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CASE REPORT

Laparoscopic Common Bile Duct Exploration for Stones at a Resource Poor Hospital in Trinidad & Tobago: A Retrospective Study

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ABSTRACT

Background: Surgeons in the Caribbean are generally reluctant to perform laparoscopic common bile duct (CBD) exploration at the time of cholecystectomy because exploration is perceived to have low clearance rates. We routinely perform laparoscopic explorations for CBD stones at the Port of Spain General Hospital in Trinidad & Tobago. This retrospective study sought to document outcomes after laparoscopic CBD exploration.

Methods: We identified all patients who underwent laparoscopic CBD exploration for stone extraction at the General Hospital in Port of Spain over a ten-year period from January 1, 2013 to January 30, 2023. The following data were extracted: demographic details, operating time, stone clearance rates, retained stone rates, conversions, complications. All data were entered into an excel database and the data were analyzed with SPSS version 20.

Results: Intra-operative cholangiograms were performed in 49 patients, and CBD stones identified in 12 (25%) patients at a mean age of 48.7+/- 8.63 years. These patients underwent laparoscopic CBD exploration without prior endoscopic retrograde cholangio-pancreatography. The mean stone burden was 4.7+/-2.54 stones. Four (33%) patients had attempts at trans-cystic exploration, and they all required choledochotomies to complete CBD exploration. Eight patients had initial attempts at choledochotomy for stone extraction. The mean operating time for laparoscopic cholecystectomy, operative cholangiography and CBD exploration with duct clearance was 169.6+/-35.1 minutes. There were 2 (17%) conversions, 1 (8.3%) complication (bile leak) and no mortality. Stone clearance rate was 91.7% (11). The mean duration of hospitalization was 0.6 days. There were no instances of retained or recurrent CBD stones in this series.

Conclusions: While laparoscopic CBD exploration does demand increased skill sets, such as laparoscopic suturing, mastering duct exploration techniques, interpreting biliary anatomy and operative cholangiography, we have shown that it is feasible in the resource poor Caribbean setting. Surgeons planning to perform laparoscopic CBD exploration should have a working knowledge of biliary anatomy and variations and the ability to suture laparoscopically.

Introduction:

In the era of open surgery, common bile duct (CBD) exploration was routinely performed for choledocholithiasis. However, it is less frequently practiced today by minimally invasive surgeons since laparoscopic exploration requires increased skill sets.[1] Instead, many patients are sent for stone extraction by endoscopic retrograde cholangiopancreatography (ERCP).[2]

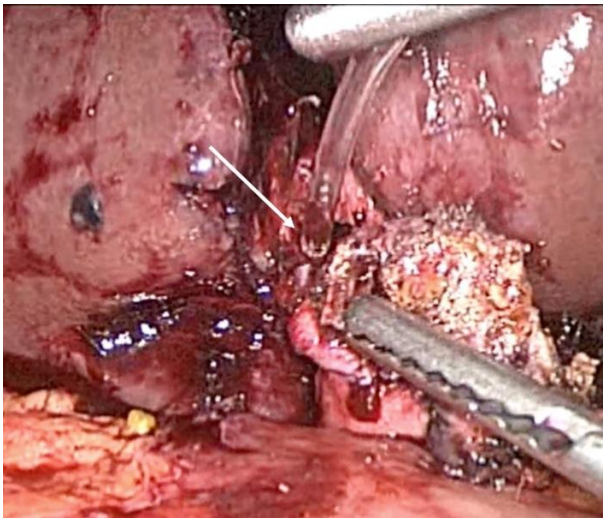
Similarly, Caribbean surgeons are generally reluctant to perform laparoscopic CBD exploration at the time of laparoscopic cholecystectomy,[3] citing the following reasons: (1) resource-poor operating rooms are not equipped for this procedure, (2) ERCP is readily available and (3) laparoscopic exploration is perceived to have low clearance rates and (4) relevant expertise is not readily available. However, we could find no objective data to support these statements during a literature search.

The hepatopancreatobiliary team at the Port of Spain General Hospital in Trinidad & Tobago routinely performs laparoscopic CBD explorations for choledocholithiasis. We carried out a retrospective study to document clinical outcomes after laparoscopic CBD exploration in this low-volume facility in Trinidad & Tobago. The primary aim of the study was to establish that laparoscopic CBD exploration was feasible in a resource poor setting. Secondary aims were to document stone clearance rates and the incidence of retained common duct stones.

Methods:

The General Hospital in Port of Spain is a government-funded hospital with a catchment population of 750,000 persons in the north-western part of Trinidad & Tobago. At this institution, we selectively performed operative cholangiography when pre-operative liver function investigations and/or imaging raised a suspicion of common duct stones, using the protocols previously outlined.[3]

As this was a resource poor institution, we did not have many tools at hand. For example, there is no catheter-passer for cholangiography and we were required to perform cholangiograms free-handedly (Figure 1). This involved partial transection of the cystic duct and introduction of a 5Fr infant feeding tube passed through a 5mm port, alongside a working instrument. The internal end of the catheter was manipulated with needle holders and passed into the cystic duct, allowing 50mls of diluted ultravist® (iopromide) to be instilled while fluoroscopic images were recorded. In patients with filling defects suggestive of CBD stones (Figure 2), we committed to laparoscopic CBD exploration.



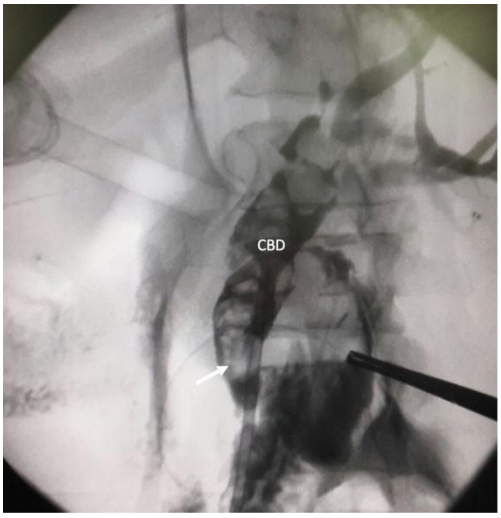
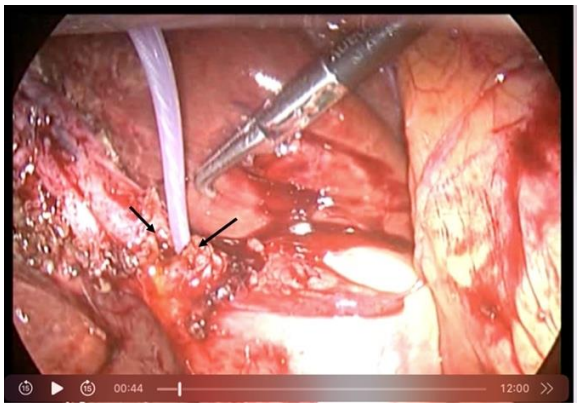


Figure 1: A 5Fr infant feeding tube is passed free-handedly into the cystic duct to perform operative cholangiography. Figure 2: An intra-operative cholangiogram that demonstrates multiple stones in the common bile duct (CBD). The arrow points to the most distal stone impacted in the lower CBD.

We used a trans-cystic approach when the cystic duct diameter was >4mm and there were distal CBD stones <5mm in diameter. In this case, a Fogarty balloon catheter was passed into the cystic duct and used to dilate the cystic duct. The CBD was then trawled with the balloon catheter and laparoscopic graspers were used to milk stones from the cystic duct stump (Figure 3). When available and required, a Dormia basket was employed to aid stone evacuation (Figure 4).



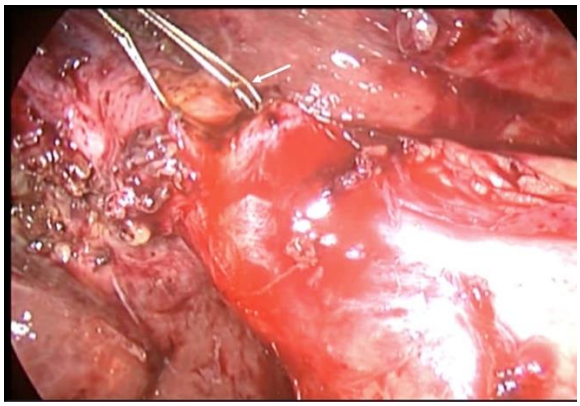


Figure 3: A Fogarty catheter is inserted into the opened cystic duct to trawl the common duct for stones. The arrows demonstrate the transverse incision used to open the cystic duct. Figure 4: A Dormia basket (arrow) is being used to deliver common duct stones across the opened cystic duct.

When the cystic duct diameter was smaller than 4mm or there were large stones >5mm, we performed a choledochotomy for exploration. Our facility did not have laparoscopic knives. Therefore, we introduced a #11 surgical blade mounted in reverse direction on a needle holder. Intra-corporeally and under vision, the blade was reversed and mounted onto the needle holder, which was then used to incise the CBD (Figure 5).

Laparoscopic scissors were then used to complete the choledochotomy. Stone extraction proceeded in a similar fashion, with a balloon catheter and/or Dormia basket (Figure 6).

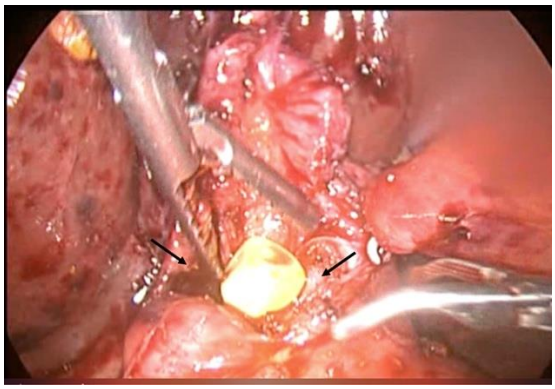


Figure 6: A large stone is being retrieved across a choledochotomy. The arrows point to the longitudinal incision used to open the common bile duct.

Stone clearance was always confirmed with repeat cholangiography. We routinely closed the duct primarily with 4/0 PDS sutures. When the CBD was small and there was concern about structuring, a T-tube was placed, but this was left to the discretion of the operating surgeon. A passive Blake's drain was routinely left at Calot's triangle at the end of the operation.

After securing institutional review board approval, we retrospectively examined hospital records for all patients who underwent laparoscopic CBD exploration for choledocholithiasis by two surgeons from January 1, 2013 to January 30, 2023 at a facility in Trinidad & Tobago. We included all patients >18 years of age who had complete documentation available. Exclusion criteria included patients <18 years of age, those in whom clinical information was unavailable and/or those who did not consent to participate. The following data were extracted: demographic details, operating time, stone clearance rates, retained stone rates, conversions, complications. All data were entered into an excel database and the data were analyzed with SPSS version 20.

We defined stone clearance as the removal of all stones within the CBD after duct manipulation, confirmed on cholangiography. A retained stone was considered as one which was detected in the CBD less than 6 months after cholecystectomy.[4] Recurrent CBD stones were defined as those detected more than 6 months following cholecystectomy.[4]

Results:

Over the 10-year study period, using our protocol of selective cholangiography, intra-operative cholangiograms were performed in 49 patients. There were CBD stones identified in 12 (25%) patients using these selective protocols. There were 11 females and 1 male at a mean age of 48.7 Years (Range 39-68; SD +/- 8.63; Median 49). These patients all went on to have laparoscopic CBD exploration. All patients had conventional laparoscopic explorations and one patient underwent

FreeHand robot-assisted laparoscopic exploration.

Of the 12 patients, 6 were identified pre-operatively by jaundice and/or abnormal liver function tests and 6 (50%) were unexpected intra-operative findings prompted by a low threshold to perform cholangiography: large ducts intra-operatively (2) and unclear anatomy at surgery (4).

Nine (75%) patients had at least one stone in the CBD distal to the cystic duct junction and 3 (25%) had stones in the proximal CBD. The mean stone burden was 4.7 stones (Range 2-9; SD +/-2.54; Median 4). No patients had ERCP prior to surgery.

Four (33%) patients had attempts at trans-cystic exploration, and they all required choledochotomies to complete duct exploration. Eight patients had initial attempts at choledochotomy for stone extraction. In two (17%) patients, the surgeon decided that stone clearance could not be achieved, prompting conversion to open exploration. In one of these patients no additional stone was found after conversion, meaning there was duct clearance after laparoscopic exploration.

The remaining 10 patients had successful duct clearance as confirmed by post-extraction cholangiography. In this group, all choledochotomies were closed with 3/0 PDS sutures and 2 (20%) patients required T-tube placement at the discretion of the operating surgeon. A passive drain was routinely left at the operative bed.

The mean operating time for laparoscopic cholecystectomy, operative cholangiography and duct exploration with duct clearance was 169.6 minutes (Range 120-220; SD +/-35.1; Median 177.5). The mean duration of hospitalization was 0.6 days (Range 0-3; SD 0.996; Median 0). There were no recorded deaths, 91.7% stone clearance and 1 (8.3%) complication (bile leak requiring prolonged drain insertion). There were no instances of retained or recurrent CBD stones in this series.

Discussion:

Choledocholithiasis is present in 3-10% of patients scheduled for laparoscopic cholecystectomy.[5] In Caribbean practice, many of these patients are sent for stone removal by pre-operative ERCP using a two-staged approach to care. This often incurs treatment delays, two rounds of general anaesthesia and increased overall cost of care - which to date have not been quantified in surgical literature from the Caribbean region.

There has been documentation in Caribbean literature that ERCP carries a 10%[6] to 11.1%[7] risk of complications. Plummer et al[6] also documented that 1% of persons undergoing ERCP developed severe pancreatitis, which is accompanied by potential mortality. Therefore, one must consider the cumulative morbidity and mortality when ERCP is used. Furthermore, ERCP is not universally available in Trinidad & Tobago. It was not available at our tertiary referral center in Trinidad & Tobago up to the year 2023. This mirrors the health care environment in several other Caribbean nations. Therefore, we believe that laparoscopic CBD exploration is a useful skill for surgeons to possess.

We agree that laparoscopic CBD exploration requires additional expertise and equipment. However, we have demonstrated that the procedure is still feasible despite resource

constraints. In our facility, due to resource constraints, we were forced to use modified techniques such as reverse mounting of a #11 blade and freehand cannulation of the CBD. This operating theatre environment is similar to that in other Caribbean nations and many resource-poor nations across the globe.

In our low resource setting, the operating time for laparoscopic cholecystectomy, cholangiography and CBD exploration was 169.6 minutes and this was comparable to existing reports in the surgical literature, where operating time ranges from 120 minutes[8] to 194 minutes.[9]

Using rudimentary surgical equipment, our stone clearance rates were 91.7% and this was also comparable to existing reports in surgical literature,[8,10,11,12,13] where stone clearance rates after laparoscopic CBD exploration were reported to range from 85%[10-11] to 92%[13]. We must point out that these results were achieved with rudimentary surgical equipment such as reverse mounting of the surgical blade and freehand cholangiography. This is important to point out because many surgeons shy away from this procedure, because of the perception that laparoscopic CBD exploration is difficult and results in low stone extraction rates.[14] However, there is good quality data documenting that laparoscopic CBD exploration resulted in 85-92% duct clearance,[10-13] <10% morbidity[10,11,15,16] and <1% mortality.[15] In our setting, our results were comparable with 91.7% duct clearance, 8.3% minor morbidity and 0 mortality.

Because of the perceptions associated with LCBDE, they are infrequently performed in the English-Speaking Caribbean. A survey of Caribbean surgeons[17] revealed that laparoscopic CBD exploration was performed routinely by surgeons in only 4 (24%) of 17 countries in the Anglophone Caribbean: Barbados, Cayman Islands, St. Lucia, and Trinidad & Tobago. One of the reasons surgeons avoided this procedure was that their operating theatres were not prepared to facilitate this service as there were no cholangioscopes, catheter passers, or other specialized equipment. We agree that laparoscopic CBD exploration requires additional surgical expertise, knowledge of biliary anatomy, some specialized equipment, but we have shown that it is still feasible in the resource poor environment.

A strong argument supporting laparoscopic CBD exploration is that it facilitates complete treatment at a single sitting. When pre-operative ERCP and subsequent laparoscopic cholecystectomy was compared to single stage laparoscopic cholecystectomy and CBD exploration in 1,757 patients with CBDS across 13 trials, single stage treatment resulted in greater stone clearance (94% vs 90%), lower treatment costs, lower morbidity (7.6% vs 12%), retained stones (1.2% vs 7.9%), cumulative operating time (112 vs 132 minutes) and hospitalization (4.9 vs 6.6 days).[18]

Conclusion:

While Laparoscopic CBD exploration does demand increased skill sets, such as laparoscopic suturing, mastering duct exploration and stone extraction techniques and interpreting biliary anatomy and IOC, we have shown that it is feasible in the resource poor setting, such as the Caribbean. Surgeons planning to perform LCBDE should have a working knowledge of biliary anatomy and variations and the ability to suture laparoscopically.

Conflicts of Interest Statement:

None

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