

Practical Considerations for Common Duct Stone Clearance

Dennis L Sta Ana

Department of Surgery, Marikina Valley Medical Center, Sumulong ave, Marikina City-1800, Philippines

Abstract

Patients undergoing cholecystectomy have a 10 to 18% chance of common duct stone (CDS) being discovered during the procedure. With the advent of laparoscopy the generally successful open common bile duct exploration for the treatment of common duct stone has been largely replaced by endoscopic means. Lately however, endoscopic clearance is being challenged by a single stage laparoscopic common duct exploration. No clear consensus has been developed to delineate specific practice guidelines for each procedure. Even so, different variables such as patient variables, institutional limitations and technical considerations make the choice of the appropriate procedure a lot more confusing. It is the aim of this article review to find out practical options for the surgeons on the basis of established parameters for safe surgery as well circumstantial parameters that may be variably present in different hospital settings. The search strategy was to review literatures, abstracts, electronic databases, and bibliographies published from year 1999 until 2008 using different medical search engines. Results of this review showed two RCTs (n 378) comparing preoperative endoscopic clearance vs laparoscopic stone clearance and two smaller RCTs (n 166) which compared single stage laparoscopic stone clearance vs delayed endoscopic clearance. There was shorter length of stay in the laparoscopy arm in both studies but stone clearance rate, mortality and morbidity were not significantly different for all studies. Literatures that dealt with circumstantial parameters such as patient variables, institutional limitations and technical expertise, all showed positive significance for these parameters in predicting the success or failure of a procedure for common duct clearance.

Keywords: Common duct stones, cholecystitis, choledocholithiasis, ERCP, complications, laparoscopic choledochotomy, endoscopic surgery.

OBJECTIVES

The objectives of this review were to compare available data on four of the common procedures for CDS clearance. Procedures included were. (1) Open CBDE, (2) Preoperative ERCP, (3) Postoperative ERCP, and (4) Laparoscopic common bile duct clearance (LCBDC) based on success rate, mortality, morbidity, length of hospital stay, and cost. This review also aimed to find out how circumstantial parameters such as patient variable, institutional limitation and technical consideration would affect the decision making process for the treatment of CDS.

MATERIAL AND METHODS

A systematic literature search for relevant articles, abstracts, bibliographies and electronic data base using search engines such as Google, Springerlink, Highwire Press, and Medline. Thirty articles were chosen of which 4 randomised controlled trials and one systematic review were.

Accepted methods of treatment for common bile duct stone were evaluated for its outcome measures such as mortality, morbidity, success rate, duration of hospital stay and cost. No attempt was made to install one procedure as the best procedure for all types of scenario. Findings are presented based on available data gathered from the literature search.

Accepted methods of treatment for common duct stones are: (1) Open CBDE, (2) Preoperative, (3) Postoperative ERCP/

ES, (4) Laparoscopic cholecystectomy with common duct clearance via transcystic route (LTCCBDE) or through a choledochotomy (LCBDE). Variables commonly used in the formulation of treatment strategy were chosen for analysis. This included articles dealing with institutional limitation, technical expertise and patient factors. These variables were then studied for its possible contribution in the choice of treatment modality.

INTRODUCTION

NIH consensus of 1993 replaced open cholecystectomy with Laparoscopic cholecystectomy as the procedure of choice for cholecystolithiasis. Gallstone, even if it is asymptomatic, has a 10-50% chance of complication within 20 years.² In patients who undergo cholecystectomy, 18% will be found to have choledocholithiasis.^{3,4} With the dawning of the laparoscopic era, Endoscopic retrograde cholangio pancreatography (ERCP) became popular in common duct stone (CDS) removal.⁵ In the beginning, it was a choice between open common bile duct exploration (CBDE) and endoscopic stone clearance (ERCP/ES) for CDS. With technical advances in laparoscopic removal of stone and the improvement in skills among laparoscopic surgeons, more and more used the single stage method of removing the CDS. It has now become important to compare laparoscopic and endoscopic approaches in the removal of common duct stones so that guidelines may be set.¹⁰ At present, there are a lot of controversies in the management of CDS. To

add to this, standard algorithm, variations in laparoscopic skills, availability of proper equipment and cost differences in medical centers perpetuate the lack of consensus for this problem. The current practice option for CDS at the time of laparoscopic cholecystectomy (LC) are preoperative or postoperative ERCP/ES, intraoperative ERCP/ES, LTCCBDE, LCBDE and outright open CBDE. In the absence of official consensus, decision becomes dependent on the patient's medical fitness, technical skill of the surgeon, availability of equipment, availability of the endoscopic team and cost.

RESULTS AND DISCUSSION

The most contentious issue in the management of CDS is which between laparoscopic surgery and ERCP will be most beneficial to patients. Two RCTs conducted comparative studies on preoperative ERCP and laparoscopic CBDE using a total of 378 patients (Table 1).^{6,7} Two smaller RCTs compared treatments of stones found during surgery using 166 randomized patients (Table 2).^{8,9} Conversion rates for laparoscopic surgery were 7.4%,⁷ implied 3.5%,⁵ 2.4%⁸ and 1.3%.⁹ Combined success rates for laparoscopic vs endoscopic CBD stone clearance on an intention-to-treat basis were 88% vs 88% for the preoperative ERCP comparison. And for intraoperatively discovered CDS, there is 84% success rate for laparoscopic stone clearance as compared to 75% in the postoperative ERCP. Success rates for transcystic clearance is 81% and 85% choledochotomy.⁶⁻⁹ Furthermore, the meta-analysis for laparoscopic stone clearance and both preoperative and postoperative ERCP showed no significant difference mortality, morbidity, success rate in ductal clearance, and hospital stay¹¹ except for the study of Rhodes⁹ wherein the single stage approached was significantly shorter. It is noteworthy, however, that the endoscopy arm is an extraprocedure during the treatment process.

1. *Open CBDE*: In a systematic review by Martin DJ et al, 2006(11), open surgery result showed lower failure of treatment with fewer additional procedures. It also showed less mortality if compared with ERCP/CS. This procedure poses clear clear discomfort to the patient. In addition, the authors cautioned that the data are little dated and modern practice context must be kept in mind.
2. *Preoperative ERCP/ES*: ERCP has the ability to remove CDS in 90% of cases.²¹ However, patients with clinical and biochemical suspicion of CDS, only 20-50% will be truly positive after ERCP. The patient, therefore, is unnecessarily exposed to complications of ERCP which runs to 5-20%¹¹⁻¹³ as well as delayed the treatment and resultant additional cost. On the other hand, in cases where there is high pretest probability of CDS and in the absence of expertise, this procedure becomes the most cost effective strategy.¹
3. *ERCP/ES after LC*. In patients with CDS discovered during LC, endoscopic stone clearance may be performed in another day. Reason may be due to lack of expertise to do a single stage surgery or absence of an endoscopist. A focused study by Nathanson et al. 2005⁸ comparing single stage

laparoscopic choledochotomy and delayed ERCP/ES for patients with failed LTCCBDE, showed no significant difference in clearance rate, morbidity and length of hospital stay.

4. A. *LTCCBDE*: Transcystic common duct exploration using dormia basket, fogarty catheter affords the patient with CDS a single stage removal of the gallbladder and the common duct stone without t tube insertion. Success rate is about 80%.^{15-17,14,18,19} In cases of failure a choice between LCBDE, Intraoperative endoscopic removal of stone or postoperative stone extraction may be made.
- B. *LCBDE*: A less attractive choice than LTCCBDE, it entails a choledochotomy to extract the CDS. It demands excellent skills and more operative time than the other surgical options. Success rate ranges from 50 to 97%.^{14,15,20}

Complications for ERCP

1. ERCP/ES complication
2. Pancreatitis (8%)
3. Bleeding (3%)
4. Perforation (1.5%)
5. Cholangitis (2%)
6. Recurrent stones (8%)
7. Stenosis (8%).

List of Complications for Laparoscopic Cholecystectomy

1. Wound infection (7.5%)
2. Bleeding (0.5%)
3. Abscess (0.15%)
4. Postoperative bile leak (0.75%)
5. Pulmonary embolism (0.5%)
6. Pneumonia, pulmonary (0.2%)
7. Urinary (0.2%)
8. Cardiac (0.2%)
9. Retained stones (0.2%).

Patient Selection

Age seems to be important in predicting the incidence of CDS. Under the age of 60, patients with gallstones have 8 to 15% chance of concomitant CDS and in patients over 60 years, concomitant CDS is 15 to 60%.¹

Atherosclerotic heart disease is not an absolute contraindication in laparoscopic CDS clearance.²²⁻²⁴ Circumstantial factor such as inadequate expertise in laparoscopic procedure may result in prolonged surgery with prolonged pneumoperitoneum thereby possibly increasing the intracranial pressure (ICP). Prolonged pneumoperitoneum in the background of increased ICP is a contraindication for laparoscopy²³⁻²⁵ hence clinical situation dictates preoperative stone extraction or the use of open CBDE to remove the CDS.

CDS in the background of acute cholecystitis is seen in 3 to 25% of patients.²⁶ When considering LTCCBDE, the surgeon

must anticipate possible friable cystic duct, increase bleeding or a distorted anatomy. Presence of these inflammatory changes makes the surgery hazardous to the patient^{27,28} hence open technique or postoperative endoscopic clearance must be in mind.

Morphology of the stone is very important to consider when choosing the optimum procedure. Proximal stone is less amenable to LTCCBDE. Large stone may not pass through the cystic duct. CDS larger than 9 mm are hard to remove via transcystic route.

Institutional Limitations

In the treatment of CDS, the hospital considers the availability of a good team of laparoscopic surgeons, presence of expert endoscopist and cost-effectiveness of the procedure. As compared to cholecystectomy, the presence of CDS significantly increases the mortality, morbidity and cost of treatment of the patients. The choice of doing a single stage LTCCBDE shortens hospital stay, lower cost, and lower mortality and morbidity when compared to LC with second stage ERCP/ES.²⁷

In the absence of laparoscopic skill or equipment, LC with postoperative ERCP/ES may be the proper procedure to use.

Technical Expertise

In advance medical centers, a complete choice of operative and nonoperative management of CDS stone may be used.

Operative management includes transcystic CBDE, fluoroscopic wirebasket retrieval, ampullary balloon dilatation, Lap CBDE, antegrade transcystic sphincterotomy, and open CBDE all of which presents their own advantages and disadvantages. Nonoperative management includes ERCP/ES, Percutaneous transhepatic stone removal, and observation. When all of the armamentarium for the treatment of CDS are present in the institution, decision is hinged on the analysis of established parameters.

CONCLUSION

Based on analyzed data from the literature search, open CBDE is still a valid procedure in the era of laparoscopy when the intended procedure is open cholecystectomy or if the medical condition precludes the use of laparoscopy. CDS when discovered during the course of LC is treated best with LTCCBDE. If the surgeon fails in the transcystic approach, either LCBDE, Intraoperative or postoperative ERCP/ES may be carried out.

There are varying circumstances that may affect the choice of procedure for CDS.²⁹ Surgeons may best serve their patients if parameters other than that used in standardized treatment are considered in choosing the best option for the patient.

REFERENCES

1. Consensus Development Panel. Gallstones and laparoscopic cholecystectomy. (National Institutes of Health Consensus Development Panel on Gallstone and Laparoscopic Cholecystectomy). JAMA 1993;269(8):1018-24.
2. Ko CW and Lee SP. Epidemiology and natural history of common bile duct stones and prediction of disease. Review. Gastrointestinal Endoscopy 2002;56(6 Suppl):S165-69. [MEDLINE: 1247261]
3. Lezoche E, Paganini AM. Technical considerations and laparoscopic bile duct exploration: transcystic and choledochotomy. Seminars in Surgery 2000;7(4):262-78.
4. Soltan et al. A simple scoring system for predicting bile duct stones in patients with cholelithiasis. Journal of Gastrointestinal Surgery 2001;5(4):434-37.
5. Fletcher D R. Changes in the practice of biliary surgery and ERCP during the introduction of laparoscopic cholecystectomy to Australia: Their possible significance. Australian and New Zealand Journal of Surgery 1994;64(2):75-80.
6. Sgourakis G, Karaliotas K. Laparoscopic common bile duct exploration and cholecystectomy versus endoscopic stone extraction and laparoscopic cholecystectomy for choledocholithiasis. A prospective randomized study. Minerva Chir 2002;57:467-74.
7. Cuschieri A, et al. EAES multicenter prospective randomized trial comparing two-stage vs single-stage management of patients with gallstone disease and ductal calculi. Surg Endosc 1999;13:952-957.
8. Nathanson LK, et al. Postoperative ERCP versus laparoscopic choledochotomy for clearance of selected bile duct calculi: A randomized trial. Ann Surg 2005;242:188-92.
9. Rhodes M, et al. Laparoscopic exploration of the common bile duct: Lessons learned from 129 consecutive cases. Br J Surg 1995;82:666-68.
10. Martin DJ, et al. Surgical versus endoscopic treatment of bile duct stones. Cochrane Database Syst Rev. Apr 2006;19:CD003327.
11. Cisek PI, Greaney GC. The role of endoscopic retrograde cholangiopancreatography with laparoscopic cholecystectomy in the management of choledocholithiasis. Am Surg 1994;60:772-76.
12. Graham SM, et al. Laparoscopic cholecystectomy and common bile duct stones. The utility of planned perioperative endoscopic retrograde cholangiography and sphincterotomy: Experience with 63 patients. Ann Surg 1993;218:61-67.
13. Jung LU, et al. Laparoscopic cholecystectomy and intraoperative ERCP. Surg Rounds 1996;19:406-12.
14. Fiore NF, et al. An analysis of perioperative cholangiography in one thousand laparoscopic cholecystectomies. Surgery 1997;122:817-21.
15. Berthou JC, Drouard F, Charbonneau P, Moussaier K 1998.
16. Evaluation of laparoscopic management of common bile duct stones in 220 patients. Surg Endosc 12:16-22.
17. Carroll BJ, Fallas MJ, Phillips EH. Laparoscopic transcystic choledochoscopy. Surg 1994;8:310-14.
18. Carroll BJ, Phillips EH, Dayakhovsky L. Laparoscopic choledoscopy: An effective approach to the common bile duct. J Laparoendosc Surg 1992;2:15-21.

19. Philips EH, Liberman M, Carroll BJ, Fallas MJ, Rosenthal RJ, et al. Bile duct stones in the laparoscopic era. Is preoperative sphincterotomy necessary? *Arch Surg* 1995;130:880-85.
20. Vracko J, Wiechel KL. How often might a transcystic-ductstone extraction be feasible? *Surg Endosc* 1998;12:12-15.
21. Paganini AM, Lezoche E. Follow-up of 161 unselected-consecutive patients treated laparoscopically for common bile duct stones. *Surg Endosc* 1998;12:23-29.
22. Carroll BJ, et al. Laparoscopic cholecystectomy in critically ill cardiac patients. *Am Surg* 1993;59:783.
23. Milas M, et al. Management of biliary tract stones in heart transplant patients. *Ann Surg* 1996;223:L747.
24. Irgau L, et al. Elective intraoperative intracranial pressure monitoring during laparoscopic cholecystectomy. *Arch Surg* 1995;130:1011.
25. Josephs LG, et al. Diagnostic laparoscopy increases intracranial pressure. *J Trauma* 1993;36:815.
26. Rosenthal RJ, et al. Intracranial pressure: Effects of pneumoperitoneum in a large animal model. *Surg Endosc* 1997;11:376.
27. Rattner DW, et al. Factors associated with successful laparoscopic cholecystectomy for acute cholecystitis. *Ann Surg* 1993;217:233.
28. Zucker KA, Flowers JL, Bailey RW, Graham SM, Buell J, Imbembo AL. Laparoscopic management of acute cholecystitis. *Am J Surg* 1993;165:508.
29. Lieberman MA, et al. Management of choledocholithiasis during pregnancy: A new protocol in the laparoscopic era. *J Laparoendosc. Surg* 1995;5:399.