

Through the Keyhole: Unmasking the Unexpected in Laparoscopic Cholecystectomy – A Case Series

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ABSTRACT

Background: Acute Cholecystitis is a common complication of gallstone disease resulting in emergency surgery. Acute Cholecystitis increases the risk of iatrogenic Common Bile Duct (CBD) injuries due to Inflammation, edema and adhesions. Establishing critical view of safety ensures identification of the cystic duct and cystic artery before dissection or ligation, thereby preventing iatrogenic CBD injuries, even with anomalies of biliary and vascular network. Approximately 15-25% of the population has biliary anatomical variations.

Methods: This case series reports eleven patients underwent Laparoscopic Cholecystectomy. Their clinical presentation, diagnostic workup, surgical treatment, and follow-up results are presented

Keywords: laparoscopic cholecystectomy, Biliary anomalies; Acute cholecystitis; Critical view, common bile duct, laparoscopic subtotal cholecystectomy.

INTRODUCTION

Definition and Background

Laparoscopic cholecystectomy is a commonly performed surgical procedure worldwide and is considered the gold standard for treating gallstone disease. [2-3] However, not all cholecystectomies are simple, especially in cases involving anatomical variations and severe inflammation of the gallbladder. Anatomical variations around Calot's triangle are present in 20% to 50% of patients but are not always identified before surgery. [1-2,8-10]

Epidemiology

In one of the large studies from Europe (3933 patients) published recently, the indications for laparoscopic cholecystectomy (LC) were cholelithiasis in 75.5%, pancreatitis in 13.3%, cholecystitis in 6.3%, choledocholithiasis in 3.05%, and other complications in 1.2% of cases.2

In the United States 600,000 cases of LC are performed annually. Some of these operations are associated with bile duct injuries and their importance cannot be underestimated.3,4 The incidence of these injuries ranges between 0%, 3% to 0%, 6%.5,6 This means there are approximately 1800 to 3600 cases of bile duct injuries/year. Significant numbers of these patients need complex surgery, postoperative special care with definite mortality and extra cost

Case presentation

Case 1

A 38 year gentleman known to have gallstones with episodes of biliary colic in the past presented himself to the Department of General Surgery with abdominal pain in the right upper quadrant for a week, which subsided with oral analgesics and antibiotics.

USG's Abdomen and Pelvis showed over distended Gall Bladder with multiple calculi. A laparoscopic cholecystectomy using a 4-port technique was therefore performed.

Laparoscopic exploration showed a distended gallbladder. Adhesions with a short cystic duct and an anomaly in the cystic artery during the dissection of Calot's triangle using a monopolar hook seen. Cystic artery crossing over the CBD anteriorly noted. Once the critical view of safety was obtained in the anterior and posterior aspects, the cystic artery and cystic duct were clipped titanium clips. RHA was undamaged.

Case 2

A 65-year-old male presented with acute cholecystitis, fever, and RUQ tenderness. Ultrasound revealed a distended gallbladder with pericholecystic fluid. Due to severe adhesions, a subtotal cholecystectomy was performed. Recovery was prolonged, requiring drain placement, but the patient was discharged on day 5 without major complications.

Case 3

A 28-year-old female had intermittent RUQ pain postprandially, with ultrasound showing a single mobile stone. Elective laparoscopic cholecystectomy was performed without complications. She was discharged the same day and resumed work within 3 days, highlighting an uncomplicated outpatient procedure.

Case 4

A 52-year-old diabetic female presented with acalculous cholecystitis; CT showed a thickened gallbladder wall. Due to difficult dissection, the surgery was converted to open. Despite the complexity, he had no major complications and was discharged on day 7.

Case 5

A 36-year-old female at 28 weeks gestation presented with acute RUQ pain and nausea; ultrasound confirmed gallstones. Laparoscopic cholecystectomy was safely performed under fetal monitoring. Both mother and fetus recovered well, with no pregnancy-related complications.

Case 6

A 47-year-old male with a history of gallstone pancreatitis underwent MRCP, ruling out choledocholithiasis. Routine laparoscopic cholecystectomy was performed, and he was discharged within 24 hours. No recurrence of pancreatitis was observed at follow-up.

Case 7

A 59-year-old female presented with obstructive jaundice and suspected CBD stone. ERCP confirmed and extracted the stone, followed by laparoscopic cholecystectomy. Recovery was smooth, with normalized liver function tests postoperatively.

Case 8

A 33-year-old male (BMI 38) had RUQ pain and fatty food intolerance, with ultrasound-confirmed gallstones. Surgery was technically challenging due to obesity, prolonging operative time. A postoperative wound seroma resolved conservatively.

Case 9

A 70-year-old high-risk male had an incidental 1.2 cm gallbladder polyp. Due to malignancy concerns, elective laparoscopic cholecystectomy was performed. Histopathology confirmed benignity, and recovery was uneventful.

Case 10

A 54-year-old female presented with recurrent biliary colic, and ultrasound revealed multiple gallstones without CBD dilation. Intraoperatively, a tortuous right hepatic artery (Moynihan's hump) was identified near Calot's triangle, requiring meticulous dissection. Laparoscopic cholecystectomy was completed without vascular injury. The patient recovered well and was discharged on **postoperative day 2** with no complications.

Case 11

A 53-year-old female had chronic upper abdominal discomfort and a palpable mass, with ultrasound showing a distended, stone-free gallbladder (suggestive of mucocele). During surgery, the tense gallbladder was decompressed before dissection. Histopathology confirmed a mucocele. The patient had an **uneventful recovery** and was discharged on **day 1**.

Fig 1

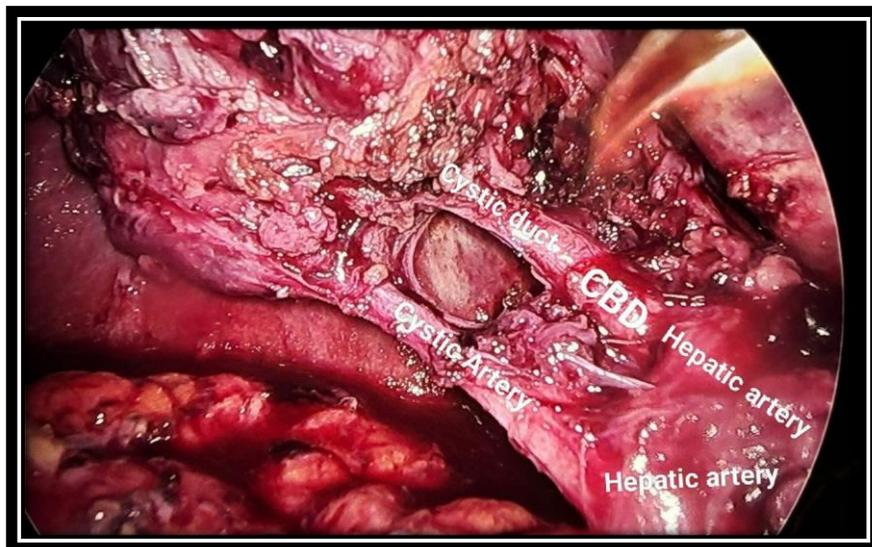
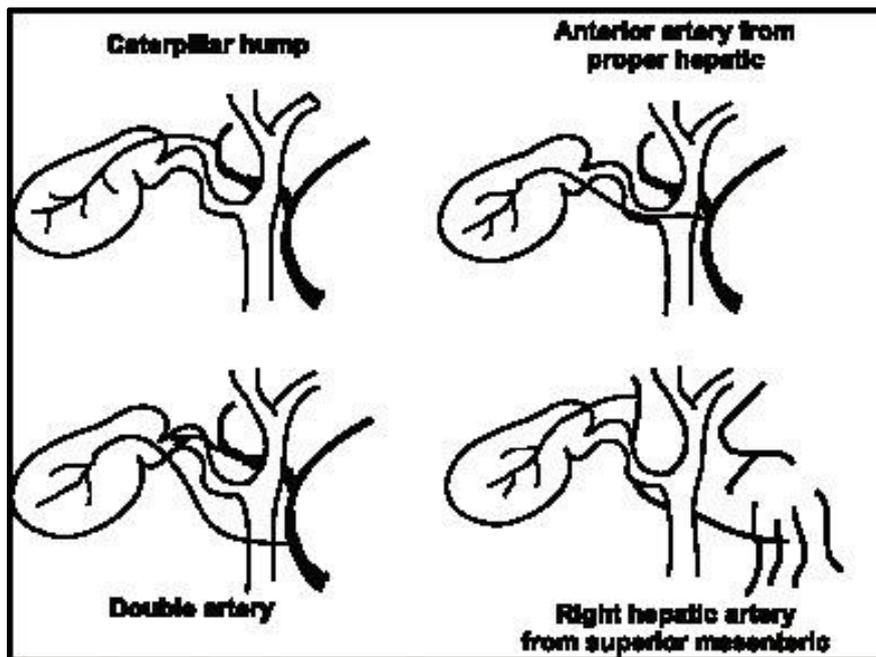


Fig 2



DISCUSSION

The cystic duct joins the gallbladder to the bile duct and is one of the important structures needing proper identification and division during a standard cholecystectomy. The cystic duct may run a straight or a fairly convoluted course. Its length is variable and usually ranges from 2 to 4 cm.^[13]

The cystic artery is a branch of the right hepatic artery (RHA) and is usually given off in the Calot's triangle. It has a variable length and enters the gallbladder in the neck or body area. The course and length of the cystic artery in the Calot's triangle is variable. Although classically the artery traverses the triangle almost in its center, it can occasionally be very close or even lower than the cystic duct.^[14]

This case series report aims to provide a comprehensive overview of this subject to ensure that every surgeon performing a cholecystectomy is well-informed about this variation and can thus avoid serious complications.

Laparoscopic cholecystectomy is a commonly performed surgical procedure worldwide and is considered the gold standard for treating gallstone disease. [2-3] However, not all cholecystectomies are simple, especially in cases involving anatomical variations and severe inflammation of the gallbladder. Anatomical variations around Calot's triangle are present in 20% to 50% of patients but are not always identified before surgery. [1-2,8-10]

Most patients with suspected gallbladder disease will undergo an abdominal ultrasound as the initial imaging test. [2] However, ultrasound does not provide detailed anatomy of the biliary and vascular system, which can make procedures challenging, especially in cases of significant gallbladder inflammation combined with anatomical variations.

To ensure a safe surgery and avoid potentially serious complications, the surgeon should always strive for the critical view of safety before clipping the cystic duct and artery, as introduced by Strasberg in 1995. [9,10] Three conditions are necessary to obtain the critical view of safety: the hepatocystic triangle should be identified and cleared of all fibrous and fatty tissue, the infundibulum of the gallbladder should be dissected off the liver bed, and only 2 structures should be entering the gallbladder, namely the cystic artery and the cystic duct.

Failure to correctly identify all the structures of Calot's triangle can lead to bile or blood leakage, which is the most common cause of conversion to open cholecystectomy. Reported mortality due to blood vessel injury is 0.02%. [3,4-5]

CONCLUSION

Cystic artery crossing over the CBD anteriorly with short cystic duct, is an anatomical variation that may be encountered during laparoscopic cholecystectomy, one of the most commonly performed surgical procedures. A thorough understanding of the anatomy of the biliary tract and the gallbladder is crucial to ensure safe surgery and prevent arterial damage and operative complications. Before clipping the cystic artery, it is essential to always obtain a critical view of safety to avoid accidental vascular or ductal injuries. Iatrogenic injuries and conversion rate can be reduced depending on the surgeon's experience, special techniques, and intraoperative investigations

Footnote

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