Surg. Gastroenterol. Oncol. 2023;28(3):181-184 DOI: 10.21614/sgo-599

Laparoscopic Cholecystectomy and Common Bile Duct Exploration for Cholecystocholedocholithiasis Treatment: How We Do It (with video)

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ABSTRACT

Background: Choledocholithiasis occurs in 8–20% of patients with gallbladder stones. All patients with symptomatic gallbladder stone disease should be assessed for synchronous choledocholithiasis. When synchronous to symptomatic gallbladder stones disease, indication for treating both is clear. The most common treatment options are single-stage approach (SSA) with laparoscopic cholecystectomy and common bile duct (CBD) exploration or two-stage approach (TSA) combining pre- or post-operative ERCP (endoscopic retrograde cholangio-pancreatography) and laparoscopic cholecystectomy. SSA is gaining emphasis as surgeons' experience with advanced laparoscopic procedures increases.
Surgical Technique: Our center's preference for cholecystochodocholithiasis treatment is a laparoscopic SSA. We present a case of a 79 years-old woman with uncomplicated symptomatic cholecystochodocholithiasis. SSA with laparoscopic cholecystectomy and CBD exploration was performed.
Discussion: Laparoscopic SSA is gaining popularity, but some technical issues may impose as well as a long learning curve, and these patients are still usually managed in a TSA. Laparoscopic CBD exploration is a highly effective procedure. SSA has high rates of stone clearance, with lower rate of recurrent stones, preserving Oddi's sphincter function with the advantage to treat patients in a single intervention, obliviating the need for additional procedures and its associated risks. Shorter hospital stay and lower overall costs have been reported. For fit, low-risk patients with uncomplicated choledocholithiasis a SSA can be a better option provided adequate instruments, logistics and surgical team expertise exist.
Conclusion: Laparoscopic cholecystectomy with CBD exploration is a safe and feasible treatment strategy for cholecystocholodocholithiasis, though few centers perform it as a routine practice.
Key words: cholecystocholedocholithiasis, single-stage approach, laparoscopy, common bile duct exploration, surgery

Received: 17.07.2023
Accepted: 10.09.2023

INTRODUCTION

Gallstones prevalence in general adult population is 10-20% (1,2).

Choledocholithiasis occurs in 8–20% of patients with gallbladder stones (GS) (3,4,5). Its natural history is not completely understood (4). They may be primary, formed in bile ducts, or, most commonly, secondary, as they pass from the gallbladder into common bile duct (CBD). Major risk factors are related to biliary stasis or infection, more common in older adults in whom conditions favoring CBD dilation predispose to stone formation (4). All patients with symptomatic GS disease should be assessed for synchronous choledocholithiasis (2). According to patients' age, 10-33% of patients with cholecystocholedocholithiasis are symptomatic, and older patients are more likely to have symptoms. Most symptomatic patients with uncomplicated choledocholithiasis present with epigastric or right upper quadrant pain associated with nausea and vomiting, not necessarily related to food intake (4), and severity may depend on the number and size of the stones (4). When symptomatic, diagnosis is simple, as patients can present with acute cholangitis, obstructive jaundice, or acute/recurrent episodes of biliary pancreatitis (2). Asymptomatic choledocholithiasis, occurring in up to 50% of cases, is more difficult to diagnose. Magnetic resonance cholangiopancreatography (MRCP) and endoscopic ultrasonography are sensitive and specific imaging methods to assess for choledocholithiasis. Preoperative endoscopic retrograde cholangiopancreatography (ERCP) should not be used routinely for diagnosis. It is not cost-effective, over 10% are normal even in patients with CBD stones, and there is the risk for pancreatitis (1-13,5% of cases) (2).

In isolated asymptomatic choledocholithiasis indication for treatment is debatable. However, when synchronous to symptomatic GS disease, indication for treatment of both is clear. Laparoscopic cholecystectomy is widely accepted as the first-line treatment for symptomatic GS disease, and due to evolving laparoscopic techniques, choledocholithiasis management has been increasingly under debate, but no consensus regarding optimal management strategy exists (2).

The most common treatment options for cholecystocholedocholithiasis are single-stage approach (SSA) with laparoscopic cholecystectomy and CBD exploration (trans-cystic or via choledochotomy), or two-stage approach (TSA) combining pre- or post-operative ERCP and laparoscopic cholecystectomy (1). With laparoscopic cholecystectomy as the current standard for GS disease treatment, ERCP followed by laparoscopic cholecystectomy has been the conventional strategy in a TSA (3). However, SSA is gaining emphasis as surgeons' experience with advanced laparoscopic procedures increases (5). It allows for a more selective CBD approach and avoids unnecessary ERCPs and its associated morbidity, also obliviating the need for multiple procedures.

SURGICAL TECHNIQUE

When feasible, our center's preference for cholecystochodocholithiasis management is a laparoscopic SSA. We present a case of a 79 years-old woman with uncomplicated symptomatic cholecystochodocholithiasis, with past medical history of arterial hypertension and dyslipidemia. Patient had recurrent self-limited episodes of pain in the epigastrium and right hypochondrium, associated with nausea and vomiting. A MRCP showed a 20-millimeters GS, and intrahepatic biliary tree and CBD (13 millimeters in diameter) dilation with an 8-millimeters stone in its distal end. SSA with laparoscopic cholecystectomy and CBD exploration was proposed.

Patient was in supine position. Pneumoperitoneum was created with Veress needle through a periumbilical incision. Four ports were placed, and we used 2 trocars of 12 millimeters (periumbilical and epigastrium) and 2 of 5 millimeters (right hypochondrium and right flank). Epigastric port position was slightly different from that used in standard laparoscopic cholecystectomy as it was inserted 2,5 cm to the left of the midline to be in position to perform CBD exploration. During the operation, a flexible cholangioschope (11 Fr, 30º) was inserted through this port to perform CBD exploration. Periumbilical port was placed in the midline, just above the umbilicus. This was used as the camera (30º) port. Supplementary video 1 intents to highlight the key-steps in laparoscopic cholecystectomy and CBD exploration that we performed.

Surgical procedure had the following steps:

1) Dissection started around gallbladder performing adhesion lysis to adjacent structures, gallbladder was partially dissected from its bed and used for retraction.
2) Dissection proceeded around Calot's triangle achieving the critical view of safety. Cystic duct (CD) and cystic artery (CA) anterior and posterior branches were identified. CD was ligated only proximally. CA anterior and posterior branches were ligated (2 distal and 1 proximal metallic clip).
3) An incision in the CD was done, just distal to the metallic clip. A flexible cholangiography catheter was passe into the CD, and iodinated contrast dye was injected.
4) Intra-operative trans-cystic cholangiography showed a stone located in the distal end of CBD (compatible

with pre-operative location). Contrast dye normally passed through the duodenum.

5) A flexible cholangioschope was inserted through the epigastric port into the CD. However, due to technical/anatomical difficulties, trans-cystic approach for CBD exploration was not feasible.
6) A longitudinal supra-duodenum choledochotomy was performed, and the flexible cholangioscho-scope was inserted into CBD. CBD proximal part, right and left hepatic ducts, and secondary and tertiary ducts were viewed. Cholangioschoscope was directed downward to view CBD distal segment up to the papilla. Debris were removed by flushing with a copious amount of normal saline. Cholangioscopy showed the previously known 8 millimeters stone in distal end of CBD. A Fogharty catheter was passed and cleared some of the debris, and a Dormia basket was used to extract the stone (collected in an endo-bag).
7) Choledochotomy was primarily closed with an absorbable interrupted 3-0 monofilament suture.
8) Cholangiography catheter was inserted into the CD and a final cholangiography was performed, with no subtraction images in biliary tree and normal passage of contrast into duodenum.
9) CD was ligated distally with a plastic staple and then divided. CA anterior and posterior branches were also divided.
10) Gallbladder was completely dissected from its bed and extracted in an endo-bag. Hemostasis was reviewed, and a subhepatic drain was left in place and retrieved through the right flank port.

Operative time was 200 minutes. Post-operative period was uneventful, and drain was withdrawn in the 2nd pos-operative day. Patient was discharged home at 3rd day after surgery, remaining asymptomatic with no evidence for stone recurrence during the subsequent 2 years follow-up period in our institution.

DISCUSSION

Laparoscopic SSA is gaining popularity in cholecysto-choledocholithiasis treatment. Even though, it is not routinely performed, as technical issues impose and learning curve is long, and these patients are still usually managed in a TSA. ERCP can be performed pre- or post-operatively. Endoscopic sphincterotomy is always performed, resulting in Oddi's sphincter disruption, exposing patients to complications such as bleeding, perforation, and post-procedure pancreatitis (2). It also poses future risks for ampullary stenosis, duodenum-biliary reflux, cholangitis, recurrent stones, and even biliary malignancies (3,5). Both pre- and post-operative ERCP are effective in CBD stone clearance. Another option is intra-operative ERCP, allowing for a SSA (2). However, endotracheal tube and supine position create some difficulties, along with logistical issues as well as a longer operative time, which may discourage its use. Laparoscopic cholecystectomy after ERCP may be difficult to perform, with higher complication rates due to post-procedure inflammation and fibrosis in and around Calot's triangle, as well as potential adhesions (3). In fact, Calot's triangle dissection and cholecystec-tomy are easier in patients undergoing SSA.

Laparoscopic CBD exploration is a highly effective procedure with an overall clearance rate ranging from 75-92% and minimal morbidity, but with a slightly higher rate of retained stones compared to other techniques (2). Trans-cystic approach should be the first-line option. However, it can only be used for few (less than 5) small (less than 10 millimeters) CBD stones, and for those located distal to the cystic confluence. In alternative, CBD exploration can be done via choledo-chotomy (1). In fact, this should be the choice for large, multiple stones that cannot be extracted through the CD. Regarding choledochotomy, primary closure is safe and effective and can be performed as an alternative to T-tube drainage. Operative time and post-operative hospital stay are shorter and costs are lower than T-tube drainage, as well as post-operative complication rate (1). However, doing primary closure as first-option instead of T-tube drainage remains controversial (5). Intra-operative cholangiography may not be always technically possible and increases operative time, but has excellent accuracy for CBD stones detection, and can be done to access for stone clearance. Successful laparoscopic exploration and stone removal using a Fogharty catheter or a Dormia Basket has been reported in 60–90% of cases in specialized centers (2). When performing CBD exploration, mean operative time is significantly higher than for cholecystectomy only, but it usually has no impact on hospital stay, morbidity, or overall costs, still being more favorable than a TSA (3).

When a TSA is chosen, the most common option is pre-operative ERCP followed by laparoscopic cholecys-tectomy (5). It is reported to be associated with higher rates of stone clearance, but with a higher risk for pancreatitis and longer hospital stay (5). Post-operative bile leakage is reported to be lower, but patients undergo two different procedures under general anesthesia (5). Another disadvantage is the time elapsed between procedures, as in many centers it might not be feasible to perform ERCP and laparoscopic cholecystectomy during the same hospitalization.

SSA has high rates of stone clearance, with lower rates of recurrent stones, preserving Oddi's sphincter function with the advantage to treat patients in a single intervention, obliviating the need for additional procedures and its associated risks, an important issue especially in older patients. Shorter hospital stay and lower overall costs have also been reported (3,5). An exception is when a bile leak occurs or T-tube drainage is used for choledochotomy closure, as these patients usually have longer hospitalizations (5). Both strategies have similar overall efficacy, complication, morbidity, and mortality rates (3,5). Some studies report a slightly lower morbidity rate with SSAs (2).

TSA may be indicated for high-risk patients, including those with acute cholangitis, jaundice, coagulopathy, severe pancreatitis, and retained stones, for whom shorter and less complex procedures might be advisable. For fit, low-risk patients with uncomplicated choledocholithiasis a SSA can be a better option provided adequate instruments, logistics and surgical team expertise exist (3,5).

CONCLUSION

Laparoscopic cholecystectomy with CBD exploration is a safe and feasible treatment strategy for cholecystocholodocholithiasis, though few centers perform it as a routine practice (2). It appears to be the most cost-effective treatment option but requires suitable logistic conditions and an experienced surgical team.

Authors' contribution

All listed contributors designed the study and did the collection and assembly of data as well as data analysis and interpretation. All authors wrote the manuscript and did its final approval.

Conflicts of interest and funding sources

The authors have no conflict of interest to declare. No financial support and technical or other assistance were received.

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