

# Transfundibular Cholangioscopy-Guided Laparoscopic Management of Fistulized Mirizzi Syndrome with Giant Stone Migration: A Case Report

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## Abstract

## Case Report

**Background:** Mirizzi syndrome is an uncommon complication of chronic gallstone disease caused by an impacted stone in the gallbladder infundibulum or cystic duct, leading to extrinsic compression of the common bile duct. Advanced disease may progress to cholecystobiliary fistula formation, resulting in distorted biliary anatomy and a substantial risk of bile duct injury during surgery. The role of intraoperative cholangioscopy in guiding laparoscopic management of these complex cases remains poorly documented. **Case presentation:** A 60-year-old woman presented with progressive jaundice and right upper quadrant pain. Initial computed tomography demonstrated biliary dilatation secondary to common bile duct stones but did not suggest Mirizzi syndrome. Magnetic resonance cholangiopancreatography confirmed biliary obstruction without clearly identifying a cholecystobiliary fistula. During laparoscopic exploration, severe inflammatory changes precluded safe dissection of Calot's triangle, prompting a bailout strategy with infundibulotomy. Transfundibular intraoperative cholangioscopy unexpectedly revealed a cholecystobiliary fistula through which a giant stone had migrated into the common bile duct. Laparoscopic choledochotomy allowed extraction of the impacted stone, followed by cholangioscopy-guided removal of two residual distal stones. Primary closure of the common bile duct and subtotal laparoscopic cholecystectomy were successfully completed. A low-output postoperative bile leak resolved with conservative management. **Conclusion:** This case highlights the value of transfundibular intraoperative cholangioscopy in the management of advanced fistulized Mirizzi syndrome. By providing direct visualization of the biliary anatomy and fistulous communication, this technique facilitated surgical decision-making, complete bile duct clearance, and successful laparoscopic treatment while minimizing the risk of major bile duct injury. **Keywords:** Mirizzi syndrome, cholelithiasis, laparoscopy, cholangioscopy, cholecystobiliary fistula.

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## INTRODUCTION

Mirizzi syndrome (MS) is a rare but potentially severe complication of chronic gallstone disease, reported in approximately 0.05% to 5.7% of patients undergoing cholecystectomy [1,2]. It results from prolonged impaction of a gallstone within the gallbladder infundibulum or cystic duct, leading to extrinsic compression of the common bile duct (CBD). In advanced stages, persistent inflammation may cause progressive erosion of the bile duct wall, resulting in the formation of a cholecystobiliary fistula and further distortion of the biliary anatomy [3–5].

Preoperative diagnosis remains challenging because the clinical presentation is often nonspecific, typically consisting of obstructive jaundice and right

upper quadrant pain. Despite significant advances in cross-sectional imaging, including computed tomography (CT) and magnetic resonance cholangiopancreatography (MRCP), Mirizzi syndrome is still frequently diagnosed intraoperatively, particularly in fistulized or advanced forms where inflammatory changes obscure normal anatomical landmarks [6–9].

Traditionally, open surgery has been considered the standard treatment for advanced Mirizzi syndrome because of the high risk of bile duct injury associated with severe inflammation and fibrosis of the hepatocystic triangle. However, increasing surgical expertise and advances in minimally invasive techniques have expanded the role of laparoscopy in carefully selected patients. Bailout strategies, such as subtotal

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cholecystectomy, together with adjunctive intraoperative imaging techniques, may improve anatomical identification and facilitate safe biliary surgery while reducing the risk of major bile duct injury [10–14].

Intraoperative cholangioscopy provides direct visualization of the biliary tree and may be particularly valuable in complex cases by identifying fistulous communications, assessing biliary anatomy, and confirming complete bile duct clearance. Nevertheless, reports describing the use of transfundibular cholangioscopy during the laparoscopic management of fistulized Mirizzi syndrome remain scarce.

We report the case of an advanced fistulized Mirizzi syndrome with migration of a giant gallstone into the common bile duct through a cholecystobiliary fistula. The patient was successfully treated by a totally laparoscopic approach combining transfundibular intraoperative cholangioscopy, laparoscopic choledochotomy, stone extraction, and subtotal cholecystectomy.

## CASE PRESENTATION

A 60-year-old woman with no significant past medical or surgical history presented to the emergency department with a 3-day history of progressive jaundice associated with epigastric and right upper quadrant pain. She denied fever, pruritus, nausea, vomiting, or changes in bowel habits.

On physical examination, the patient was overweight, hemodynamically stable, and afebrile. Abdominal examination revealed a soft, non-distended abdomen without tenderness, palpable mass, or Murphy's sign.

Laboratory investigations demonstrated obstructive cholestasis with conjugated hyperbilirubinemia and marked hepatocellular injury, with serum transaminase levels exceeding six times the upper limit of normal. Inflammatory markers were elevated, with a C-reactive protein level of 90 mg/L and a leukocyte count of  $10.5 \times 10^9/L$ , including neutrophilia ( $8.6 \times 10^9/L$ ). Serum lipase, renal function, and electrolyte levels were within normal limits.

Contrast-enhanced abdominal computed tomography (CT) demonstrated marked dilatation of the gallbladder and both intrahepatic and extrahepatic bile ducts secondary to a  $20 \times 16$  mm stone located within the mid common bile duct. The common bile duct measured 15 mm in diameter, while the intrahepatic biliary confluence measured 17 mm. Additional findings included diffuse gallbladder wall thickening, transient perfusion abnormalities involving hepatic segment IV, and a small distal common bile duct stone (Figure 1).

Magnetic resonance cholangiopancreatography (MRCP) subsequently confirmed a 24-mm impacted stone at the cystic duct–common bile duct junction, associated with upstream biliary dilatation and two small distal common bile duct stones (Figure 2). The gallbladder appeared free of intraluminal stones. Although these findings raised suspicion of Mirizzi syndrome, neither imaging modality clearly demonstrated a cholecystobiliary fistula.

A laparoscopic approach was undertaken. Intraoperative exploration revealed acute cholecystitis with severe inflammatory changes involving the hepatocystic triangle, making safe dissection of Calot's triangle impossible (Figure 3). A bailout strategy was therefore adopted by performing an infundibulotomy to avoid bile duct injury.

Opening the gallbladder infundibulum released a large amount of purulent material, which was sent for microbiological analysis. No gallbladder stone was identified. Intraoperative transfundibular cholangioscopy unexpectedly demonstrated a cholecystobiliary fistula providing direct access to the common bile duct. Through this fistulous communication, a giant impacted stone measuring approximately 2 cm was visualized within the common bile duct, together with two residual distal stones, establishing the diagnosis of fistulized Mirizzi syndrome (Figure 3).

Following identification of the common bile duct, a longitudinal laparoscopic choledochotomy was performed directly over the impacted stone, allowing its extraction en bloc. Repeat cholangioscopy enabled removal of the two distal stones and confirmed complete clearance of the common bile duct. Exploration of the intrahepatic biliary tree revealed no residual stones or other abnormalities (Figure 4).

The choledochotomy was closed primarily using a continuous 2-0 absorbable polyglactin (Vicryl®) suture without T-tube drainage. Given the extensive inflammatory destruction of the gallbladder neck and the presence of a cholecystobiliary fistula, a laparoscopic subtotal cholecystectomy was performed to minimize the risk of bile duct injury. A Delbet drain was placed adjacent to the choledochotomy.

Histopathological examination demonstrated acute-on-chronic xanthogranulomatous cholecystitis without evidence of malignancy.

The postoperative course was complicated by a low-output bile leak (approximately 100 mL/day) detected on postoperative day 2 through the subhepatic drain. Conservative management resulted in gradual resolution, with drainage decreasing to 50 mL/day by postoperative day 5. The patient was discharged home on postoperative day 6 with the drain in place and close

outpatient follow-up. The drain was removed on postoperative day 20 after complete cessation of bile

drainage for three consecutive days, accompanied by normalization of liver function tests.



**Figure 1: Contrast-enhanced abdominal computed tomography (coronal reconstruction) demonstrating marked intrahepatic and extrahepatic biliary dilatation secondary to an obstructing common bile duct stone (red asterisk). The arrows indicate the dilated biliary tree**

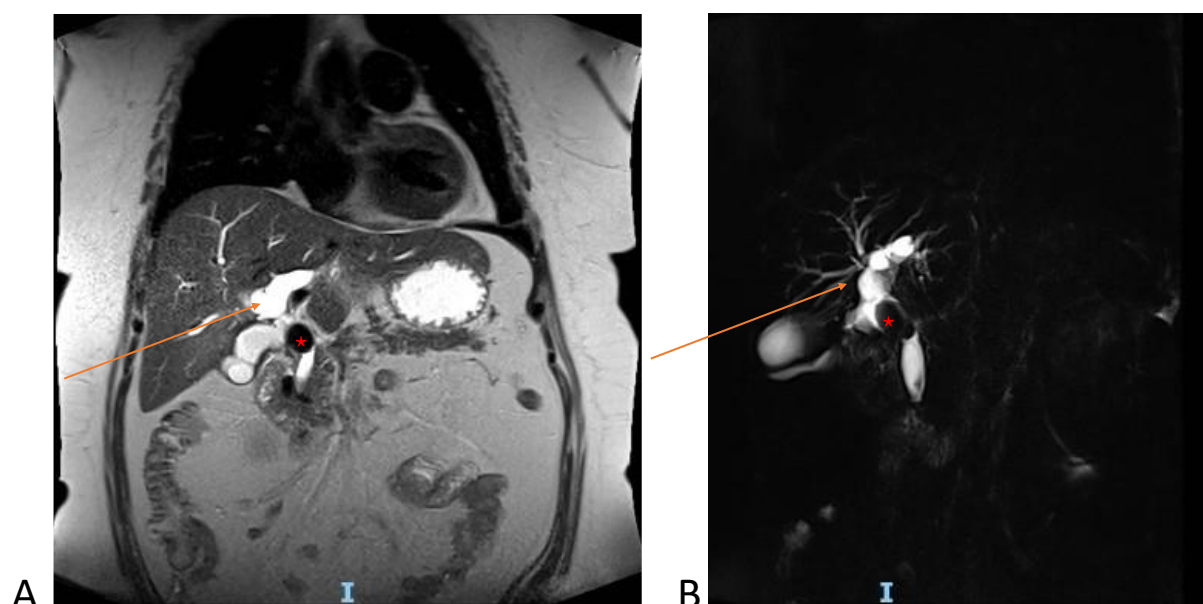


**Figure 2: Magnetic resonance cholangiopancreatography (coronal view) demonstrating an impacted stone at the cystic duct–common bile duct junction (red asterisk) with upstream biliary dilatation (arrows), highly suggestive of Mirizzi syndrome**

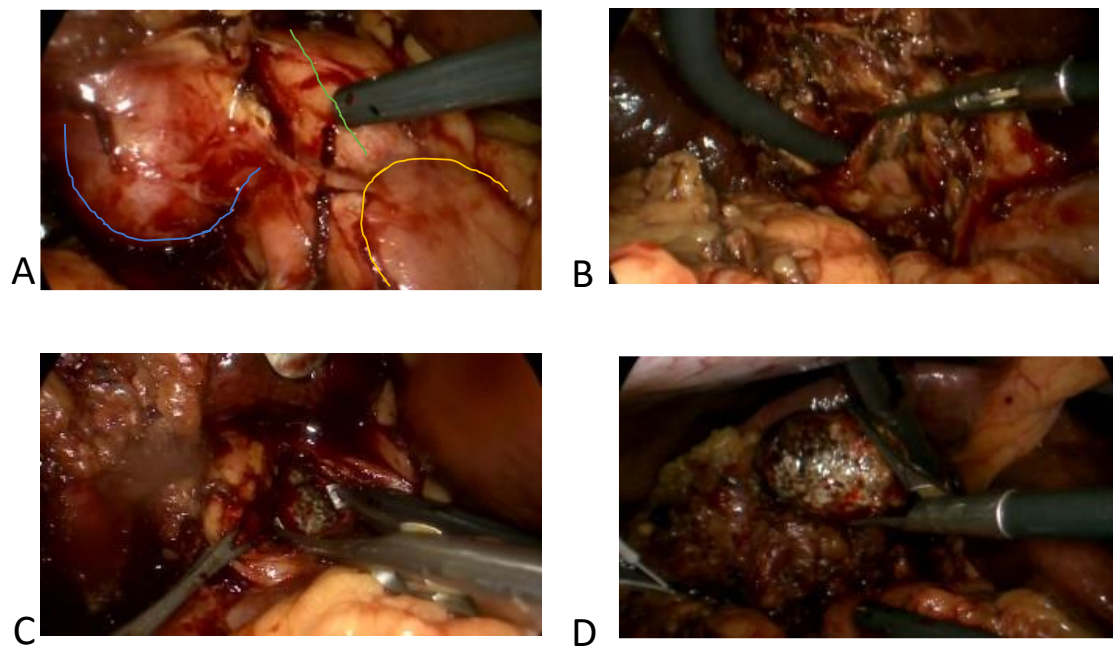


**Figure 3: Intraoperative findings.**

- (A) Initial laparoscopic exploration showing severe inflammatory changes involving the hepatocystic triangle. The gallbladder infundibulum (blue), common bile duct (green), and duodenum (yellow) are identified.  
 (B) Infundibulotomy followed by transinfundibular cholangioscopy demonstrating the cholecystobiliary fistula and direct visualization of the giant common bile duct stone.  
 (C) Longitudinal laparoscopic choledochotomy performed directly over the impacted stone.  
 (D) En bloc extraction of the giant common bile duct stone

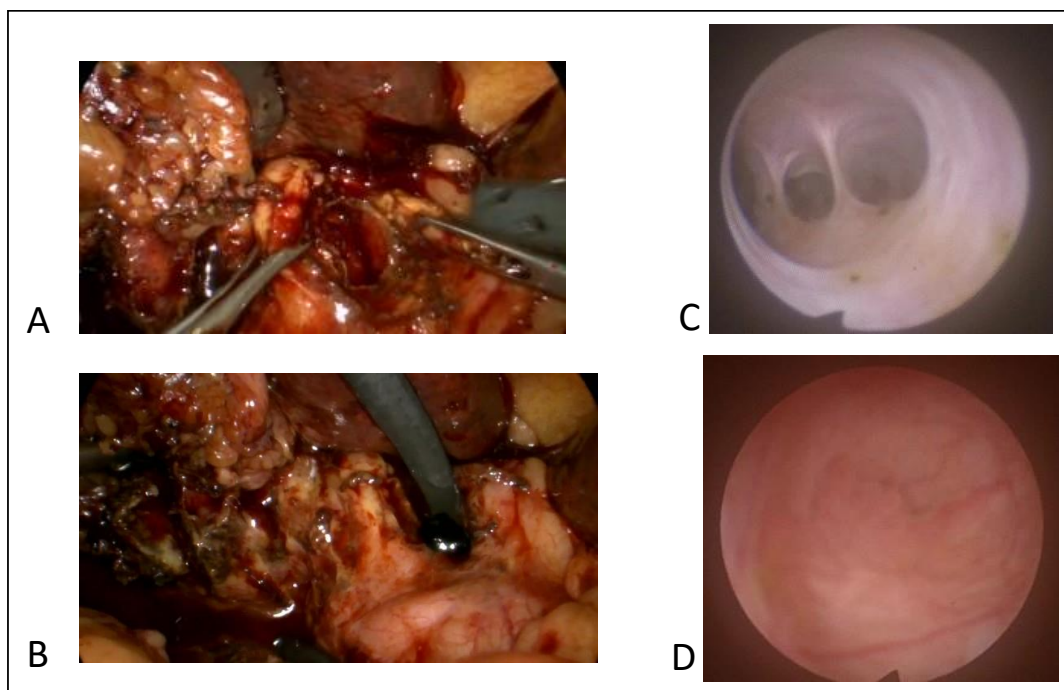


**Figure 4: Intraoperative cholangioscopic assessment following stone extraction.**

- (A) Common bile duct after removal of the impacted stone.  
 (B) Cholangioscopic exploration of the common bile duct confirming complete stone clearance.  
 (C) Cholangioscopic view of the intrahepatic bile ducts demonstrating the absence of residual stones.  
 (D) Distal common bile duct after stone extraction, showing the lumen of the common bile duct and the sphincter of Oddi.

## DISCUSSION

Mirizzi syndrome is an uncommon but technically demanding complication of chronic gallstone disease, characterized by impaction of a gallstone within the gallbladder infundibulum or cystic duct, resulting in extrinsic compression of the common bile duct (CBD). Persistent inflammation may progressively erode the bile duct wall, leading to the formation of a cholecystobiliary fistula, as described in the Csendes classification of advanced Mirizzi syndrome [1,15]. These anatomical alterations considerably increase the risk of bile duct injury during surgery and remain one of the main reasons for conversion to open surgery.

Preoperative diagnosis remains difficult because the clinical manifestations are nonspecific and imaging findings may be misleading. Although the combination of contrast-enhanced computed tomography (CT) and magnetic resonance cholangiopancreatography (MRCP) improves diagnostic accuracy, fistulous communications are frequently overlooked before surgery [6–9]. In the present case, CT demonstrated biliary obstruction caused by choledocholithiasis without suggesting Mirizzi syndrome, while MRCP identified an impacted stone at the cystic duct–CBD junction but failed to demonstrate the cholecystobiliary fistula. The definitive diagnosis was established only during surgery by transfundibular cholangioscopy, and retrospective review of the preoperative imaging subsequently revealed subtle findings consistent with the fistulous communication.

The principal novelty of this report lies in the use of transfundibular intraoperative cholangioscopy. Following infundibulotomy performed as part of a bailout strategy, direct endoscopic visualization of the biliary tree allowed immediate identification of the cholecystobiliary fistula, accurate assessment of the biliary anatomy, localization of the migrated giant common bile duct stone, and confirmation of residual distal choledocholithiasis. Unlike conventional intraoperative cholangiography, which provides only indirect fluoroscopic imaging, cholangioscopy offers real-time endoluminal visualization of the biliary tract, thereby facilitating intraoperative decision-making and reducing anatomical uncertainty in complex biliary disease [10,16,17].

Severe inflammation and fibrosis of the hepatocystic triangle frequently preclude achievement of the critical view of safety in advanced Mirizzi syndrome. In such circumstances, current international recommendations advocate adoption of a bailout strategy rather than persistence with hazardous dissection [12–15]. In our patient, subtotal laparoscopic cholecystectomy was intentionally performed after infundibulotomy to minimize the risk of major bile duct injury. This strategy, combined with choledochotomy and cholangioscopy-guided stone extraction, enabled

Laparoscopic management of advanced Mirizzi syndrome remains controversial because of its technical complexity and the historically high rates of conversion and biliary complications. Nevertheless, increasing experience in hepatobiliary surgery and the availability of advanced intraoperative imaging techniques have demonstrated that minimally invasive treatment is feasible in carefully selected patients managed by experienced surgeons [10,11]. Our case further supports this evolving concept by illustrating how intraoperative cholangioscopy can complement established bailout strategies and facilitate safe laparoscopic management of complex biliary anatomy.

The low-output postoperative bile leak observed in our patient resolved with conservative treatment alone. Such bile leaks are well-recognized after subtotal cholecystectomy, particularly in the presence of severe inflammation, and most resolve spontaneously with adequate drainage, as reported in previous series [13,14]. This favorable outcome further supports the safety of a tailored minimally invasive approach when meticulous postoperative surveillance is ensured.

Although this report describes a single case, it highlights the potential value of transfundibular cholangioscopy as an adjunct in the surgical management of advanced Mirizzi syndrome. Beyond facilitating identification of a cholecystobiliary fistula, this technique enables direct assessment of biliary anatomy, confirmation of complete bile duct clearance, and optimization of the operative strategy. Larger studies are required to determine its reproducibility and define its role within standardized management algorithms for complex biliary disease.

## CONCLUSION

Advanced fistulized Mirizzi syndrome remains one of the most challenging conditions encountered in biliary surgery because of the severe inflammatory changes, distorted anatomy, and substantial risk of bile duct injury. This case demonstrates that a tailored laparoscopic approach combining a bailout strategy, transfundibular intraoperative cholangioscopy, choledochotomy, and subtotal cholecystectomy can achieve safe and effective management in carefully selected patients. In our patient, transfundibular cholangioscopy played a pivotal role by identifying the cholecystobiliary fistula, accurately delineating the biliary anatomy, guiding complete bile duct stone clearance, and facilitating intraoperative decision-making. Although further studies are required to establish its role in standardized treatment algorithms, this technique appears to be a valuable adjunct for the minimally invasive management of complex Mirizzi syndrome in experienced hepatobiliary centers.

## Highlights

- Mirizzi syndrome is a rare and technically demanding complication of chronic gallstone disease.
- A giant common bile duct stone migrated through a cholecystobiliary fistula in advanced Mirizzi syndrome.
- Transfundibular intraoperative cholangioscopy enabled definitive identification of the fistula and precise assessment of the biliary anatomy.
- A fully laparoscopic strategy combining subtotal cholecystectomy, choledochotomy, and cholangioscopy achieved complete biliary clearance.
- Transfundibular cholangioscopy may enhance the safety of laparoscopic management in selected patients with complex Mirizzi syndrome.

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