

Comparison of Open Versus Laparoscopic Common Bile Duct Exploration

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ABSTRACT

Introduction: Common bile duct (CBD) stone is a relatively frequent disorder with a prevalence of 10-20% in patients with gallstones. Primary CBDS originate within the CBD by bile stasis and infection. Secondary CBD Stones originate in the gallbladder and migrate into the bile duct. However single-stage Laparoscopic CBD exploration the present study was undertaken to compare open and laparoscopic CBD exploration for the management of CBD stones about efficacy, safety, feasibility, and postoperative outcome. The present study aims to compare Open V/S Laparoscopic CBD exploration in patients of CBD stone based on: Technical Feasibility, Efficacy (operative time), Safety (intraoperative complications), post-operative outcome related to pain, leakage, LFT, paralytic ileus, and hospital stay.

Materials And Methods: This prospective randomized study was conducted on 60 patients divided randomly into group A and group B, irrespective of their gender. Group A: Comprising of 30 patients undergoing Laparoscopic CBD exploration. Group B: Comprising of 30 patients undergoing open CBD exploration.

Results: The mean intraoperative blood loss in group A was 34.30±32.79 mL and in group B, it was 64.06±27.65 mL. A patients was 102.93±9.95 minutes and in group B, it was 92.83±8.59 minutes. The pain score was calculated postoperatively using a visual analog scale which was higher in

open common bile duct exploration at days 1,2 and 3, which is statistically significant ($p=0.001$).

Conclusion: The results of the current study found that laparoscopic CBD exploration and open CBD exploration had no significant difference in postoperative complications. Although open CBDE had lesser operative time than laparoscopic CBDE, the latter was better than open CBDE in terms of reduced intraoperative blood loss, postsurgical pain, early return of bowel sounds, and lesser duration of hospital stay. So, the laparoscopic CBDE can be advocated as a primary tool in the surgical management of CBD stone.

Keywords: CBD Stones, CBD Exploration.

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INTRODUCTION

Gallstone disease is one of the most prevalent gastrointestinal diseases with a substantial burden to health care systems that are supposed to increase in aging populations at risk.¹

Gallstones occur when there is an imbalance in the chemical constituents of bile that result in the precipitation of one or more of the components.² Gallstones are common with prevalence as high as 60% to 70% in American Indians and 10% to 15% in white adults of developed countries.³ In India, the prevalence of gallstones has been reported to be 4.15%; more in females 5.59% than males 1.99%.⁴ Common bile duct (CBD) stone is a relatively frequent disorder with a 10-20% prevalence in patients with gallstones.⁵

Primary CBD stones originate within the CBD by bile stasis and infection. Secondary CBD Stones originate in the gallbladder and migrate into the bile duct, are the most common, and tend to be cholesterol or black-pigment stones.⁶

CBD stones are often asymptomatic and are detected incidentally during workup in up to 10–18% of patients with gallbladder stones awaiting cholecystectomy.⁷ Symptoms and signs suggestive of common bile duct stones are abdominal pain, jaundice, nausea, vomiting, fever, cholangitis, pancreatitis, and elevated levels of bilirubin or liver enzymes.

These may be associated with serious complications, including obstructive jaundice, acute cholecystitis, acute pancreatitis, gallstone ileus, primary sclerosing cholangitis, biliary cirrhosis.⁸ Early diagnosis and prompt treatment are the most important for managing CBD stones (CBDS). The general trend of management of CBD Stones is standing if indicated, followed by laparoscopic cholecystectomy. However single-stage Laparoscopic CBD exploration (LCBDE) is emerging as a primary and cost-effective treatment modality with less morbidity. No consensus has been achieved concerning the best approach because the laparoscopic

management of CBD stones has not had a wide diffusion, and little is known about its long-term results. In situations where there are difficulties in performing a combined laparoendoscopic procedure or the laparoscopic experience is limited, it is safer to perform an ERCP followed by cholecystectomy.⁹ Hence, the present study was undertaken in the Surgery department of Rajindra Hospital, Patiala to compare open and laparoscopic CBD exploration for the management of CBD stones in relation to efficacy, safety, feasibility, and postoperative outcome. The present study aims to compare Open V/S Laparoscopic CBD exploration in patients of CBD stone based on 1. Technical Feasibility, Efficacy (operative time), Safety (intraoperative complications). And Post-operative outcome related to pain, leakage, LFT, paralytic ileus, and hospital stay.

MATERIALS AND METHODS

This prospective randomized study was conducted on 60 patients divided randomly into group A and group B, irrespective of their gender. Group A: Comprising of 30 patients undergoing Laparoscopic CBD exploration. Group B: Comprising of 30 patients undergoing open CBD exploration. Cases with Diagnosed and confirmed cases of choledocholithiasis and Patients above 18 years of age were included in study and The patient who did not give informed consent, Medically unfit patients, Patients below 18 years of age and Pregnant patients were excluded from study.

Pre-Operative Screening: The detailed history of the patient was taken, and a clinical examination was done. Various relevant hematological and biochemical investigations (Hb, BT, CT, TLC, DLC, Blood urea, S. Creatinine, S Bilirubin, SGOT, SGPT, Alk Phosphatase, PTI, HbsAg, HCV, HIV, ECG) were done. All the patients underwent Transabdominal ultrasound, MRCP (Magnetic Retrograde Cholangiopancreatography), and CECT Abdomen (where required) to look for common bile duct pathology.

Operative Procedure: Standard laparoscopic common bile duct exploration procedure was followed in group A patients and standard open bile duct exploration was performed in group B patients. Choledochotomy was performed by a longitudinal incision of 1 cm with the help of an endoscopic knife just below the insertion of the cystic duct into the bile duct. The calculi were retrieved spontaneously while incising duct or milking the CBD and with irrigation and suction. Completion choledochoscopy was performed with a flexible choledochoscope to look for any retained calculi and assess the completeness of the procedure. Primary closure of CBD was done in cases where the ampulla was not violated, and complete stone clearance was confirmed by choledochoscopy. In group B patient's Open common bile duct exploration standard procedure was followed and Choledochotomy was performed longitudinally with a scalpel,

preserving lateral blood supply. Calculi extracted with Desjardin's forceps, milking of CBD, and irrigation suction. Completion choledochoscopy was performed to assess the completeness of the procedure with a flexible choledochoscope. Choledochotomy was closed over a t-tube with continuous 3-0 R/B Polyglactin sutures. Primary closure of CBD was done in cases where the ampulla was not violated, and complete stone clearance was confirmed by choledochoscopy. Patients were followed up at the following timelines: day 0, day 1, day 2, and day 3 for various parameters (viz. post-surgical pain, drain output, any other complaints like distention of the abdomen, return of bowel sound, and duration of hospital stay). Post-surgical pain was calculated based on a visual analog score. These findings were noted down for the patients in two subgroups were compared and results were evaluated at the end of the study.

RESULTS

It was seen mean duration of surgery in group A patients was 102.93±9.95 minutes and in group B, it was 92.83±8.59 minutes. So, it was relatively more in laparoscopic common bile duct exploration as compared to open, which is statistically significant (p =0.001). It was observed that the mean intraoperative blood loss in group A was 34.30±32.79 mL and in group B, it was 64.06±27.65 mL. Blood loss was more open, and it was statistically significant (p=0.0003) signifying that LCBDE is better in terms of intraoperative blood loss.

It was observed that postoperative complications in group A, 2 patients (6.67%) had postoperative bile leak and 1 patient (3.33%) had a sub-hepatic collection. In group B, 3 patients (10%) had postoperative wound infection, 1 patient (3.33%) had bile leak and 1 patient (3.33%) had a sub-hepatic collection. In group A, 27 patients (90%) had no complications. In group B, 25 patients (83.33%) had no complications.

The pain score was calculated postoperatively using a visual analog scale which was higher in open common bile duct exploration at days 1,2 and 3, which is statistically significant (p=0.001). While there was no significant difference between the groups at day 0, signifying that LCBDE is a better procedure in terms of post-operative pain.

It was observed that the mean time duration of return of bowel sounds in group A was 2.50±1.14 days (range from 1-5 days) and in group B, it was 4.30±1.21 days (range from 2-7 days). In the majority of individuals in group A, bowel sounds returned on day 2, and in group B, bowel sounds returned on day 4.

It was observed that the mean duration of hospital stay in group A was 5.10±1.09 days and in group B, it was 7.47±1.38 days. A maximum number of individuals had hospital stays in the range of 5-6 days in group A and the range of 7-8 days in group B.

Table 1: Operative Time (In Minutes)

Operative Time (in minutes)	No. of Patients	Mean	Std. Deviation	p-value
Group A	30	102.93	9.95	0.001
Group B	30	92.83	8.59	

Table 2: Blood Loss During Procedure (In ml) [Intraoperative complications]

(Blood Loss in mL)	No. of Patients	Mean	Std. Deviation	p-value
Group A	30	34.30	32.79	0.0003
Group B	30	64.06	27.65	(HS)

Table 3: Postoperative Complications

Postoperative Complications	Group A		Group B	
	Patients	Percentage	Patients	Percentage
Bile Leak	2	6.67%	1	3.33%
Sub Hepatic Collection	1	3.33%	1	3.33%
Wound Infection	0	0%	3	10%
No	27	90%	25	83.33%
Total	30	100%	30	100%
p value	0.995 (NS)			

Table 4: Comparison of Post-Surgical Pain (VAS) in both Groups

Time Interval	Post-Surgical Pain (VAS)	No. of Patients	Mean	Std. Deviation	Std. Error Mean	p-value
Day 0	Group A	30	5.40	0.67	0.12	0.854
	Group B	30	5.37	0.72	0.13	
Day 1	Group A	30	3.10	0.88	0.16	0.001
	Group B	30	4.70	0.70	0.13	
Day 2	Group A	30	1.47	0.78	0.14	0.001
	Group B	30	3.83	0.70	0.13	
Day 3	Group A	30	1.00	0.69	0.13	0.001
	Group B	30	2.70	0.79	0.15	

Table 5: Return of Bowel Sounds

Day of return of Bowel Sounds	Group A		Group B	
	Patients	Percentage	Patients	Percentage
Day 1	5	16.67%	0	0%
Day 2	13	43.33%	2	6.67%
Day 3	6	20%	5	16.67%
Day 4	4	13.33%	11	36.67%
Day 5	2	6.67%	7	23.33%
Day 6	0	0%	4	13.33%
Day 7	0	0%	1	3.33%
Total	30	100%	30	100%
Mean±SD	2.50±1.14		4.30±1.21	
p value	0.001 (HS)			

Table 6: Duration of Hospital Stay (in days)

Duration of Hospital Stay (in days)	Group A		Group B	
	Patients	Percentage	Patients	Percentage
1-2 days	0	0%	0	0%
3-4 days	12	40%	0	0%
5-6 days	14	46.67%	8	26.67%
7-8 days	4	13.33%	15	50%
9-10 days	0	0%	6	20%
11-12 days	0	0%	1	3.33%
Total	30	100%	30	100%
Mean±SD	5.10±1.09		7.47±1.38	
p-value	0.001 (HS)			

DISCUSSION

In our study, the mean operative time in group A was 102.93±9.95 minutes and in group B, it was 92.83±8.59 minutes (Table 3), which is higher in Laparoscopic CBD Exploration and is statistically significant ($p=0.001$). The results of the present study were found to be similar to the study conducted by Helmy MZ et

al. (2018) who also reported that the operative time in Laparoscopic CBD Exploration [120 (90-220) min] was more than Open CBD Exploration [100 (80-180) min].¹⁰ Grubnik VV et al. (2012) reported the mean duration of laparoscopic operations to be 82 min (range, 40–160 min). The mean intraoperative blood

loss in group A was 34.30 ± 32.79 mL and in the group, B was 64.06 ± 27.65 mL (Table 4) which is statistically highly significant ($p=0.0003$) signifying that intraoperative blood loss was more in the open group i.e group B. Patients were followed up for postoperative outcome related to pain, leakage, paralytic ileus and duration of hospital stay. In group A, 2 patients (6.67%) had postoperative bile leak and 1 patient (3.33%) had a sub-hepatic collection. In group B, 3 patients (10%) had postoperative wound infection, 1 patient (3.33%) had bile leak, and 1 patient (3.33%) had a sub hepatic collection (Table 5). Statistically, there was no significant difference in postoperative complications in both groups ($p= 0.995$). Li KY et al. (2018) found that the success rate and complication rate were not significantly different between the laparoscopic common bile duct exploration group and open common bile duct exploration group (both $p > 0.05$).¹¹ In our study, there was a statistically significant difference between the groups for post-surgical pain at days 1, 2, and 3 ($p= 0.001$) which was higher in open CBDE i.e group B (Table 6). While the difference between the groups for postsurgical pain was statistically non-significant at day 0.

Halwani HM et al. (2017) reported that open CBDE was associated with a statistically significant increase in mortality (adjusted odds ratio [AOR] 2.95; 95% CI 1.18 to 7.41; $p = 0.02$), composite morbidity (AOR 2.19; 95% CI 1.56 to 3.07; $p < 0.0001$), bleeding (AOR 1.86; 95% CI 1.11 to 3.12; $p = 0.02$), return to the operation room (AOR 1.90; 95% CI 1.16 to 3.12; $p = 0.01$), and readmission related to the first operation (AOR 1.55; 95% CI 1.00 to 2.39; $p = 0.05$).¹² Bayramov N et al. (2017) also found that the total number of complications (19.4%) in the 1-stage laparoscopic group was significantly ($p<0.05$) lower than in the open (52.5%) and laparoendoscopic (33.3%) groups.¹³ The mean time duration of return of bowel sounds in group A was 2.50 ± 1.14 days (range from 1-5 days) and in group B, it was 4.30 ± 1.21 days (range from 2-7 days). In the majority of individuals in group A, bowel sounds returned on day 2, and in group B, bowel sounds returned on day 4 (Table 7). Statistically, there was a highly significant difference in return of bowel sounds of both the groups ($p= 0.001$), signifying the return of bowel sound was earlier in LCBDE i.e group A. Jain A et al. (2017) reported that bowel recovery time was 2 ± 1.3 days in t-tube group and 2.1 ± 1 days in biliary stenting group after open common bile duct exploration.¹⁴ The mean duration of hospital stay in group A was 5.10 ± 1.09 days and in group B, it was 7.47 ± 1.38 days. A maximum number of individuals had hospital stays in the range of 5-6 days in group A and the range of 7-8 days in group B (Table 8). Statistically, there was a highly significant difference in the mean duration of hospital stay of both the groups ($p= 0.001$), signifying shorter hospital stay in LCBDE i.e group A. The results of the present study are comparable to a study conducted by Bayramov N et al. (2017) which reported that the hospital stay was significantly shorter in the 1-stage laparoscopic group (2.3 days in 1-stage laparoscopic, 6.5 days in laparo-endoscopic, and 8.2 days in open approach group).¹³ Helmy MZ et al. (2018) reported that the mean hospital stay was 3 (2-4) days in the LCBDE group and 8 (5-12) days in the OCBDE group. Ferzli GS et al. (1994) reported the mean hospital stay was 2.7 days among patients who underwent LCBDE. Gui L et al. (2016) reported that LCBDE had a shorter length of hospital stay (4.7 ± 2.5 days versus 11.3 ± 3.1 days, $P < .001$) than the OCBDE group.¹⁵

CONCLUSION

Early diagnosis and prompt treatment are the most important for managing CBD stones (CBDS). There are different modalities for managing the common bile duct stones viz. endoscopic retrograde Cholangiopancreatography (ERCP), open CBD exploration, and laparoscopic CBD exploration. The present study was conducted to compare Open versus Laparoscopic CBD exploration based on safety (intraoperative complications), efficacy (operative time), technical feasibility, and postoperative outcome related to pain, leakage, LFT, paralytic ileus, and hospital stay.

The results of the current study found that laparoscopic CBD Exploration and open CBD Exploration had no significant difference in postoperative complications. Although open CBD Exploration had lesser operative time than laparoscopic CBD Exploration, the latter was better than open CBD Exploration in terms of reduced intraoperative blood loss, postsurgical pain, early return of bowel sounds, and lesser duration of hospital stay. So, the laparoscopic CBD Exploration can be advocated as a primary tool in the surgical management of CBD stone.

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