adjacent biliary and vascular structures. Many of the variations in the anatomy of the extrahepatic biliary tree and associated vasculature are cited as potential causes of bile duct injury and vascular trauma.

References:


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