# Clinical Profile and Endoscopic Management in Patients with Choledocholithiasis

Manoj Lamsal,[1] Anurag Jha,[1] Brindeswari Kafle,[1] Rabin Hamal,[1] Tshering Wangdi Sherpa,[1] Pradip Kumar Kafle,[1] Tulsi Ram Bhattarai,[1] Mohan Bhusal,[2] Dinesh Koirala,[1] Rahul Pathak[1]

[1]Department of Gastroenterology, Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal, [2]Department of Internal Medicine, Lumbini Provincial Hospital, Butwal, Rupandehi, Nepal.

## ABSTRACT

**Background:** Common bile duct stones is a common medical problem that are usually seen in association with gallstone disease. Endoscopic management of Common bile duct stones involves doing Endoscopic retrograde cholangiography for bile duct clearance which is the primary therapeutic modality of choice. This prospective study was done to identify the clinical characteristics and outcome of patients presenting with Common bile duct stones undergoing Endoscopic retrograde cholangiography.

**Methods:** A prospective observational study was conducted on all patients undergoing Endoscopic retrograde cholangiography in department of Gastroenterology, Tribhuvan University Teaching Hospital, for management of diagnosed or suspected choledocholithiasis from April 2023 to March 2024. Patient demographics, clinical characteristics, Endoscopic retrograde cholangiography findings and post procedure outcome data were collected and analysed.

**Results:** A total of 110 patients (61.8% male and 38.2% female) were included in the final analysis. Successful clearance of Common bile duct was obtained in 76.4% patients with overall adverse events of 18% related to the procedure. Among patients undergoing the procedure, 16.4% couldn't be managed with Endoscopic retrograde cholangiography and were referred for surgical management.

**Conclusions:** Endoscopic management in form of Endoscopic retrograde cholangiography is a safe and effective method to manage patients with Common bile duct stones.

**Keywords:** Common bile duct calculi; endoscopic sphincterotomy; ERCP.

## INTRODUCTION

Choledocholithiasis refers to the presence of stones in common bile duct that complicates around 10-15 % gallstone disease.[1] CBD stones can be primary or secondary, with secondary stones being the most common cause.[2,3]

Patients suspected of choledocholithiasis presents with right upper quadrant pain with elevated liver enzymes in a primarily cholestatic pattern.[4,5] The diagnostic imaging study includes Ultrasound, MRCP, CT and EUS for suspected patients. Compared to MRCP and EUS, CT scan has low sensitivity in direct demonstration of the stones (sensitivity 75%).[6, 7]

Preoperative ERCP followed by cholecystectomy is the most frequently used treatment worldwide for choledocholithiasis.[8] When performed by a qualified professional, ERCP has a ductal clearance success rate of about 80-90%.[9-12] The objective of our study is to assess the clinical profile of patients with choledocholithiasis and outcome of ERCP. This study will provide further insight into best endoscopic management of choledocholithiasis.

## METHODS

All patients who underwent ERCP procedure in Gastroenterology department for suspected or confirmed cases of choledocholithiasis or presented with cholangitis were prospectively included in this study from April 2023 to March 2024. Data was recorded

**Correspondence: Dr Rahul Pathak, Department of Gastroenterology, Maharajgunj Medical Campus, Institute of Medicine, Maharajgunj, Nepal. Email: dr.rahuliom@gmail.com, Phone: +9779851113793.**

and prospectively evaluated. Study population were either admitted cases or underwent procedure as day care basis. In the cholangitis cohort, admissions for cholangitis of all causes were included in the analyses. Admissions for cholangitis resulting from any cause were incorporated into the analyses for the cholangitis cohort. We excluded from the research population any admissions with any secondary or subsequent diagnosis indicating the presence of malignancy.

The diagnosis of choledocholithiasis was confirmed or suspected on the basis of visualized stone in the imaging (USG, CT scan or MRCP) or dilated CBD with obstructive pattern of LFT. All patients were given 1 gram ceftriaxone at the start of procedure and hyoscine butyl bromide was used to suppress the intestinal motility. Patients were sedated with intermittent bolus doses of intravenous fentanyl and continuous infusion of propofol under continuous cardiac monitoring and use of pulse oximeters. cardiac ERCP was done with side viewing duodenoscope (Pentax ED 34-I 10T) and electrosurgical unit of ERBE Germany was used for required purpose during the procedure. Selective wire-guided CBD cannulation was attempted. Attempted CBD cannulation requiring more than 5 minutes were labelled as difficult cannulation and was tried with precut sphincterotomy, either fistulotomy or needle knife papillotomy. Successful CBD cannulation cases were followed by cholangiogram to depict the biliary anatomy and visualize the obstructive stone. Endoscopic sphincterotomy (EST) was done for successful retrieval of stone during Ballon trawling or dormia basket. Very few stones required mechanical lithotripter for CBD clearance. Patients were observed for 4 hours post procedure in recovery room and either discharged or admitted in case of any suspicion for complications of procedure.

This study was approved by Institutional Review Committee of Institute of Medicine, TUTH. Formal written consent was taken prior to inclusion in the study. Observation findings were recorded and statistical analysis was done using IBM SPSS version 24.0.

## RESULTS

A total of 110 ERCPs were performed over 12 months period in ERCP suite of Gastroenterology department of TUTH. Baseline characteristics are shown in Table 1 below. There was wide variability in age of patients with choledocholithiasis, youngest being 12 years and oldest being 92 years. Most patients undergoing the procedure were female with female:male ratio of 1.6. Majority of the patients presented with pain abdomen and biochemical evidence of obstructive jaundice. Nearly 10% of total patients presented with acute biliary cholangitis requiring urgent intervention.

**Table 1. Baseline characteristics of patients who underwent ERCP.**

| Characteristics | Value (N=110) |
|---|---|
| Age in years (Mean ± SD) | 49.6 ± 17.5 |
| Gender (Female: Male)% | 63: 39 (61.8% :38.2%) |
| **Comorbities** | |
| HTN | 12 (11.8%) |
| T2DM | 4 (3.9%) |
| IHD/CAD | 5(4.9%) |
| COPD | 2 (2.0%) |
| Liver Disease | 4 (3.9%) |
| **Urgency of ERCP N (%)** | |
| Elective | 93 (91.2%) |
| Emergency | 9 (8.8%) |
| **Presenting Symptoms N (%)** | |
| Biliary Colic | 100 (90.9%) |
| Obstructive jaundice | 22 (20%) |
| Fever | 11 (10%) |
| Cholangitis | 11 (10%) |
| Pancreatitis | 15 (13.6%) |
| Asymptomatic | 9 (8.2%) |
| Post cholecystectomy status | 19 (17.3%) |
| **Liver Function Test N (%)** | |
| Normal | 11 (10%) |
| Obstructive pattern | 74 (67.3%) |
| Hepatocellular pattern | 25 (22.7%) |
| **Imaging modalities N (%)** | |
| USG | 101 (91.8%) |
| CT | 25 (22.7%) |
| MRCP | 33 (30%) |
| **Imaging Finding N (%)** | |
| Stone visualized | 102 (92.7%) |
| CBD dilated without stone | 6 (5.5%) |

ERCP Procedural Characteristics

Patient characteristics during and after the procedure are shown in Table 2 below. In this study, most common type of papilla was type 1 and least common type was

type 2 & 4. Difficult cannulation was encountered in 42 cases with 26 cases requiring advanced cannulation technique in the form of needle knife papillotomy (NKP). Most commonly utilized method of stone extraction was ballon trawling followed by basket and mechanical lithotripsy. Out of 110 cases, 8 patients could not be cannulated. A total of 84 patients had complete CBD clearance while 18 patients had unsuccessful procedure and was referred for surgery. Most common ERCP related adverse events observed in our study was post ERCP pancreatitis (4.5% ) and desaturation during the procedure (4.5%). None of them were life threatening. One patient developed perforation which resolved with conservative management.

**Table 2. ERCP procedural observed characteristics.**

| Characteristics | Value (N=110) |
|---|---|
| **Papilla type** | |
| Type 1 | 52(47.3%) |
| Type 2 | 13(11.8%) |
| Type 3 | 32(29.1%) |
| Type 4 | 13(11.8%) |
| **Cannulation time (N=102)** | |
| <5 minutes | 60(58.8%) |
| >5 minutes | 42(41.2%) |
| **Cholangiogram finding (N=102)** | |
| Normal | 0 |
| Dilated CBD without filling defect | 35(34.3%) |
| Filling defects seen | 67(65.7%) |
| NKP done | 26(23.6%) |
| **Method of stone Retrieval (N=102)** | |
| Ballon trawling | 96(87.3%) |
| Basketting | 5(4.5%) |
| BML | 1(0.9%) |
| **Method of papillary widening (N=102)** | |
| Sphincterotomy | 102(92.7%) |
| Sphincterotomy + CRE ballon dilatation | 6(5.8%) |
| **Outcome of ERCP** | |
| Unsuccessful | 18(16.4%) |
| Partial CBD Clearance | 8(7.3%) |
| Complete CBD clearance | 84(76.4) |

**Table 2. ERCP procedural observed characteristics.**

| Characteristics | Value (N=110) |
|---|---|
| **Number of ERCP session for complete CBD clearance (N=102)** | |
| Single session | 78(76.5%) |
| >1 session | 24(23.5%) |
| **ERCP Related Adverse Events** | |
| Bleeding | 2(1.8%) |
| Perforation | 1(0.9%) |
| Pancreatitis | 5(4.5%) |
| Cholangitis | 3(2.7%) |
| Hypoxia during procedure | 5(4.5%) |
| Arrythmia during procedure | 3(2.7%) |
| Shock during procedure | 1(0.9%) |

Stone number was also variable among patients with 28% having single stone retrieved, 12% two stones retrieved, 5% three stones retrieved and 14% having four or more stones retrieved. Eleven percent patients had confirmed stones in imaging but nothing came out during the ERCP procedure, probably due to spontaneous passage of small stone before the procedure.

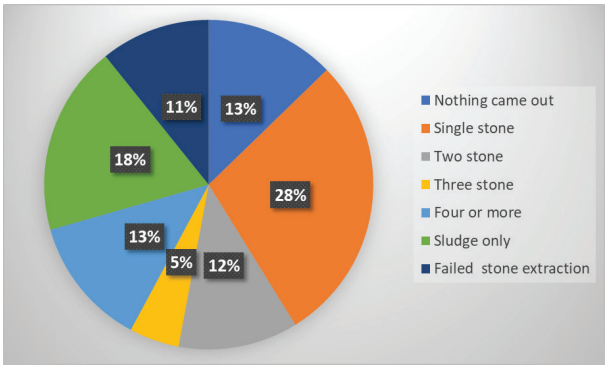


**Figure 1. Final Result of ERCP.**

Those patients who did not achieve complete CBD clearance after single or multiple sessions of ERCP, they were referred for CBD exploration with cholecystectomy. Altogether 20 patients were referred for surgical management for choledocholithiasis for various reasons as tabulated below.

| Table 3. Patients referred for CBD exploration. | |
|---|---|
| Periampullary Diverticulum | 7 |
| CBD stricture in cholangiogram | 7 |
| Mirizzi syndrome | 2 |
| Impacted large stone | 2 |
| Choledochal cyst | 1 |
| Hepaticolithiasis | 1 |
| Cystic duct stone | 1 |

## DISCUSSION

The majority of choledocholithiasis results from migrated stones from gall bladder. The clinical presentation of the patient could be asymptomatic or symptomatic in 15-20 % with biliary colic or complications , sometimes severe, such as pancreatitis or cholangitis.[13] Our study showed that patients having asymptomatic choledocholithiasis were 8.2% while symptomatic patients with any symptoms were 91.8%. Severe complications in the form of cholangitis was present in 10 % patients and pancreatitis in 13.6 % patients.

Successful selective CBD cannulation was possible in 102 cases (92.7%) and 8 cases (7.3%) could not be cannulated despite advanced cannulation technique. The findings of successful CBD cannulation is comparable with the study done by Gurung et al in Dhulikhel hospital( 94.1%).[14] Among 8 cases of failed CBD cannulation 4 cases had abnormal duodenal anatomy resulting unstable duodenoscope position, 2 cases had large duodenal diverticula and 2 cases had downfacing papilla.

Successful CBD clearance in index procedure was achieved in 76.5% cases which was lower than various studies published in the past.[15-17] Reason for lower CBD clearance in our study could be due to the fact that our centre, a tertiary care hospital, is a referral centre for complex and difficult CBD stones referred from other primary and secondary level hospitals. It was interesting to note that patients presenting with cholangitis had lower CBD clearance on index ERCP procedure (25%) since the aim of the index ERCP in such patients was to achieve biliary drainage and control of source of infection with the least possible intervention. The success rate of CBD clearance in index ERCP procedure can be increased with addition of advanced resources like cholangioscopy-assissted lithotripsy and early consideration of endoscopic papillary large balloon dilatation as well as mechanical lithotripsy.

ERCP is relatively a safe procedure to achieve CBD clearance in patients with choledocholithiasis with studies showing overall complication rate of 8-12%, most commonly manifesting as pancreatitis.[18-20] In the present study, overall complication rate was around 18% which is slightly higher than previous studies, probably due to lack of dedicated anesthesia team and lack of advanced accessories for difficult CBD stones. Similar to previous studies, pancreatitis was most common complication observed when anesthesia related adverse events were not considered. Post ERCP pancreatitis occurred in 4.5 % of total cases, none of the cases were severe requiring intensive management. Life threatening complication in the form of perforation occurred in one patient which was retroperitoneal and so improved without requiring major surgical intervention. Post ERCP cholangitis occurred in three cases (2.7%) and were due to dislodged CBD stent in two cases and formation of hematoma on sphincterotomy site (patient under anticoagulant). ERCP complications can happen even with the experienced hands but endoscopist need to be aware of such events and be proactive in diagnosing and managing them.

Our study has some limitations. Small sample size, lack of advanced techniques like cholangioscopy-assissted lithotripsy, lack of early use of mechanical lithotripsy and endoscopic papillary balloon dilatation as well as quality of ERCP accessories could have affected the outcome of our study.

The strength of our study is that the confirmation of CBD clearance was based on cholangiographic image obtained during ERCP procedure.

## CONCLUSIONS

Management of patients with choledocholithiasis requires careful case selection and optimization before CBD clearance. ERCP is the primary endoscopic modality of treatment of choledocholithiasis which is often followed by laparoscopic cholecystectomy. With the advent of better ERCP techniques and resources, patients with choledocholithiasis can achieve complete CBD clearance with minimum overall adverse events.

## REFERENCES


1. Narula VK, Fung EC, Overby DW, Richardson W, Stefanidis D, the SGC. Clinical spotlight review for the management of choledocholithiasis. Surgical Endoscopy. 2020;34(4):1482-91.doi: https://doi.org/10.1007/s00464-020-07462-2
2. Copelan A, Kapoor BS. Choledocholithiasis: Diagnosis and Management. Tech Vasc Interv Radiol. 2015;18(4):244-55 .doi:https://doi.org/10.1053/j.tvir.2015.07.008

3. Hirschfield GM, Beuers U, Corpechot C, Invernizzi P, Jones D, Marzioni M, et al. EASL Clinical Practice Guidelines: The diagnosis and management of patients with primary biliary cholangitis. Journal of hepatology. 2017;67(1):145-72.doi: https://doi.org/10.1016/j.jhep.2017.03.022
4. Cronan JJ. US diagnosis of choledocholithiasis: a reappraisal. Radiology. 1986;161(1):133-4 .doi:https://doi.org/10.1148/radiology.161.1.3532178
5. Pedersen OM, Nordgård K, Kvinnsland S. Value of sonography in obstructive jaundice: limitations of bile duct caliber as an index of obstruction. Scandinavian journal of gastroenterology. 1987;22(8):975-81.doi: https://doi.org/10.3109/00365528708991945
6. Tseng CW, Chen CC, Chen TS, Chang FY, Lin HC, Lee SD. Can computed tomography with coronal reconstruction improve the diagnosis of choledocholithiasis? Journal of gastroenterology and hepatology. 2008;23(10):1586-9.doi: https://doi.org/10.1111/j.1440-1746.2008.05547.x
7. Miller FH, Hwang CM, Gabriel H, Goodhartz LA, Omar AJ, Parsons III WG. Contrast-enhanced helical CT of choledocholithiasis. American Journal of Roentgenology. 2003;181(1):125-30.doi: https://doi.org/10.2214/ajr.181.1.1810125
8. Freitas ML, Bell RL, Duffy AJ. Choledocholithiasis: evolving standards for diagnosis and management. World journal of gastroenterology: WJG. 2006;12(20):3162. doi:https://doi.org/10.3748/wjg.v12.i20.3162
9. Arregui ME, Davis CJ, Arkush AM, Nagan RF. Laparoscopic cholecystectomy combined with endoscopic sphincterotomy and stone extraction or laparoscopic choledochoscopy and electrohydraulic lithotripsy for management of cholelithiasis with choledocholithiasis. Surgical endoscopy. 1992;6:10-5. doi: https://doi.org/10.1007/bf00591180
10. Koo KP, Traverse LW. Do preoperative indicators predict the presence of common bile duct stones during laparoscopic cholecystectomy? The American journal of surgery. 1996;171(5):495-9.doi: https://doi.org/10.1016/s0002-9610(97)89611-0
11. Perissat J, Huibregtse K, Keane F, Russell R, Neoptolemos J. Management of bile duct stones in the era of laparoscopic cholecystectomy. British journal of surgery. 1994;81(6):799-810.doi: https://doi.org/10.1002/bjs.1800810606
12. Tham T, Lichtenstein D, Vandervoort J, Wong R, Brooks D, Van Dam J, et al. Role of endoscopic retrograde cholangiopancreatography for suspected choledocholithiasis in patients undergoing laparoscopic cholecystectomy. Gastrointestinal endoscopy. 1998;47(1):50-6.doi: https://doi.org/10.1016/s0016-5107(98)70298-6
13. Attili AF, De Santis A, Capri R, Repice AM, Maselli S, Group G. The natural history of gallstones: the GREPCO experience. Hepatology. 1995;21(3):656-60. doi: https://doi.org/10.1016/0270-9139(95)90514-6
14. Gurung R, Purbey B, Koju R, Bedi T. Endoscopic retrograde cholangiopancreatography at Dhulikhel Hospital: outcome analysis. Kathmandu University Medical Journal. 2014;12(1):55-9.doi: https://doi.org/10.3126/kumj.v12i1.13640
15. Christoforidis E, Vasiliadis K, Tsalis K, Patridas D, Blouhos K, Pramateftakis M-G, et al. Factors significantly contributing to a failed conventional endoscopic stone clearance in patients with "difficult" choledecholithiasis: a single-center experience. Diagnostic and Therapeutic Endoscopy. 2014;2014.doi: https://doi.org/10.1155/2014/861689
16. Ödemiş B, Kuzu UB, Öztaş E, Saygılı F, Suna N, Coskun O, et al. Endoscopic management of the difficult bile duct stones: a single tertiary center experience. Gastroenterology Research and Practice. 2016;2016.doi: https://doi.org/10.1155/2016/8749583
17. Almadi MA, Eltayeb M, Thaniah S, Alrashed F, Aljebreen MA, Alharbi OR, et al. Predictors of failure of endoscopic retrograde cholangiography in clearing bile duct stone on the initial procedure. Saudi Journal of Gastroenterology. 2019;25(2):132-8.doi: https://doi.org/10.4103/sjg.sjg_304_18
18. Williams E, Taylor S, Fairclough P, Hamlyn A, Logan R, Martin D, et al. Risk factors for complication following ERCP; results of a large-scale, prospective multicenter study. Endoscopy. 2007;39(09):793-801.doi: https://doi.org/10.1055/s-2007-966723
19. Bergman JJ, Rauws EA, Fockens P, van Berkel A-M, Bossuyt PM, Tijssen JG, et al. Randomised trial of endoscopic balloon dilation versus endoscopic sphincterotomy for removal of bileduct stones. The Lancet. 1997;349(9059):1124-9.doi: https://doi.org/10.1016/s0140-6736(96)11026-6
20. Freeman ML, Nelson DB, Sherman S, Haber GB, Herman ME, Dorsher PJ, et al. Complications of endoscopic biliary sphincterotomy. New England Journal of Medicine. 1996;335(13):909-19.doi: https://doi.org/10.1056/nejm199609263351301