

## Laparoscopic Management of Common Bile Duct Stone: A Clinical Outcome Based Prospective Study

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### Abstract-

**Introduction-** Common bile duct stones(CBD)are found in approximately 10-20% of the patients undergoing laparoscopic cholecystectomy (LC). More than 95% of biliary tract stones are related to gall stone. Primary stone develop in bile ducts. Secondary stones originate in the gallbladder and migrates into the bile duct.

**Method :** This was a prospective study conducted on 75 patients. The aim of our study to compare the clinical outcome of laparoscopic Vs open management of common bile duct stone removal. CBD was exposed and a vertical ductomy. "T" tube placement done in 16 patients (8 in LCBDE and 8 in open CBD exploration).

**Results :-** out of 75 patients, there were 20 male patients and 55 were female patients. The male female ratio was 1:2.7. Primary closure done in 67 patients. Conversion done in 8 patients due to adhesion in 6 patients bleeding in 2 patients. Average hospital stay was 5.7 days. 2 patients developed biliary peritonitis and duodenal fistula in 1 patient.

**Conclusion:-** Laparoscopic CBD exploration is a safe, feasible and single stage option for management of CBD stones and probably better option than ERCP.

**Key words:-** Laparoscopic common bile duct extraction(LCBDE), Endoscopic Retrograde Cholangiopancreatography (ERCP) , Endoscopic sphinctrotomy(ES).

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### I. Introduction

Common bile duct stones(CBD)are found in approximately 10-20% of the patients undergoing laparoscopic cholecystectomy (LC)<sup>(1)</sup>. Incidence increase with age to over 80% in those who are over 90 yrs<sup>(2)</sup>. More than 95% of biliary tract stones are related to gall stone. The prevalence of common bile duct stone in patients with symptomatic gallstone varies upto 10-20%<sup>(3)</sup>. Common bile duct stones are classified as primary and secondary on the basis of site of its origin. Primary stone develop in bile ducts. Secondary stones originate in the gallbladder and migrates into the bile duct.

CBD stones are managed by open CBD exploration, laparoscopic CBD exploration, Percutaneous trans-hepatic stone removal, Endoscopic sphincterotomy, Trans-duodenal sphincterotomy, Choledochoduodenostomy/choledochocojejunostomy.

Traditionally, the treatment of choice for CBD stones has been open CBD exploration. Open bile duct exploration has significantly increases the morbidity in relation to degree of obstructive jaundice and presence of medical risk factors. The open choledocholithotomy, morbidity rate varies from 0-74%<sup>(4)</sup>, but is substantially higher in cases of inflammatory complications; mortality in acute cholangitis rises to 21-32% and in acute pancreatitis is up to 3-12%. With the advent of pre-operative choledochoscopy, the incidence of retained bile duct stone in most series is 15%<sup>(5)</sup>. In this series, successful clearance of CBD stones achieved in 86% of cases. If ERCP has failed, or not possible, if surgeon does not have the experience and necessary tools to perform laparoscopic duct exploration or laparoscopic effort has failed, than open exploration become necessary. Ductal stones are identified either preoperatively or intra-operatively by ultrasound, cholangiography, or palpation<sup>(6)</sup>.

The standard 4 port configuration for laparoscopic cholecystectomy used and fifth port made in between the right midclavicular and epigastric port just below the subcostal margin for inserting the choledochoscope. Intra-operative cholangiography done as per standard protocol.

The advent of Endoscopic Retrograde Cholangiopancreatography (ERCP) and ES dramatically changed the management of CBD stones. ERCP and ES is a quick and of-ten painless procedure, successful in >90% of the patients. However, there are few adverse effects of the procedure like pancreatitis, bleeding, failure to clear duct, cholangitis<sup>(7)</sup>.

When stones are present in gall bladder and bile duct, LCBDE is best method for gall bladder and clearing of bile duct as a single stage procedure. If patient has cholecystectomy previously and have evidence of retained stone in bile duct are best served by ERCP. Laparoscopic CBD stone removal is a single stage process and there are least complication like pancreatic cholecystitis.

In ERCP most common complication is pancreatitis. Pancreatitis occurs in 10% of patients undergoes ERCP and 1% of them develop severe pancreatitis. In laparoscopic

management of CBD stone removal, complications are less than ERCP like bile leak, blood loss, wound infection and self-limiting post-operative intestinal obstruction.

We planned our study regarding recovery period, post-operative pain, CBD stone recurrence and postop complications.

The objective of the study is to demonstrate that laparoscopic CBD exploration is a safe, feasible and single stage option for the management of CBD stones.

## II. Methodology

Our study was conducted on 75 patients presented with stone in common bile duct in department of general surgery in M.L.B. Medical college, Jhansi diagnosed with cholelithiasis and common bile duct stones were enrolled in this study.

**Inclusion criteria:** patients with obstructive jaundice due to stones, surgically fit patients with concomitant gallstones and common bile duct (CBD) stones, patients in whom endoscopic retrograde cholangiopancreatographic retrieval had failed previously mainly because of instrumentation failure; large or multiple CBD stones requiring extraction and drainage with remaining stent.

**Exclusion criteria:-** Patients who had undergone upper abdominal surgery, patients not fit for surgery. CBD was exposed and a vertical ductotomy performed on the anterior surface of the duct distal to the cystic-CBD junction. The CBD was flushed with 30 ml of saline through the catheter. Small stones got flushed, Fogarty balloon dilatation and then withdrawal of stones into the intra-abdominal cavity for retrieval of stones done. Chole-  
dochoscope and pressurized saline used to facilitate the clearance of small stones and particulate matter and ensure that all stone were removed. 'T' tube placement done in 16 patients (8 in LCBDE and 8 in open CBD exploration). External tube drains were used.

Postoperatively we used Visual Analog Scale (VAS) for pain, use of IV analgesic, 'T' tube cholangiography on 8<sup>th</sup> day and ultrasonography of abdomen for CBD stone and postop complications like biliary peritonitis and duodenal fistula and hospital stay and causes of conversions like adhesion and bleeding.

## III. Results

In our study, out of 75 patients, there were 20 male patients and 55 were female patients. The male female ratio was 1:2.7. The youngest patient was of 13 yrs. of age and oldest patient was 78 yrs. of age. Mean time of surgery was 58 minutes. 'T' tube placement was done in 16 patients. Primary closure done in 67 patients. Conversion done in 8 patients due to adhesion in 6 patients bleeding in 2 patients. Average hospital stay was 5.7 days. 2 patients developed biliary peritonitis and duodenal fistula in 1 patient.

## IV. Discussion

Before the introduction of laparoscopic and endoscopic procedures, choledocholithiasis was treated by open CBD exploration. The principal minimal invasive option for treatment of CBD stones include endoscopic sphincterotomy(ES) and laparoscopic CBD exploration (LCBDE).The major challenge of successful LCBDE with choledochotomy include using choledochoscopy to remove CBD stones laparoscopically, are indwelling of 'T' tube through choledochotomy, and intra-corporeal suturing and knotting. Once the surgeon is familiar with these procedures, however LCBDE can be performed as smoothly as conventional surgery. The drawback of LCBDE include substantial requirement for equipment, including two sets of video system (one for laparoscopy and one for choledochoscopic procedures).

The discussion on CBD exploration comparing prior studies with my study has been done under age and sex, operative time, hospital stay, conversion rate, laparoscopic vs. ERCP vs. open CBD exploration.

In studies of Suc et al: average age of presentation of CBD calculus was 35 to 40 yrs. In our study, youngest age was 13 yrs and eldest age was 78 yrs, and average age was 45 yrs.

In studies of Hammerstron et al: average time taken for Laparoscopic CBD exploration was 1 hrs 30 min to 2 hrs. In our study, average time was 45 to 70 minutes.

In study of Hammerstron et al: and Suc et al: average length of hospital stay were 16 days(highest). In our study, average hospital stay was 5.7 days.

Conversion rate was highest in study of Sees and Matin 20% and lowest in Shoes et al: 2%. In our study, the conversion rate was 10.66%.

In study done by Barken et al: 26 choledocholithiasis (F:M::23:3) undergone ERCP. Duct was successfully cleared in 14 patients, stones were present at the end of procedure in 8 patients, stents were placed in 3 patients to prevent infections and recurrent cholangitis. In our study, 67 out of 75 patients of choledocholithiasis undergone laparoscopic CBD exploration with 100% successful clearance of duct. Laparoscopic CBD exploration is a safe, feasible and single stage option for management of CBD stones.

In study done by J.P. Dorman., J.L. Glass, ERCP in the management of CBD calculus after cholecystectomy. 32 patients M:F::8:24 were selected, of which 10 had undergone open cholecystectomy and 22 had undergone laparoscopic cholecystectomy. ERCP performed in 28 patients and it was successful in 21 patients, surgery required in 7 patients. ERCP related complications occurred in 3 patients, 2 developed pancreatitis and post sphincterotomy bleeding in 1 patient. This study reveals that retained or recurrent stones following cholecystectomy are best treated Endoscopically and ERCP.

### POST OPERATIVE OUTCOMES

S. No.	ERCP (Ann. Surg. 2008-Aug) Curet MJ, Pitcher DE	Laparoscopic cholecystectomy (Ann. Surg. 2008-Aug) Curet MJ, Pitcher DE	Our study
<b>Bile leak</b>	<b>0</b>	6- 2 settled,3 ERCP, 1 reoperation	<b>0</b>
<b>Pancreatitis</b>	<b>4</b>	<b>3</b>	<b>0</b>
<b>Severe sepsis</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>Retained stone</b>	2(re-operation)	1(ERCP)	<b>0</b>
<b>GI bleed</b>	2 (transfusions)	<b>0</b>	<b>0</b>
<b>Duodenal Fistula</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>Reoperation</b>	<b>3</b>	<b>3</b>	<b>0</b>
<b>Overall significant morbidity</b>	6(13%)	7(17%)	3(4%)
<b>Hospital stay(mean)</b>	<b>7.7</b>	<b>6.4</b>	<b>5.7</b>
<b>Death</b>	<b>1</b>	<b>1</b>	<b>0</b>

**Controlled Duodenal Fistula was formed which healed spontaneously on 14<sup>th</sup> day**

#### Pain recovery

Pain was less in Laparoscopic CBD exploration than in open CBD exploration. As shown in our study, requirement of analgesic was less the 24 hrs. Recovery after Laparoscopic CBD exploration was much earlier as compared to open CBD explosion. In our study, we mobilized the patients on 1<sup>st</sup> post-operative day and on 2<sup>nd</sup> day and patients were able to performed their routine work. Discharge after Laparoscopic CBD exploration is much earlier. As shown in our study, average time of hospital stay is 5.7 days which is much less than open CBD exploration .

#### Comparison of Lap CBD exploration with open CBD exploration

Laparoscopic CBD exploration is associated with low morbidity and mortality. It is associated with less hospital stay. Laparoscopic CBD exploration is minimally invasive and it has faster recovery, quicker return to normal work. Laparoscopic CBD exploitation is associated with less complications like wound infection, hematoma, neuralgia.

**Comparison of Laparoscopic CBD exploration with ERCP**

When stones are present in gall bladder and bile duct, Laparoscopic CBD exploration was better option as it is single stage procedure.

If patient has cholecystectomy previously and have an evidence of retained stones in bile duct were best managed by ERCP.

In laparoscopic management of CBD stones removal complications were less the ERCP like bile leak, minor wounds, wound infection.

**Summary of Randomized Controlled Trials: Laparoscopic Transdochal and open CBD exploration**

Reference	Year	No. Of Patients	Mean age	Lap/open	Success rate(%)	Conversion rate(%)	Retained stone(%)	Morbidity rate(%)	Mortality rate(%)	Length of stay(days)
Neoptolmes et al	1987	60	59	Open	92	-	8	7	2	11
Hammerston et al	1995	41	74	Open	90	-	2	7	7	16
Targarona et al	1996	48	80	open	96	-	2	8	4	11
Sees and Martin	1997	51	51	Lap	100	20	-	-	-	10
Rhoes et al	1998	40	-	Lap	75	2	1	10	0	1
Suc et al	1998	105	-	Lap	100	-	0	4	1	16
Cushieri et al	1999	150	-	Lap	83	13	0	16	1	6
Our study	2010	75	-	Lap	100	10.66	0	4	0	5.7

Several studies (Hammerston et al: Suc et al: Rhoes et al:) have emerged to managed synchronous CBD stones: i.e. open CBD exploration, laparoscopic CBD exploration or postoperative ERCP with stone extraction.

Our study reveals that inadvertently discovered CBD stone at the time of laparoscopic cholecystectomy has to be addressed laparoscopically if this technique is mastered by the surgeon, otherwise posing the dilemma between converting to an open procedure or relying on postoperative ERCP for stone retrieval.

The policy of selective preoperative ERCP before laparoscopic cholecystectomy has been proposed, as in study of Stain et al: Barken et al: performed preoperative ERCP in all patients with an elevation of more than twice as normal in one of LFT measurements. Approximately 57.6% of those had stones.

In another study of Barkun et al: independent predictor were Bilirubin (>30mmol/L). Presence of dilated CBD on ultrasonography > 6mm and suspected or detected bile duct stone (at ultrasonography), performed pre-operative ERCP in all patients. Approximately 74.6% of those had stone. Our study was based on clinical symptomatology, LFT and ultrasonography.

We performed Laparoscopic CBD exploration in all patients with a success rate of 100%.

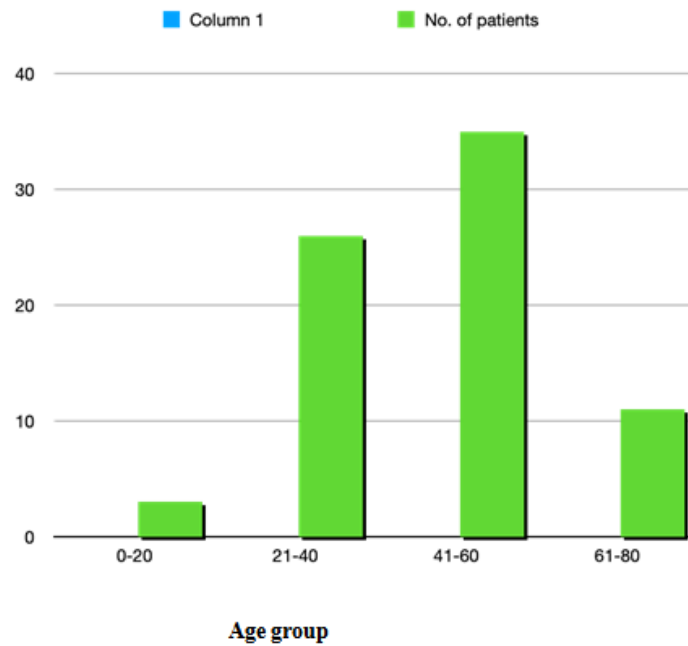
**V. Conclusion**

- Laparoscopic CBD exploration requires advanced expertise of operating surgeon.
- Choledochoscope is not essential as can be substituted with rigid Nephroscope or Urethroscope.
- ‘T’ tube is not mandatory-depends upon sphincter of oddi.

Laparoscopic CBD exploration is a safe, feasible and single stage option for management of CBD stones and probably better option than ERCP.

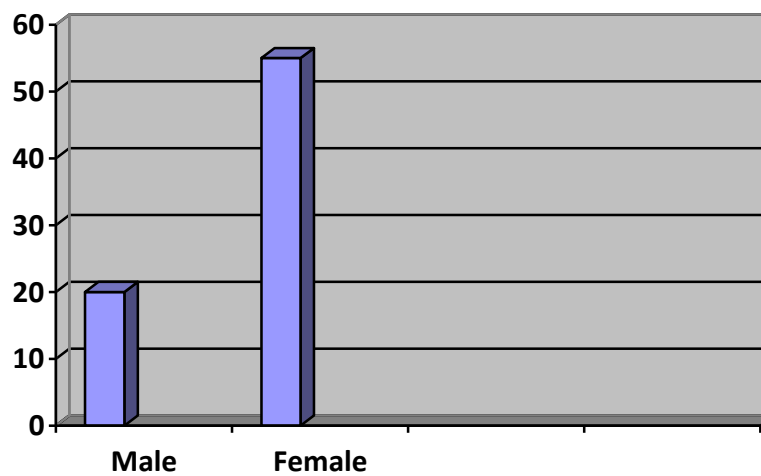
**AGE DISTRIBUTION**

Age Group	0-20	21-40	41-60	61-80
No. Of patients	3	26	35	11



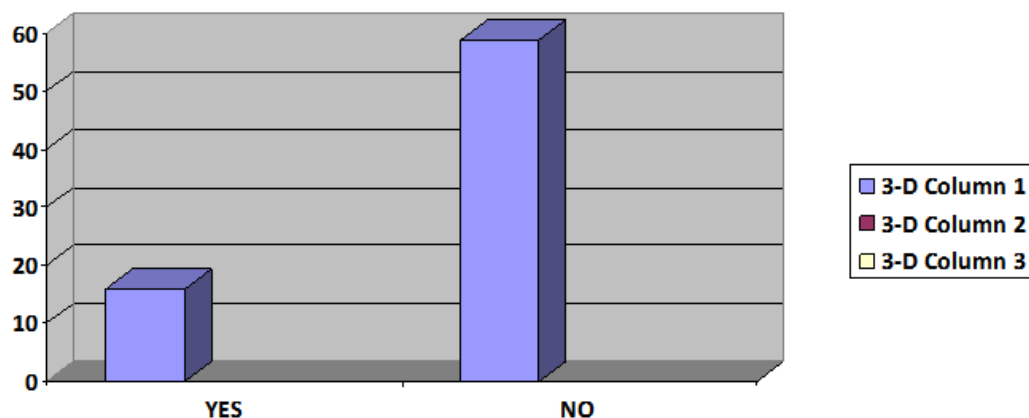
**SEX DISTRIBUTION**

SEX	Males	Female
No. Of patients	20	55



**'T' TUBE-**

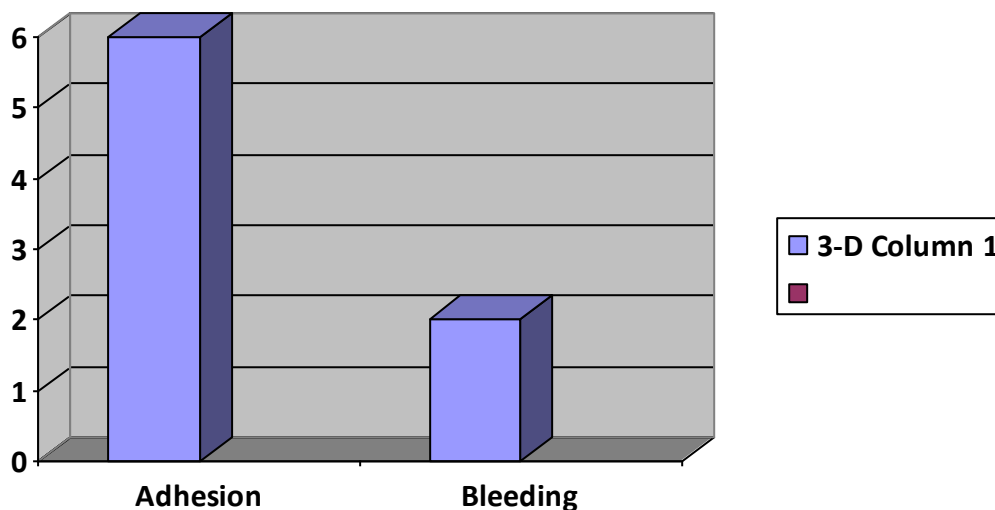
T- Tube	Yes	NO
No. Of Patients	16	59



**T- Tube placement**

**CAUSES OF CONVERSION**

Causes	Adhesion	Bleeding
No. Of patients	6	2



**Causes of Conversion**

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