

# Near-Miss Hepatic Duct Injury Resulting From Misidentification of Calot's Triangle During Laparoscopic Cholecystectomy

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## ABSTRACT

**Introduction:** Bile duct injury is a serious and life-threatening problem. This well-known, albeit rare, problem is an important complication of laparoscopic cholecystectomy.

**Case Description:** A 74-year-old woman was referred to our surgical department for elective cholecystectomy due to gallstone disease. We proceeded with elective laparoscopic cholecystectomy as planned. Dissection near Calot's triangle was initiated to obtain the critical view of safety. The dissection gradually revealed a thin, bile duct-like structure adhered to the gallbladder surface. The bile duct-like structure was finally revealed to be the common hepatic duct, which had been pulled from its normal position and was stuck to the gallbladder body. Until this point in the operation, the common hepatic duct had been mistaken for the cystic duct and was almost divided. The true Calot's triangle was then recognized and dissected. The true cystic duct and cystic artery were then identified. The common hepatic duct was firmly adhered to the gallbladder body and was difficult to release from the gallbladder wall. Therefore, subtotal cholecystectomy was completed.

**Conclusions:** Careful intraoperative observation of Calot's triangle is important to prevent bile duct injury. If surgeons find it difficult to identify the location of this triangle, they should perform subtotal cholecystectomy to prevent intraoperative complications.

**Key Words:** Bile duct injury, Calot's triangle, critical view of safety, laparoscopic cholecystectomy, subtotal cholecystectomy.

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## INTRODUCTION

Bile duct injury is a serious and potentially life-threatening problem.<sup>1</sup> This well-known, albeit rare, problem is an important intraoperative complication of laparoscopic cholecystectomy. We encountered near-miss hepatic duct injury resulting from the misidentification of Calot's triangle during laparoscopic cholecystectomy.

## CASE REPORT

A 74-year-old woman was referred to our surgical department for elective cholecystectomy due to gallstone disease. She had experienced 2 gallbladder attacks several months earlier. Preoperative computed tomography (CT) scanning showed that her gallbladder was filled with a large stone and had moderately thickened walls. The gallbladder appeared to be nonfunctioning.

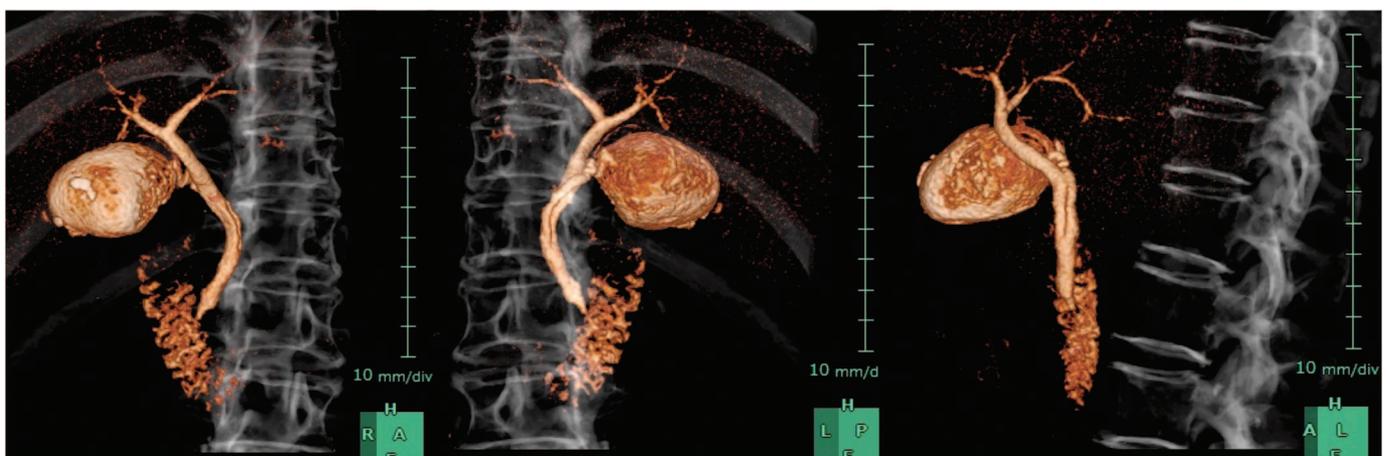
Drip infusion cholecystocholangiography (DIC)-CT indicated no abnormality of the bile ducts, including the cystic duct, hepatic duct, and common bile duct (**Figure 1**). However, DIC-CT showed that the long cystic duct passed in a medial-to-lateral direction under the common hepatic duct. The DIC-CT also showed the cystic duct running parallel to the hepatic duct with a spiral course and entering the bile duct from the left lateral aspect. At presentation, physical examination revealed no abdominal tenderness and laboratory examination demonstrated near-normal values for all parameters tested. Elective laparoscopic cholecystectomy was undertaken as planned.

Intraoperative findings included moderate adhesions between the omentum and the entire gallbladder; these adhesions were relatively easy to release. A dome-down technique was abandoned because the fundus and body of the gallbladder were firmly adhered to the liver bed. Trans-gallbladder cholangiography was not performed because the gallbladder was filled with stones and the cystic duct was expected to obstruct. Dissection near Calot's triangle was initiated with the use of a flexible-tip laparoscope to obtain the critical view of safety (**Figure 2a and 2b**). However, we misidentified the large triangle shown in **Figure 2c** as Calot's triangle and began dissection in this area. Rouviere's sulcus was not observed because of severe inflammatory changes. The cystic plate could not be detected because of firm adhesions. The dissection gradually revealed a thin bile duct-like structure adhered to the gallbladder surface, hidden within the fat tissues. The bile duct-like structure was finally revealed to be the common hepatic duct, which had been pulled from its normal position and was adhered to the gallbladder body. Until this point in the

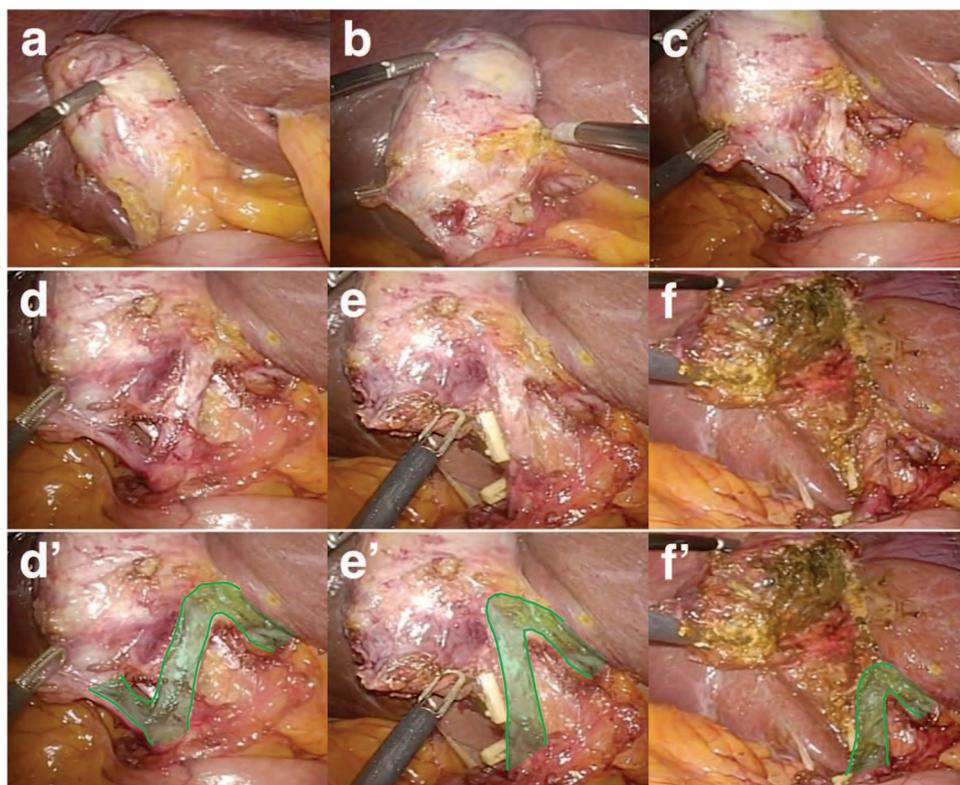
operation, the common hepatic duct had been mistaken for the cystic duct and was almost divided. We recognized that the small triangle (**Figure 2c**) was the true Calot's triangle immediately before resection of the hepatic duct. After identifying the true Calot's triangle, we proceeded with dissection in this area. Finally, a very short section of the cystic duct was exposed and the cystic artery was conclusively identified (**Figure 2d**). These were clipped and divided, and the true Calot's triangle was opened (**Figure 2e**). The common hepatic duct was firmly adhered to the gallbladder body and was difficult to safely release from the gallbladder wall. Therefore, a part of the gallbladder wall was left attached to the hepatic duct, and subtotal cholecystectomy was completed (**Figure 2f**). Ultimately, the gallbladder wall on the liver side was left attached to the liver and to the hepatic duct. The remnant mucosa was coagulated. In **Figure 2d'–f'**, the hepatic duct and cystic duct are traced with green lines to make them more clearly visible. As this figure indicates, the common hepatic duct was greatly displaced and bent ventrally by the gallbladder, which is lifted upward in the images. After gallbladder removal, the bent hepatic duct returned to its original straight state. The patient was discharged 3 days postoperatively with no complications. None of the preoperative imaging modalities, including DIC-CT, had helped to identify the intraoperative position of the hepatic duct because they did not reveal the adhesion of the hepatic duct to the gallbladder.

## DISCUSSION

Bile duct injury is a serious and potentially life-threatening problem<sup>1</sup> that can cause major morbidity, prolonged hos-



**Figure 1.** Three-dimensional drip infusion cholecystocholangiography-computed tomography.



**Figure 2.** (a–f) Intraoperative findings during laparoscopic cholecystectomy. The hepatic duct and cystic duct are traced with green lines (d'–f').

pitalization, high cost, and litigation. If the hepatic duct is mistakenly divided during laparoscopic cholecystectomy, conversion to an open procedure and hepaticojejunostomy is required. To prevent bile duct injury and other intraoperative complications, it is essential to achieve the critical view of safety at the beginning of cholecystectomy.<sup>1</sup> This technique is well known worldwide among surgeons.

To achieve the critical view of safety, it is important to expose the anatomy by circumferentially elevating the gallbladder from the cystic plate. However, if this anatomy, including the cystic plate, is not visible or is challenging to dissect because of severe inflammation, it might be difficult to achieve the critical view of safety. When the location of Calot's triangle is initially misidentified because of dense scarring or severe inflammatory changes, achieving the critical view of safety becomes harmful. In such difficult conditions, this procedure might lead to injury of the bile duct or hepatic artery. In the present case, if dissection of the triangle of Calot had been performed from above down instead of from below upward, it may have been easier to identify the

true triangle of Calot. However, if it had been necessary to dissect the cystic plate, the hepatic duct likely would have been injured in this case.

Careful intraoperative observation of Calot's triangle is important to prevent bile duct injury because preoperative imaging modalities provide almost no information to evaluate inflammatory conditions affecting Calot's triangle. These imaging modalities, including DIC-CT and magnetic resonance cholangiography, are not designed to demonstrate adhesions between the common hepatic duct and the gallbladder. These modalities only demonstrate the luminal shape of the biliary tree. It is important to know that these modalities give little information regarding adhesions between the wall of the gallbladder and the bile ducts. The true Calot's triangle was finally identified in this patient. However, if surgeons find it difficult or impossible to identify the location of this triangle, they should abandon achievement of the critical view of safety and instead perform subtotal or partial cholecystectomy<sup>2–4</sup> to prevent major intraoperative complications.

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