



COMBINED ANOMALLY OF RIGHT HEPATIC ARTERY & RIGHT HEPATIC DUCT IN CHOLECYSTECTOMY: A CASE REPORT AND LITERATURE REVIEW

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ABSTRACT In contrast to the conventional belief that ligation & division of the cystic artery & duct almost completes the operation we would like to say dissection in gall bladder fossa also may be very dangerous. We are presenting a case here to show how dangerous gall bladder fossa may be after an easy Calot's Triangle dissection. A 45 year old female with a history of biliary colic was scheduled for open cholecystectomy. After dissection in Calot's triangle & removal of gall bladder from liver bed it was seen that the right hepatic artery travels a long extra-hepatic course through gall bladder fossa before entering the liver near the fundus of the gall bladder. The right hepatic duct also seen to travel an unusually long extra-hepatic course through the gall bladder fossa before entering into the liver. The right hepatic duct was punctured with fine needle to confirm the presence of bile.

KEYWORDS : open cholecystectomy, aberrant right hepatic artery, aberrant right hepatic duct

INTRODUCTION

There is a trend among the senior surgeons to ligate and divide the cystic pedicle cautiously leaving the the rest of liver bed dissection to junior residents without any monitoring. But this practice may cause fatal complications like conversion from lap to open cholecystectomy & biliary injuries which may need further complicated surgical procedures. A right hepatic lobectomy and reconstruction of the left hepatic duct was required because of right hepatic lobe atrophy and recurrent cholangitis due to post cholecystectomy bile duct repair. [7]. Misinterpretation of normal anatomy and anatomical variations contribute to the occurrence of major postoperative complications like biliary injuries following a cholecystectomy, the incidence being higher with laparoscopic cholecystectomy. A look at the basic anatomy is therefore important for biliary and minimally invasive surgeons. This includes normal anatomy and variations of the biliary apparatus as well as the arterial supply to the gallbladder.[10] Modern medical technology (ultrasonography, intraoperative radiologic contrast methods, ERC, CT and NMR) help in performing cholecystectomy and operative procedures on bile ducts. In spite of excellent visualization, perioperative lesions and variation of anatomy of vascular structures or extra hepatic (especially accessory) bile ducts during laparoscopic & open cholecystectomy are a frequent cause of intra- and postoperative complications. Therefore, we wish to point to some rare anatomy of bile ducts, right hepatic artery & hepatic veins during dissection within gall bladder fossa. [4] Accidents involving vessels or the common bile duct during cholecystectomy can be avoided by careful dissection of Calot's triangle and the hepatoduodenal ligament around the cystohepatic triangle. [5]

Although an aberrant hepatic duct entering the cystic duct is not especially rare, the main right hepatic duct entering the cystic duct is extremely rare, with only six cases reported thus far. Cholangiography may be mandatory whenever biliary anomalies are suspected during laparoscopic cholecystectomy. As the right hepatic duct entering the cystic duct can lead to ductal injury, this anomaly should be kept in mind when performing cholecystectomy. [8]

Case report: A 45 year old female patient presented to our out patient department with complaints of indigestion, hyperacidity intermittent epigastric pain for last 3 months. USG of upper abdomen revealed multiple gall bladder calculi with features of chronic cholecystitis. Her liver function test including all liver enzymes was normal. Patient was diagnosed as a case of chronic calculus cholecystitis and scheduled for open cholecystectomy.

At operation, after opening the abdomen by right subcostal incision Calot's triangle was seen having moderate adhesions. After dissection of Calot's triangle it was seen that the right hepatic artery goes under

the gall bladder after giving off the cystic artery branch. The right hepatic artery (RHA) was seen to travel deep to gall bladder fossa in extra-hepatic course. After ligation and division of the cystic artery and cystic duct together by silk gall bladder was dissected off liver bed very cautiously to avoid injury to extra-hepatic RHA. After removal of whole gall bladder from liver bed it was seen that RHA travel a long extra-hepatic course through gall bladder fossa before entering into live near fundus of gall bladder. The right hepatic duct (RHD) was seen to travel an unusually long extra-hepatic course along the upper margin of the gall bladder fossa before entering into the liver near the fundus.

Intra-operative picture was given showing the unusually long extra-hepatic course of RHA starting near red arrow and entering liver as shown by green arrow. Black arrow indicates the cut end of cystic artery and cystic duct. The blue arrow indicates the position of common hepatic duct (CHD). The yellow arrow indicates the right hepatic duct (RHD) arising from CHD. A small area of yellowish tinge over RHD indicates the punctured site of needle.

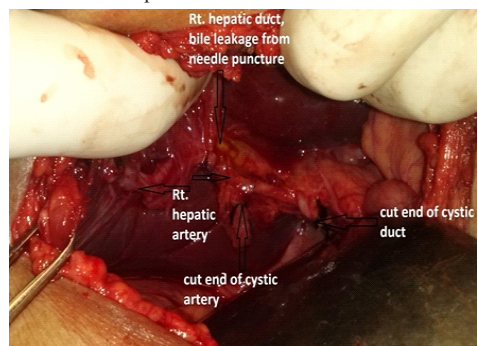


Figure I

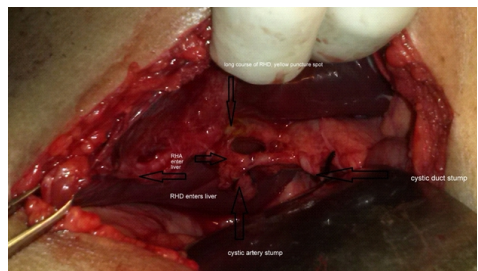


Figure II

Discussion and literature review : In contrast to conventional belief that cholecystectomy operation was almost complete after cystic pedicle ligation and division we want to highlight that liver bed dissection may also be difficult and dangerous owing to variation of anatomy in gall bladder fossa. Most surgeons are very much relaxed and casual during liver bed dissection or concentrate outside operative field leaving the liver bed dissection to junior residents. As the case we have described above where the liver bed shows atypical rare anatomy increasing the risk of injury during dissection. There were many types of variations of hepatic duct confluence as described by Couinaud in 1957, but none has not such long extra-hepatic course of RHD as described in above operative picture. We are unaware of such combined anomaly of RHA and RHD reported in literature.

The normal vascular pattern of liver, biliary system and pancreas was seen in only 60% of population. The origin and course of both RHA, cystic artery RHD has several documented anomalies. These variations are very much important to the surgeons to prevent iatrogenic injury to RHA or RHD. The RHA usually arises from hepatic artery proper after giving off the right gastric and gastroduodenal branch. RHA usually passes behind the common hepatic duct and enters the cystic triangle of Calot. But in some cases it passes in front of the bile duct making it vulnerable to injury during dissection. [1] After giving off the cystic artery branch RHA enters the liver shortly with very small extra-hepatic course. But in rare cases as shown in above picture it travel a very long course in gall bladder fossa before entering into the liver near fundus of gall bladder making it vulnerable to injury during dissection of gall bladder from liver bed. The confluence of right and left hepatic ducts takes place at the right of hilar fissure of the liver anterior to the portal venous bifurcation and overlying the origin of the right branch of portal vein. The extra-hepatic segment of the right duct is short but the left duct has a much longer extra-hepatic course. [1]

The course of the RHA is anterior to the bile duct in 64% of cases, anterior to portal vein in 0.1% of cases and posterior to portal vein in 9% of cases. In 10%, the RHA runs parallel and in close proximity, to the cystic duct & neck of the gall bladder throughout its course. At the level of the neck of the gall bladder it enters the right lobe of the liver.[3] 14.8% had variant right hepatic arteries (RHAs), 4.7% patients had a variant anatomy involving both the LHA and the RHA, 4.0% patients had a variant origin of the common hepatic artery (CHA) arising from either the superior mesenteric artery (SMA) or the aorta. [6]

Uncontrollable hemorrhage during laparoscopic cholecystectomy occurs in 0.1% to 1.9% of all cases, with 88% originating from the gallbladder bed. The anatomical proximity between major branches of the middle hepatic vein and the gallbladder bed, and hence the risk of intraoperative bleeding.[11] Large branches (mean diameter = 2.1 mm) of the middle hepatic vein are directly adjacent to the gallbladder bed in 10% of patients. An additional 10% of cases also possess branches within 1 mm of the gallbladder bed. Twenty percent of all cases will display a large branch of the middle hepatic vein adherent or immediately adjacent to the gallbladder fossa. These patients are at increased risk for intraoperative bleeding. Furthermore, contracted gallbladders with evidence of chronic disease may be at increased risk for significant hemorrhage due to altered anatomy.[11]

Conversion to OC due to intraoperative hemorrhage occurred in 14 patients (0.27%); the hemorrhage was due to tangential side lesions of the cystic artery in 2 cases, the gallbladder bed in 11 cases, and the hepatic artery in 1 case. Conversion to OC caused by injury of the bile ducts occurred in 6 patients (0.12%).[13] Patients with large branches of the middle hepatic vein close to the gallbladder bed are at risk of hemorrhage during cholecystectomy and should be identified preoperatively with ultrasound.[12]

So always remain very careful during the dissection of liver bed by keeping in mind the variations of anatomy in gall bladder fossa.

The take home messages are -

- (1) don't think operation was almost over after ligation and division of cystic pedicle, be careful till the end of operation. Unlikely it may be the starting of original dissection in liver bed after an easy dissection in Calot's triangle.
- (2) if junior residents are doing the dissection then monitor them carefully.

- (3) keep in mind about the variation of anatomy which help to diagnosis any abnormality promptly.
- (4) use cautery very carefully in liver bed dissection

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