

# Long, Parallel Cystic Duct in Laparoscopic Cholecystectomy for Acute Cholecystitis: the Role of Magnetic Resonance Cholangiopancreatography

Theodoros E. Pavlidis, MD, PhD, Apostolos Triantafyllou, MD, Kyriakos Psarras, MD, PhD, Georgios N. Marakis, MD, PhD, Athanasios K. Sakantamis, MD, PhD

## ABSTRACT

Congenital malformation of the gallbladder and cystic duct that cause operative difficulty are rare developmental abnormalities of embryogenesis. We report the case of a 47-year-old male patient who presented with right upper quadrant pain, tenderness, mild jaundice, moderately elevated liver function tests, and ultrasound evidence of acute calculus cholecystitis. Magnetic resonance cholangiopancreatography (MRCP) excluded choledocholithiasis, but revealed the cystic duct anomaly. A difficult laparoscopic cholecystectomy was performed successfully. This is an unusual case of laparoscopic cholecystectomy for severe acute calculus cholecystitis in a patient with very low conjunction to the common bile duct (CBD) of a long, parallel cystic duct.

**Key Words:** Gallbladder and cystic duct embryogenesis, Congenital malformations, Biliary tree anomalies, Laparoscopic cholecystectomy, Acute cholecystitis.

## INTRODUCTION

Congenital malformations of the gallbladder and cystic duct are rare but important entities that might remain asymptomatic throughout life. However, these anomalies demand greater attention during surgery, much more so when the procedure is laparoscopically performed.<sup>1-4</sup> The surgeon must carefully identify the biliary anatomy to ensure a safe operation and avoid hazardous and potentially disastrous complications.

The abnormality may concern the existence or supernumerary (duplicate, triplicate) as well as different shapes and sites of the gallbladder (agenesis, rudimentary, transposition, "Phrygian cap" gallbladder, and others), mucosal heterotopias, or even abnormal mesentery predisposing to torsion and anomalies of the cystic duct. Cystic duct malformations include absence or duplication, giant cystic (choledochal cyst-like) transformation, and a spiral or long cystic duct. The latter appears with an abnormal course and low junction to the common bile duct or even with completely separate drainage into the duodenum.<sup>1,5</sup>

Laparoscopic cholecystectomy is being performed routinely in acute cholecystitis today, despite the fact that inflammation is considered an important factor for conversion.<sup>6</sup> In such cases, where the technical difficulties increase due to a thickened gallbladder wall and grasping inability, unclear anatomy, presence of dense adhesions, or inflammatory lesions and overall compromised access to the operating field, any coexistence of extrahepatic biliary tract anomalies predispose to increased risk of bile duct injury.<sup>7</sup>

We report an uncommon case of laparoscopic cholecystectomy for severe acute calculus cholecystitis, in a patient with very low conjunction to the common bile duct of a long, parallel cystic duct, highlighting the role of preoperative magnetic resonance cholangiopancreatography (MRCP) and the operating difficulties.

## CASE REPORT

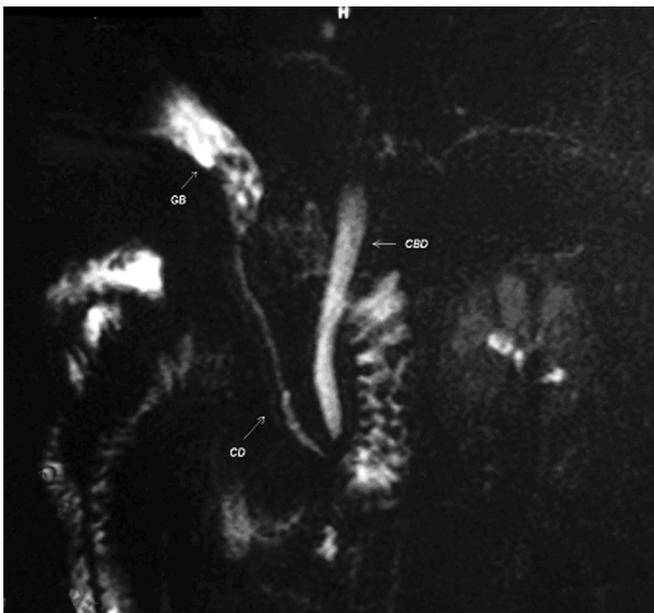
Our patient, a 47-year-old man, was admitted with a 3-day history of sharp, intermittent, right upper quadrant abdominal pain associated with nausea and vomiting. He also noticed darkening of his urine. A physical examination re-

2nd Propedeutical Department of Surgery, Medical School, Aristotle University of Thessaloniki, Hippocraton Hospital, Thessaloniki, Greece (all authors).

Address reprint requests to: Prof. Theodoros E Pavlidis, A Samothraki 23, 542 48 Thessaloniki, Greece. Telephone: ++302310 992861, Fax: ++302310 992932, E-mail: pavlidth@med.auth.gr

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vealed a soft, flat abdomen with right upper quadrant tenderness and mild jaundice. Blood pressure was 150/80 mm Hg, pulse rate was 85 beats/min, and body temperature was 36.5°C. Hematological laboratory tests, transaminases (SGOT, SGPT), and renal function tests were all normal. Total bilirubin, gamma-glutamyltransferase, and alkaline phosphatase were moderately elevated. Abdomen ultrasonography revealed small gallstones, gallbladder wall thickening, and dilated extrahepatic bile duct. MRCP was performed to exclude CBD stones. It showed a long, parallel course of the cystic duct, its very low conjunction with distal CBD, and no evidence of choledocholithiasis (**Figure 1**). The patient was scheduled immediately for laparoscopic cholecystectomy. On operation, the gallbladder was found covered completely by greater omentum attachments, shrunken, with a thickened wall, containing small gallstones (microlithiasis). Dense adhesions and scars were present in Calot's triangle obscuring the anatomy; the duodenum was loosely adhered. After meticulous dissection and cystic artery ligation and cutting, a wide bile duct at the site of cystic duct, but resembling the common bile duct, emerged; it was freed completely at a length of 8 cm to 10 cm. For more safety, a retrograde gallbladder detachment was preferred, starting from the fundus. Finally, the cystic duct was revealed hanging from the gallbladder, following a course towards the



**Figure 1.** Magnetic resonance cholangiopancreatography showing a long cystic duct (CD) with a course parallel to the common bile duct (CBD), and very low conjunction with distal CBD, no evidence of choledocholithiasis, and a gallbladder (GB) full of gallstones.

duodenum; it was ligated with large clips and cut in the middle. Thus, a difficult laparoscopic cholecystectomy was performed successfully lasting 2 hours. The patient had an uneventful postoperative course, normal liver function tests, and was discharged on the next day as usual.

## DISCUSSION

It is well known that anatomic variants of the biliary tree alone constitute one of the major groups of risk factors for bile duct injury. Variations that increase the risk of bile duct injury include the following<sup>1</sup>: aberrant insertion of the right hepatic duct into the common hepatic duct, common bile duct, or cystic duct,<sup>2</sup> low insertion of the cystic duct into the common hepatic duct,<sup>3</sup> parallel course of the cystic with hepatic ducts,<sup>4</sup> spiral course of the cystic duct, with the cystic entering the common hepatic duct along its medial surface, and<sup>5</sup> short cystic duct.<sup>8</sup> Failure to recognize these variants may lead to misidentification of the common bile and cystic ducts and may result in inadvertent ligation or resection of a portion of the common bile duct, or even in inappropriate dissection of the distal part of the cystic duct in cases of median insertion of the cystic duct. In such a context, preoperative visualization of the extrahepatic biliary tree provides the surgeon with valuable information about possible variants of the biliary tree and thus may reduce the risk of bile duct injury.<sup>9</sup>

Therefore, noninvasive techniques that can delineate the anatomy of the biliary tract preoperatively could be of clinical value. In most cases, the normal-caliber cystic duct is not seen on ultrasound or computed tomography.<sup>10</sup> Intravenous cholangiography often does not opacify the cystic duct and rarely allows a detailed visualization of the duct bifurcation. Endoscopic retrograde cholangiopancreatography (ERCP) is a very accurate but invasive method for diagnosing choledocholithiasis.<sup>9</sup> Intraoperative cholangiography is most frequently used, both to delineate the anatomy of the biliary tree and to diagnose bile duct stones. However, its routine use remains controversial.<sup>8</sup> Magnetic resonance cholangiopancreatography (MRCP) is a noninvasive diagnostic technique providing high quality cross-sectional and projection images of the biliary tree, which are almost similar in appearance to the direct cholangiograms produced by ERCP or percutaneous transhepatic cholangiography. However, its completely noninvasive nature makes MRCP an appealing modality for preoperative evaluation of the biliary tree as in this reported case.<sup>8,9</sup>

The cystic duct most often joins the extrahepatic bile duct approximately halfway between the porta hepatis and the

ampulla of Vater. However, the point at which the cystic duct joins the extrahepatic bile duct is variable, ranging from high (at the level of porta hepatis) to very low (at the level of the ampulla). The cystic duct has a parallel course relative to the extrahepatic bile duct in 10.6% of the patients and varies in length from 1.5 cm to 9.5 cm.<sup>11</sup> Often, a long, parallel course implies a common fibrous sheath around the cystic duct and the common hepatic duct<sup>11</sup> as in our case. This anatomy may be problematic at laparoscopic cholecystectomy especially when it is unknown. Ligation of the cystic duct too close to the common bile duct can result in stricture of the latter. On the other hand, mistaking the cystic duct for the bile duct can result in severe iatrogenic injuries, such as inadvertent ligation or transection of the extrahepatic bile duct. In addition, an unusually long cystic duct remnant (up to 6 cm in length) may be left after cholecystectomy, as in our case.

Although, this cystic duct anomaly does not add new findings to the literature, it is an interesting case that stresses the operative difficulties during laparoscopic cholecystectomy. These difficulties emerge from obscure anatomy due to fibrosis and the existence of this type or other types of variants. Most importantly, however, it emphasizes the importance of MRCP in doubtful cases. We think that preoperative evaluation of the extrahepatic bile duct raises the surgeon's awareness of variants, especially in potentially difficult operative situations. Thus, the role of MRCP for clarification of the anatomy in such cases is valuable and ensures the safety of laparoscopic cholecystectomy.

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