

## Uncomplicated intraoperative evaluation of an aberrant bile duct: a case report and review of the literature.

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**ABSTRACT:** The presence of aberrant bile ducts is a significant risk factor for bile duct injuries during cholecystectomy. Identification of such anatomic anomalies of the biliary tree is crucial to prevent iatrogenic biliary injuries. For that purpose many methods, both preoperative and intraoperative, have been described with controversial results. We present a case of an aberrant right hepatic duct that was found during laparoscopic cholecystectomy with the use of intraoperative cholangiography and review the literature.

*Key Words:* Aberrant bile duct, Accessory hepatic duct, Intraoperative cholangiography, Cholecystectomy.

### INTRODUCTION

Improvement in radiologic imaging methods has shown that the incidence of abnormal biliary tree anatomy is not as uncommon as previously thought, ranging from 1.4% to 27%<sup>1</sup>. The presence of aberrant bile duct(s) is responsible for a significant proportion of extrahepatic biliary tree abnormalities and significantly contributes to the increased risk of bile duct injuries during cholecystectomy. Identification of such anomalies preoperatively and/or intraoperatively is critical in order to eliminate the risk of iatrogenic biliary injury, which is associated with substantial morbidity and occasional mortality.

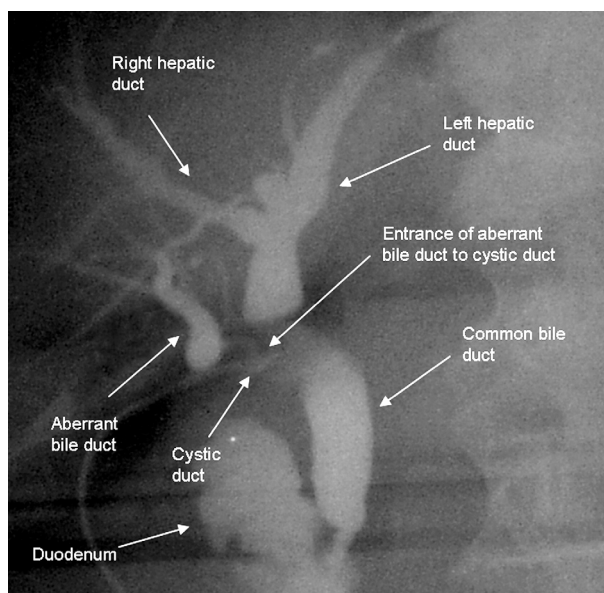
We herein report a case of an aberrant right hepatic duct that was accidentally discovered intraoperatively and discuss the clinical importance of verifying the biliary tree anatomy in order to avoid biliary injury.

### CASE REPORT

A 81-year old woman was admitted to our department for surgical management of symptomatic cholelithiasis. The patient's past medical history included repeated episodes of colic pain in the right upper quadrant, as well as four episodes of cholecystitis during the last 2 years. The preoperative sonogram of the upper abdomen showed thickening of the gallbladder's wall

and presence of multiple gallstones within the gallbladder; no dilatation of the intra- or extrahepatic bile ducts was noted.

The patient was planned for laparoscopic cholecystectomy. After the establishment of the pneumoperitoneum, the gallbladder was noticed to be covered with dense adhesions to the omentum and the hepatic flexure of the colon due to the preceding episodes of cholecystitis. The adhesions were separated meticulously. While dissecting cystohepatic triangle (of Calot) and after identifying the cystic duct and the common bile duct (CBD), a 5-mm-in diameter tubular structure was seen which paralleled the common hepatic duct and seemed to drain into the cystic duct. Due to inability to recognize the anatomical structures with safety, a cholangiogram through the cystic duct was performed, which showed the presence of an aberrant right hepatic duct draining the segments VII and VIII of the liver and entering the cystic duct just 5mm above the entry of the cystic duct into the common bile duct. (Figure 1) The cystic duct was ligated close to the neck of the gallbladder, thus preserving the drainage of the aberrant bile duct into the CBD through the remnant cystic duct. The cholecystectomy was completed without any further problems.



**Figure 1.** Intraoperative cholangiogram showing the anatomy of the biliary tree and the presence of a right aberrant bile duct entering the cystic duct.

The postoperative course was uneventful and the patient was discharged from the hospital in 3 days.

## DISCUSSION

Though variations of the biliary tree are **not rare**, the exact prevalence of abnormal biliary anatomy is widely ranging. Especially, the prevalence of aberrant bile ducts is unknown as there are huge differences in rates among both clinical studies (1.4-17%)<sup>2,3</sup> and human autopsy specimens (4-28%)<sup>4,5</sup>. A possible reason for those differences is the controversy regarding the use of terms aberrant and accessory bile ducts. Although there are studies that use those terms as synonyms, we believe the term aberrant should be used just for those ducts that present the only route of drainage of one or several hepatic segments<sup>6</sup>.

The development of aberrant bile ducts is thought to be secondary to an inhibition of primitive intestinal bud or an abnormality of formation of **primary hepatic furrow** during the first week of embryogenesis<sup>7</sup>. The majority of aberrant ducts arises from the right lobe of the liver (more than 95% of cases) and drains into the common hepatic duct in more than 70% of cases<sup>8</sup>. In our case the aberrant bile duct arose from the right lobe of the liver draining the segments VII and VIII, but instead of the common hepatic duct, it entered the

cystic duct, just 5 mm above its entry into the common bile duct. According to Hisatsugu, this type of aberrant bile duct does not exceed 7% of all cases of aberrant or accessory bile ducts<sup>9</sup>.

Aberrant bile ducts can be inadvertently ligated or transected during cholecystectomy; the ligation of an aberrant bile duct leads to exclusion of bile drainage of the analog hepatic segment, thus causing elevation of intrasegmental pressure and local biliary cirrhosis development; transection of an aberrant bile duct causes bile leakage and creation of fistula, -if there is a drainage tube-, biloma or biliary peritonitis. Both situations (ligation and transection) significantly increase morbidity and mortality and thus need to be avoided. In order to eliminate the risk of bile duct injuries a number of authors propose the routine performance of intraoperative cholangiography (IOP) during cholecystectomy<sup>10-12</sup>. However, other surgeons believe that careful dissection of Calot's triangle and exact identification of biliary tree anatomy, especially in cases of acute inflammation, having always in mind the possible variations of both biliary tree and vascular anatomy, are appropriate and sufficient measures to avoid bile duct injuries<sup>13-15</sup>. Additionally, they emphasize that bile duct injuries cannot be completely prevented by routine IOP. However, they mention that elective IOP should always be performed when the contents of Calot's triangle cannot be recognised safely.

In general, IOP, routine or selective, is a feasible, safe, fast and accurate method for detecting bile duct anatomy; only minor intraoperative complications of less than 1% have been described, with no further consequences for the patients<sup>11,16</sup>. However, to date there is no strong evidence of the efficacy of routine IOP in preventing bile duct injuries and as a consequence its use versus selective IOP is still controversial.

Instead of routine IOP some authors propose routine preoperative evaluation of the anatomy of the biliary tree by using radiologic imaging methods. Taourel et al evaluated the accuracy of magnetic resonance cholangiopancreatography (MRCP) in the diagnosis of anatomic variations of the biliary tree in 171 patients and found that MRCP leads accurately and safely to identification of biliary tree anatomic variants that may increase the risk of bile duct injury during laparoscopic cholecystectomy<sup>17</sup>. On the other

hand, Hirao et al compared helical CT cholangiography with MRCP and found that helical CT cholangiography is superior to MRCP regarding its accuracy in detection of aberrant or accessory bile ducts<sup>18</sup>. The efficacy of helical CT cholangiography in identification of biliary tree anatomy has been confirmed by several other studies<sup>19,20</sup>; however, the role of MRCP is still important, especially in cases in which the use of a contrast medium is contra-indicated, choledocholithiasis is suspected, a cystic duct is occluded, or both the bile duct and the pancreatic duct image need to be obtained simultaneously<sup>21</sup>.

About 10 years ago laparoscopic ultrasound was introduced during laparoscopic cholecystectomy as a newer intraoperative imaging method which proved to be effective in detecting bile duct stones and evaluating biliary anatomy in many studies<sup>22-23</sup>. The main advantages of laparoscopic ultrasound over IOC include speed in completing the examination, safety, repeatability, more imaging information and lower cost. The disadvantages include examiner dependency, steep learning curve, need for special equipment and certain

limitations in imaging capability. According to Machi et al the use of IOC is indicated when laparoscopic ultrasound is not complete or satisfactory in screening the bile duct for stones or in providing clear anatomic information for safe performance of laparoscopic cholecystectomy. When aberrant anatomy or bile duct anomalies are suspected, or when bile duct injuries are a concern, IOC should be performed<sup>24</sup>.

In conclusion, the presence of anatomic variants of biliary tree, including aberrant bile ducts, is a significant risk factor for bile duct injuries and accurate evaluation of the anatomy of biliary tree is considered essential to perform cholecystectomy with safety. For the evaluation of the biliary tree anatomy many methods have been described, including routine or selective IOC, laparoscopic ultrasound and preoperative MRCP or CT cholangiography. However, none of these methods can eliminate bile duct injuries unless there is essential knowledge of normal biliary tree anatomy and its variations and appropriate surgical technique is applied.

## **Ανεπίπλεκτη διεγχειρητική αναγνώριση έκτοπου χολαγγείου: παρουσίαση περιστατικού και ανασκόπηση της βιβλιογραφίας.**

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**ΠΕΡΙΛΗΨΗ:** Η ύπαρξη έκτοπων χολαγγείων αυξάνει σημαντικά τον κίνδυνο διεγχειρητικής κάκωσης των εξωηπατικών χοληφόρων στη διάρκεια της χολοκυστεκτομής. Η αναγνώριση τέτοιων ανατομικών παραλλαγών του χοληφόρου δέντρου έχει ιδιαίτερη σημασία στην πρόληψη ιατρογενών κακώσεων αυτού. Για το σκοπό αυτό, ποικίλες μέθοδοι, τόσο προεγχειρητικές όσο και διεγχειρητικές, έχουν περιγραφεί, με διαφορετικά όμως αποτελέσματα. Παρουσιάζουμε ασθενή με έκτοπο δεξιό ηπατικό πόρο, ο οποίος αναγνωρίστηκε στη διάρκεια λαπαροσκοπικής χολοκυστεκτομής με τη χρήση διεγχειρητικής χολαγγειογραφίας και ανασκοπούμε τη διεθνή βιβλιογραφία.

*Λέξεις Κλειδιά:* Έκτοπο χολαγγείο, Επικουρικό χολαγγείο, Διεγχειρητική χολαγγειογραφία, Χολοκυστεκτομή.

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