

Real-world Outcomes of Emergency ERCP in Acute Cholangitis: Experience from a Tertiary Care Centre in North India

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ABSTRACT

Background: Acute cholangitis is a potentially life-threatening condition caused by biliary obstruction and infection. Endoscopic retrograde cholangiopancreatography (ERCP) is the treatment of choice; however, optimal timing and strategy, especially in severe (grade III) disease, remain critical. This study evaluated the clinical spectrum, ERCP strategies, and short-term outcomes of patients with acute cholangitis at a tertiary care centre in North India.

Methods: This prospective observational study included 50 patients undergoing ERCP at the Department of Gastroenterology, Sher-i-Kashmir Institute of Medical Sciences, Srinagar, over 6 months from September 2024. Demographic, clinical, radiological, and microbiological parameters were recorded. ERCP timing, intervention type (upfront biliary stenting vs ductal clearance), and outcomes were assessed using Tokyo Guidelines 2018 severity grading. Early ERCP was defined as ≤ 24 hours from presentation.

Results: Mean age was 57.9 ± 14.0 years, with female predominance (52%). Most patients were 51–70 years old (62%) and from rural areas (76%). Severity grading: grade I 36%, grade II 38%, grade III 26%. Abdominal pain (96%) and fever (64%) were the most common. Choledocholithiasis accounted for 84% of cases; malignancy 10%, benign strictures, 6%. Upfront biliary stenting was performed in 66%, and complete CBD clearance in 34%. Early ERCP was performed in 80% of cases. Early ERCP (≤ 24 h) was associated with a significantly shorter hospital stay compared with delayed ERCP (2.4 ± 0.7 vs 4.6 ± 1.8 days; $p = 0.01$), while rates of early clinical improvement and complications were comparable. In Grade III patients, upfront stenting shortened hospital stay and improved short-term outcomes. Bile cultures were positive in 84%, with *Escherichia coli* in 46%. Laboratory parameters improved significantly post-ERCP (bilirubin: $p = 0.001$, ALP: $p = 0.022$, ALT: $p = 0.030$). Complications occurred in 4% (mild cholangitis and pancreatitis), all managed conservatively with no ERCP-related mortality. Most patients were discharged within 3 days.

Conclusion: Early ERCP is critical for rapid clinical improvement in acute cholangitis. Overall outcomes were comparable between upfront biliary stenting and immediate ductal clearance; however, in Grade III cholangitis, upfront stenting was associated with more favorable short-term outcomes, including shorter hospital stay. These findings support early, context-specific ERCP strategies in high-grade disease.

Keywords: Acute cholangitis, ERCP, biliary obstruction, Tokyo Guidelines, biliary drainage, stenting, choledocholithiasis

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INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP), first described by McCune in 1968 and introduced into clinical practice in the early 1970s, has evolved from a diagnostic procedure into a cornerstone therapeutic modality for biliopancreatic disorders^{1,2}. Advances in endoscopic technology, accessories, and operator expertise have firmly established ERCP as the preferred first-line intervention for biliary obstruction due to choledocholithiasis and benign or malignant

biliary strictures¹⁻⁴. In addition to biliary drainage, ERCP allows tissue acquisition through brush cytology and biopsy, with diagnostic yield further enhanced by cholangioscopy-guided sampling in selected cases^{4,5}.

Acute cholangitis is a potentially life-threatening infection of the biliary tract that results from biliary obstruction with superimposed bacterial infection. This

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leads to increased intraductal pressure, cholangiovenous reflux, bacteremia, and sepsis⁶⁻¹⁰. Classically described by Charcot as the triad of fever, right upper quadrant pain, and jaundice, severe disease may progress to altered mental status and septic shock, as later described in Reynolds' pentad^{6,11-13}. Without timely intervention, acute cholangitis can rapidly progress to multiorgan failure and death.

Choledocholithiasis remains the most common aetiology of acute cholangitis, accounting for approximately 50–80% of cases, followed by malignant and benign biliary strictures¹⁴⁻¹⁶. Biliary infection is most frequently caused by gram-negative enteric organisms, particularly *Escherichia coli*, followed by *Klebsiella*, *Enterobacter*, *Pseudomonas*, and *Citrobacter* species^{7,8}. Iatrogenic bacterial introduction, especially following ERCP in the presence of biliary obstruction, is also a recognized pathogenic mechanism^{7,9}.

The diagnosis and severity stratification of acute cholangitis are currently guided by the Tokyo Guidelines 2018 (TG18), which integrate clinical, biochemical, and imaging parameters¹⁵. Disease severity is categorized into Grade I (mild), Grade II (moderate), and Grade III (severe) based on the presence of systemic inflammation and organ dysfunction. While the majority of patients with mild disease respond to conservative management with antibiotics and supportive care, those with moderate or severe cholangitis, particularly patients presenting with organ dysfunction, septic shock, or failure of medical therapy, require early or urgent biliary decompression¹⁵⁻¹⁹.

Prompt biliary drainage has been shown to significantly reduce mortality, which historically approached 30–50% but has declined to below 10% with advances in early diagnosis, antibiotic therapy, and endoscopic intervention¹⁰⁻¹⁶. Endoscopic biliary drainage via ERCP is the preferred modality, with reported technical success rates exceeding 90%¹⁵⁻²⁰. Contemporary international society guidelines from the European Society of Gastrointestinal Endoscopy (ESGE) and the American Society for Gastrointestinal Endoscopy (ASGE) recommend early ERCP within 48 hours for most

patients and within 24 hours for those with severe disease or sepsis, tailored to disease severity and patient stability¹⁹⁻²².

Despite consensus on the need for early biliary drainage, the optimal timing and extent of intervention, specifically immediate common bile duct clearance versus temporary biliary decompression, remain areas of ongoing clinical debate. Emerging evidence and contemporary guidelines increasingly support a pragmatic, staged approach for patients with severe (Grade III) cholangitis, in which the initial procedure priorities rapid biliary decompression with temporary stenting or nasobiliary drainage, with definitive ductal clearance deferred until clinical stabilisation¹⁸⁻²².

In this context, we conducted a prospective, real-world study at a tertiary care referral centre in North India to evaluate the clinical spectrum, timing, safety, and outcomes of emergency ERCP in acute cholangitis, with particular emphasis on comparing upfront biliary stenting with immediate ductal clearance in severe disease and characterizing regional biliary microbiology.

MATERIAL AND METHODS

Aims and Objectives

Aim: To evaluate the timing, therapeutic strategies, and short-term clinical outcomes of emergency ERCP in the management of acute cholangitis at a tertiary care referral centre in North India.

Specific Objectives

1. To assess the clinical efficacy and safety of emergency ERCP in patients with acute cholangitis stratified by severity according to the Tokyo Guidelines 2018 (TG18).
2. To evaluate the impact of ERCP timing (early ≤ 24 hours vs delayed > 24 hours) on clinical recovery, duration of hospital stays, and short-term outcomes.
3. To compare ERCP strategies, immediate ductal clearance versus temporary biliary stenting, with respect to technical success, complications, and short-term survival, particularly in severe (Grade III) cholangitis.

4. To analyse the microbiological profile of bile cultures obtained during ERCP and correlate these findings with clinical outcomes.

Study Design and Setting

This prospective, hospital-based study was conducted in the Department of Gastroenterology, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Soura, Srinagar, a tertiary care referral centre serving the Kashmir valley in North India. The study was carried out over six months from September 2024, following approval from the Institutional Ethics Committee (IEC/SKIMS protocol #143/2024). The study evaluated the timing and therapeutic strategy of emergency ERCP in patients with acute cholangitis, with particular emphasis on early biliary decompression and upfront stenting in high-grade disease.

Study Population

Fifty consecutive patients diagnosed with acute cholangitis and requiring emergency ERCP for biliary drainage were enrolled during the study period. All patients were managed according to a standardized departmental protocol favoring early ERCP (within 24 hours of admission) whenever clinically feasible. Disease severity was graded using the Tokyo Guidelines 2018 (TG18), which were the operational institutional guidelines.

Inclusion Criteria

Patients presenting with clinical, biochemical, and imaging features consistent with acute cholangitis, as defined by TG18, were included.

Exclusion Criteria

- Portal hypertension with oesophageal or gastric varices
- Recent myocardial infarction
- Documented hypersensitivity to iodinated contrast media
- Refusal or inability to provide informed consent

Pre-Procedural Evaluation

All patients underwent a detailed clinical assessment, including a detailed history and systemic examination.

Baseline investigations included complete blood count, liver function tests, and coagulation profile. Imaging with ultrasonography and/or magnetic resonance cholangiopancreatography (MRCP) was performed to identify the cause of biliary obstruction. Disease severity was graded according to TG18 criteria to guide the urgency and extent of endoscopic intervention.

ERCP Procedure

ERCP procedures were performed using either Pentax i10 series or Olympus 190 series side-viewing duodenoscopes, under fluoroscopic guidance with a GE OEC Brivo mobile C-arm compact radiology system. Prophylactic intravenous antibiotics were administered before the procedure. Rectal NSAIDs for post-ERCP pancreatitis prophylaxis were administered per institutional protocol, unless contraindicated. Conscious sedation was achieved using standard doses of midazolam, and Hyoscine N-butyl bromide was administered as needed to reduce duodenal motility.

Standard ERCP accessories were used for biliary cannulation, sphincterotomy, and drainage. Plastic biliary stents (7–10 Fr diameter, 10–12 cm length) were placed when indicated. Bile samples were collected aseptically during the procedure for microbiological culture and sensitivity testing.

In patients with Grade III cholangitis or hemodynamic instability, the primary objective of the initial ERCP was rapid biliary decompression via temporary stent placement without attempting complete ductal clearance. Definitive stone extraction or stricture management was deferred until clinical stabilization.

Post-Procedural Monitoring

Patients were monitored for at least 24 hours following ERCP for procedure-related complications. Serial clinical assessments and biochemical investigations were performed to document the resolution of symptoms and improvement in laboratory parameters.

Data Collection

Demographic characteristics, clinical presentation, laboratory and imaging findings, ERCP details, therapeutic interventions, timing of ERCP (early ≤ 24

hours vs delayed >24 hours), complications, and outcomes were recorded prospectively. Microbiological findings from bile cultures were correlated with disease severity, ERCP strategy, and clinical response.

Outcome Measures

- Primary outcomes: Clinical success (resolution of fever, jaundice, and abdominal pain with biochemical improvement) and procedure-related complications.
- Secondary outcomes: Duration of hospital stay, short-term survival. Microbiological patterns and their association with disease severity were also analysed.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of SKIMS. Written informed consent was obtained from all participants, and the study was conducted in accordance with the Declaration of Helsinki (2013 revision).

Statistical Analysis

Statistical analysis was performed using SPSS version 26. Continuous variables were expressed as mean $\pm$ standard deviation, and categorical variables as frequency and percentage. Paired t-tests were used to compare pre- and post-ERCP laboratory parameters. Associations between categorical variables were analysed using the Chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant.

OBSERVATIONS AND RESULTS

A total of 50 patients diagnosed with acute cholangitis were included in the study.

Demographic Profile

The mean age of the study population was 57.9 ± 14 years (range: 28–86 years). The largest subgroup (62%) belonged to the 51–70-year age range. There was no statistically significant association between age group and ERCP outcome ($p = 0.177$). Females constituted 52% of patients, giving a male-to-female ratio of 1: 1.08. Most participants (76%) were from rural areas.

Severity of Disease

According to the Tokyo Guidelines 2018 classification, Grade II (moderate) cholangitis was the most common (38%), followed by Grade I (36%) and Grade III (26%). A trend toward higher disease severity in patients aged >70 years was observed, but this did not reach statistical significance ($\chi^2 = 2.94, p = 0.23$).

Clinical Presentation

Abdominal pain was the predominant symptom (96%), followed by fever (64%), nausea/vomiting (50%), and jaundice (40%).

The mean duration of symptoms prior to presentation was 2.8 ± 1.4 days (range: 1–7 days).

Aetiology and Imaging Findings

Choledocholithiasis was the leading cause of obstruction (84%), followed by malignant stricture (10%) and benign stricture (6%).

Table 1: Baseline Characteristics, Disease Severity, and ERCP Outcomes (N = 50)

Mean age (years)	57.9 ± 14
Age distribution (%)	≤ 30 : 2%; 31–50: 28%; 51–70: 62%; 71–90: 8%
Gender (%)	Male: 48%; Female: 52%
Residence (%)	Rural: 76%; Urban: 24%
Cholangitis severity (TG18)	Grade I: 36%; Grade II: 38%; Grade III: 26%
Etiology (MRCP/USG)	Choledocholithiasis: 84%; Malignant stricture: 10%; Benign stricture: 6%
ERCP strategy (%)	Upfront stenting: 66%; CBD clearance: 34%
Hospital stay (%)	Within 3 days: 86%; ≥ 4 days: 14%
Common organisms in bile culture	<i>E. coli</i> 46%; <i>P. aeruginosa</i> 18%; <i>Klebsiella</i> 12%;

There was excellent diagnostic concordance between MRCP/USG and ERCP findings (Cohen's $\kappa = 0.92$, 95% CI 0.84–1.00, $p < 0.001$), indicating strong diagnostic agreement.

Therapeutic Procedures and Outcomes

All patients underwent emergent ERCP. Upfront biliary stenting was performed in 33 patients (66%), while complete common bile duct clearance using balloon or basket extraction was achieved in 17 patients (34%). The technical success rate was 100%, and the clinical success rate, defined as resolution of symptoms and improvement in bilirubin levels within 72 hours, was 96%. In patients with Grade III cholangitis, the initial ERCP strategy predominantly involved temporary biliary stenting, with definitive ductal clearance deferred until clinical stabilization.

Table 2. ERCP Timing and Outcomes

Clinical improvement ≤ 72 h	39/40 (97.5%)	9/10 (90%)	0.31
Mean hospital stay	2.4 ± 0.7	4.6 ± 1.8	0.01
Complications	1 (2.5%)	1 (10%)	0.28

ERCP in Grade III Disease

Among Grade III patients ($n=13$), temporary stenting was the preferred strategy (9/13), with immediate clearance in 4/13. Fisher's exact test shows a trend toward higher use of stenting in Grade III patients ($p=0.09$).

Hospital Stay and Complications

The mean duration of hospitalization post-ERCP was 2.7 ± 0.9 days (median = 3 days). Most patients (86%) were

discharged within 72 h. Minor complications were observed in 2 (4%) patients, post-ERCP cholangitis ($n = 1$) and mild pancreatitis ($n = 1$); both were managed conservatively. No bleeding, perforation, or procedure-related mortality occurred.

Microbiological Analysis

Out of 50 bile samples, 42 (84%) showed positive culture growth. *E. coli* was the most frequent isolate (46%), followed by *Pseudomonas aeruginosa* (18%), *Klebsiella* (12%), and *Acinetobacter* (6%).

The difference in bacterial distribution between mild and severe cases was not statistically significant ($\chi^2 = 4.12$, $p = 0.39$).

Table 3. Bile culture results ($n = 50$)

<i>E. coli</i>	23	46
<i>Pseudomonas aeruginosa</i>	9	18
<i>Klebsiella</i> spp.	6	12
<i>Acinetobacter</i> spp.	3	6
Fungal	1	2
Sterile	8	16

Biochemical Parameters Pre- and Post-ERCP

Paired-sample t-tests demonstrated a significant improvement in liver function following biliary drainage. Mean serum bilirubin decreased from 7.69 ± 5.65 mg/dL to 3.83 ± 1.99 mg/dL ($t = 3.92$, $p = 0.001$). Similarly, ALP and ALT showed statistically significant reductions ($p = 0.022$ and 0.030 , respectively), while platelet count increased significantly ($p = 0.0459$). No significant change was noted in renal parameters (urea, creatinine) or hemoglobin.

Table 4. Laboratory parameters before and after ERCP (paired t-test results)

Hemoglobin (g/dL)	11.84 ± 1.84	11.41 ± 1.86	0.43	1.17	0.246 (ns)
Platelets ($\times 10^9/L$)	168.3 ± 78.5	180.6 ± 83.6	+12.3	2.07	0.0459 (S)
TLC ($\times 10^9/L$)	12.02 ± 5.88	11.55 ± 5.76	-0.47	0.41	0.687 (ns)
Bilirubin (mg/dL)	7.69 ± 5.65	3.83 ± 1.99	-3.86	3.92	0.001 (S)
ALP (IU/L)	487.6 ± 311.4	295.4 ± 170.1	-192.2	2.36	0.022 (S)
ALT (IU/L)	159.9 ± 111.5	91.0 ± 56.9	-68.9	2.24	0.030 (S)
Urea (mg/dL)	50.2 ± 24.6	38.5 ± 12.3	-11.7	1.66	0.104 (ns)
Creatinine (mg/dL)	1.28 ± 1.02	0.98 ± 0.72	-0.30	1.70	0.092 (ns)

S = statistically significant ($p < 0.05$); ns = not significant

Summary of Statistical Outcomes

- Technical and clinical success rates: 100% and 96%, respectively.
- Significant biochemical improvement (bilirubin, ALP, ALT; $p < 0.05$).
- Mean hospital stays: 2.7 days; minor complications: 4%.
- No correlation between age, gender, or severity with ERCP outcome ($p > 0.05$).
- Strong concordance between imaging (MRCP/USG) and ERCP findings ($\kappa = 0.92$, $p < 0.001$).

DISCUSSION

Emergency ERCP is pivotal in management for acute cholangitis, providing rapid biliary decompression and effective source control of sepsis. In this prospective real-world study from a tertiary care centre in North India, we evaluated the timing, safety, and endoscopic strategy of emergency ERCP across varying severities of acute cholangitis. Our findings reaffirm the critical importance of early biliary drainage and support a severity-adapted, staged endoscopic approach, particularly in patients with severe (Grade III) disease.

The demographic profile of our cohort, with a mean age of 57.9 years and a slight female predominance, is consistent with previously published series from both Asian and Western populations^{9,13,17}. The predominance of patients in the sixth and seventh decades of life underscores the increased susceptibility of older individuals to biliary sepsis, likely reflecting a higher burden of comorbidities and delayed healthcare access. Most patients presented with mild-to-moderate disease, while approximately one-quarter had severe cholangitis, a distribution comparable to that reported in large observational studies and guideline-based cohorts^{10-12,16}.

Abdominal pain and fever were the most frequent presenting symptoms, whereas Charcot's triad was observed in fewer than half of patients, reaffirming its limited sensitivity despite good specificity^{8,10,12}. These findings highlight the limitations of classical clinical features and emphasize the importance of structured diagnostic criteria such as those proposed in the Tokyo

Guidelines 2018¹⁵.

Choledocholithiasis was the leading cause of biliary obstruction in our study, accounting for 84% of cases, followed by malignant and benign biliary strictures. This distribution mirrors global epidemiological trends, although the relatively higher proportion of malignant obstruction likely reflects referral bias inherent to a tertiary care centre^{11,14,16}. The strong concordance between ultrasonography/MRCP and ERCP findings supports the reliability of non-invasive imaging in planning emergency biliary interventions^{10,12,24,25}.

A key observation of this study was the preferential use of upfront biliary stenting in nearly two-thirds of patients, particularly among those with Grade III cholangitis. In critically ill or hemodynamically unstable patients, prioritizing rapid biliary decompression over definitive ductal clearance minimizes procedural duration, reduces intraductal pressure, and lowers the risk of cholangiovenous reflux and procedure-related complications. This approach is strongly supported by the Tokyo Guidelines 2018 and endorsed by ESGE and ASGE recommendations, which advocate tailoring the extent of ERCP intervention to disease severity and patient stability^{15,16,19,20}.

Although rates of early clinical improvement and procedure-related complications were similar, early ERCP was associated with faster clinical stabilization and shorter hospital stay, indicating that its primary benefit lies in expedited recovery and reduced healthcare utilization rather than improved immediate procedural success^{12,15,21,23}.

When the ERCP strategy was analysed, overall clinical and technical outcomes were comparable between upfront biliary stenting and immediate ductal clearance. However, in patients with severe (Grade III) cholangitis, upfront stenting was associated with a trend toward more favorable short-term outcomes, particularly shorter hospital stay. This supports a staged 'drain-first, clear-later' approach in critically ill patients, where rapid biliary decompression takes precedence over definitive stone clearance. Such a strategy minimizes procedure duration and physiological stress during the acute septic

phase. These findings are consistent with prior studies demonstrating worse outcomes with delayed or prolonged ERCP attempts in septic patients^{15,21–23}.

Despite the acuity of illness, the overall complications were minimal (4%) and limited to mild cholangitis and pancreatitis, both managed conservatively. No procedure-related mortality occurred, consistent with reported complication rates of 3–10% for therapeutic ERCP. [13,14] These findings reaffirm the safety of emergent ERCP when performed by experienced endoscopists in an appropriate setting.

Microbiological analysis revealed positive bile cultures in 84% of cases, with *Escherichia coli* as the predominant organism, followed by *Pseudomonas*, *Klebsiella*, and *Acinetobacter* species. This profile is consistent with existing literature and underscores the importance of bile culture-guided antibiotic therapy and local antimicrobial stewardship [7,8,16].

Biochemical parameters demonstrated significant improvement following ERCP, reflecting effective biliary decompression. Improvement in platelet counts likely represents resolution of sepsis-related thrombocytopenia. These findings parallel prior reports evaluating early ERCP outcomes in acute cholangitis^{16,23}.

Our findings gain further relevance when interpreted alongside our previously published experience evaluating elective ERCP for common bile duct stones, where patients with acute cholangitis were excluded, and outcomes reflected procedural efficacy and safety under controlled conditions [26]. In contrast, the present study highlights the distinct clinical challenges encountered during emergency ERCP in septic patients, where therapeutic priorities shift toward rapid biliary decompression. Together, these data highlight the safety and efficacy of ERCP in biliary obstruction, besides supporting a context-specific ERCP strategy of elective ductal clearance in stable patients and staged biliary drainage in acute cholangitis, rather than a uniform interventional approach.

Strengths of this study include prospective data collection, real-world applicability, adherence to TG18

severity grading, and analysis of both timing and strategy, an area under-reported in regional literature.

LIMITATIONS

The primary limitations of this study include the small sample size, single-centre design, and lack of long-term follow-up. Microbiological sensitivity patterns and cost-effectiveness analyses were not assessed. Future multicenter studies with larger cohorts are required to validate these findings and refine management algorithms.

RECOMMENDATIONS

Emergent ERCP should be the first-line therapeutic intervention for acute cholangitis, preferably within the first 48 hours of presentation. In hemodynamically unstable or Grade III patients, upfront biliary stenting without immediate ductal clearance is a safe and effective strategy, with definitive clearance planned after stabilization.

Further prospective studies incorporating antibiotic sensitivity profiles and long-term outcomes are recommended.

CONCLUSION

Emergency ERCP is a safe, effective, and lifesaving intervention for acute cholangitis across all severity grades. Early biliary drainage, particularly within 24–48 hours, significantly improves clinical recovery, shortens hospital stay, and minimizes complications. A tailored ERCP strategy, favoring immediate clearance in stable patients and temporary biliary stenting in severe or unstable cases, ensures optimal outcomes. Regional bile microbiology highlights the importance of culture-guided antibiotic therapy.

These findings support the implementation of structured early ERCP protocols in tertiary care centres within North India and similar resource-constrained settings.

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