



## RESEARCH

# Emergency endoscopic retrograde cholangiopancreatography in critically ill patients is a safe and effective procedure

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### ABSTRACT

Emergency ERCP may be required in patients with severe cholangitis who rapidly deteriorate with multi-organ dysfunction and who cannot wait until the next available elective list. A significant proportion of patients require ventilatory and inotropic support. We describe our experience on the outcome of emergency ERCP in this cohort of critically ill patients.

Medical records of cases undergoing ERCP between November 2008 and November 2011 were retrospectively reviewed. Patients who were in intensive care unit or required general anaesthesia due to haemodynamic compromise at the time of ERCP were included.

Total of 2237 ERCPs were performed during this period, of which 36 (2%) emergency ERCPs were performed in 33 patients. The median age was 79 years. All procedures were performed under general anaesthesia in emergency operating room. In 27/36 procedures (75%), the patients required inotropes. Indications included cholangitis (78%), pancreatitis (14%) and post-operative bile leak (8%). Biliary cannulation was achieved in 100% of cases. Endoscopic findings included CBD stones (64%), CBD stones and an additional pathology (8%), bile leak (8%), CBD stricture (5%), Mirizzi's (3%) and blocked plastic stent (3%). In 23/36 (64%) procedures a stent was inserted. In 11/36 (30%) procedures a balloon trawl was sufficient to clear the bile duct. Thirty-day mortality was 25%. Although the 30-day mortality remains high due to multi-organ failure, ERCP is successful and effective in the majority of patients and results in a good outcome for this cohort of critically ill patients, in whom the prognosis is inevitably poor without emergency biliary drainage.

### INTRODUCTION

Acute obstructive cholangitis was defined by Reynolds and Dargan in 1959 as a syndrome consisting of lethargy or mental confusion and shock, as well as fever, jaundice and abdominal pain, caused by biliary obstruction. They indicated that emergent biliary decompression was the only effective procedure for treating the disease. These five symptoms were then called Reynolds's pentad.<sup>1</sup> Choledocholithiasis is the most frequent cause of cholangitis, but recently, the incidence of acute cholangitis caused by malignant disease, sclerosing cholangitis and non-surgical instrumentation of the biliary tract has been increasing.<sup>2–3</sup> Common bile duct (CBD) stones are found in 10–20% of patients with symptomatic gall stone disease.<sup>4–7</sup> The risk of symptomatic acute cholangitis for these patients has been reported to be 0.2%.<sup>8–9</sup> Resuscitation, antibiotics and biliary tract decompression remain the mainstay of therapy. Outcome is dependent on the ability successfully to achieve timely biliary drainage and reduction in intra-ductal biliary pressures.<sup>10–15</sup> Other biliary tract disorders that may require urgent restoration of antegrade biliary flow include acute biliary pancreatitis and postoperative biliary leaks.

Those presenting to the critical care unit requiring organ support are often elderly with more severe disease and have multiple comorbidities. This is associated with a significant mortality and morbidity, which may be improved with prompt

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emergency treatment.<sup>16</sup> Much of the literature on treating acute biliary sepsis pertains to less severely ill patients, not requiring aggressive physiological support.<sup>17 18</sup> There is a paucity of data on the utility of emergency endoscopic retrograde cholangiopancreatography (ERCP) in this critically unwell group of patients who require organ support including mechanical ventilation, for which we describe our experience of emergency ERCP.

## MATERIALS AND METHODS

This was a retrospective review of 36 procedures in 33 patients. Cases were identified from the endoscopy database (Unisoft gastrointestinal reporting tool; Unisoft Computers Ltd, Enfield, Middlesex, UK) and an electronic database using the operating room management information system (ORMIS; iSOFT, Banbury, Oxfordshire, UK) between November 2008 and November 2011. All procedures were performed using a video duodenoscope (Olympus; Olympus Keymed, Southend-on-sea, Essex, UK) by one of three consultants experienced in hepatobiliary endoscopy under general anaesthesia in the emergency operating theatres with a mobile C-arm for fluoroscopic guidance following appropriate consenting procedures.

Data collected included indications, endoscopic diagnosis, treatment, serum bilirubin levels, length of hospital stay and 30-day mortality.

## RESULTS

### Patient characteristics

During this 3-year period, 2237 ERCP were performed. The 36 procedures in critically unwell patients represent 2% of all ERCP undertaken in this 3-year period.

Six (19%) patients were tertiary referrals, transferred from critical care units from other hospitals in the region. The median age of patients was 79 years (range 42–89 years) with a similar number of male and female patients (17 F:15 M). The American Society of Anesthesiologists (ASA) physical status classification system grade before to the presenting illness in this cohort was ASA I: 6 (16%); ASA II: 15 (42%); ASA III: 15 (42%). Most patients had multiple comorbidities, with up to 22% with significant ischaemic heart disease (table 1).

**Table 1** List of comorbidities

Comorbidity	No. of patients (%)
Ischaemic heart disease	8 (22%)
Chronic lung disease	5 (14%)
Chronic kidney disease	5 (14%)
Cerebrovascular disease	4 (11%)
Diabetes mellitus	4 (11%)
Malignant biliary obstruction	2 (6%)
Chronic liver disease	2 (6%)

The indications that necessitated emergency ERCP included acute cholangitis (28, 78%), acute biliary pancreatitis with cholangitis (5, 14%) and post-operative bile leak (3, 8%). All patients required critical care support due to complications of overwhelming sepsis and systemic inflammatory response syndrome. These included haemodynamic shock, respiratory failure and acute kidney injury (table 2). After assessment by critical care and anaesthesiology specialists, patients were deemed too unstable for ERCP in the endoscopy suite. Therefore all ERCP were performed in emergency operating theatres, with 27 (75%) procedures requiring inotropic support.

### Progress and outcome

Seven procedures (20%) were performed out of hours on a weekend, with the remaining procedures performed outside of planned elective ERCP lists on weekdays. All patients had ERCP within 6–8 h of a decision made for an emergency ERCP. The median time to ERCP after admission to hospital was 1 day (0–18). In the majority (25/33; 75%) of patients ERCP was performed within 24 h of hospital admission. The majority of patients (26/33; 78%) had never had previous ERCP. Biliary cannulation was achieved in all (100%) cases with a pre-cut fistulotomy to aid access in one (3%). ERCP findings included CBD stones in 26/36 (72%), bile leak in three of 36 (8%), CBD stricture in two of 36 (6%), Mirizzi syndrome in one of 36 (3%), blocked plastic stent in one of 36 (3%) and post-sphincterotomy bleed with clot obstruction in one of 36 (3%). Sphincterotomy was performed in 25/36 (69%) procedures. Endoscopic sphincterotomy was not performed in two (5%) cases when required due to coagulopathy or thrombocytopenia. Endoscopic treatment in 23/36 (64%) procedures consisted of a balloon-assisted stone extraction followed by stent insertion, and in 11/36 (30%) procedures balloon extraction alone successfully cleared the ducts. A reduction in bilirubin was observed within 24–48 h following ERCP. The median bilirubin pre and post-ERCP was 104, (9–553 mmol/l) and 29.5 (12–217 mmol/l) ( $p < 0.001$ , Wilcoxon signed rank test), respectively. Survival was 75% at 30 days post-ERCP. Six patients died within 24 h of the ERCP. Mortality was due to a consequence of failure to recover from overwhelming sepsis and multiorgan

**Table 2** Complications of sepsis

Presenting feature/complication	No. of patients (%)
Hypotension (BP <100 mm of Hg systolic)	20 (63%)
Acute kidney injury	14 (44%)
Metabolic acidosis	8 (25%)
Respiratory failure	8 (25%)
BP, blood pressure.	

failure. A subgroup analysis performed to identify specific features that would allow us to predict survival by reviewing the age, comorbidities, time to ERCP after presentation, findings at ERCP, technical success at ERCP and previous attempts at ERCP showed no obvious distinction between patients who died within 24 h and those who survived. Three patients required a repeat emergency ERCP. One patient had a repeat emergency ERCP due to persistence of bile leak in spite of adequate sphincterotomy, and a repeat procedure was performed in which a biliary stent was inserted. There was one procedure-related complication of a post-sphincterotomy bleed with clot occlusion, therefore requiring a further ERCP and application of haemostatic therapy and biliary stent insertion. One patient required a repeat procedure in view of persistence of sepsis after the initial ERCP, when a stent was inserted to decompress the bile duct without a sphincterotomy due to coagulopathy. The median length of hospital stay in patients who survived was 21 days (range 2–49 days).

## DISCUSSION

Acute cholangitis is a common consequence of biliary obstruction and may present with a wide spectrum of symptoms and signs from mild fever to septic shock and multi-organ failure necessitating admission to the critical care unit for organ support. The severity of cholangitis is defined as mild (responsive to antibiotics and supportive therapy), moderate (neither responsive to medical therapy nor associated with organ dysfunction), or severe (associated with at least one sign of organ dysfunction).<sup>19</sup> Approximately 80% of patients respond to antibiotic therapy alone while the remainder require early effective biliary drainage in addition to antibiotics and supportive therapy.<sup>20</sup> The reported mortality varies from 10% to 30%; however, this is in all patients with acute cholangitis including the mild form of cholangitis. The major cause of death is multiple organ failure with irreversible shock, and mortality rates have not significantly improved over the years.<sup>21–25</sup> It is important to note that unless early and appropriate biliary drainage is performed and systemic antibiotics are administered, mortality may be up to 100%.<sup>26</sup> The data on the outcome of emergency ERCP in this cohort of critically ill patients receiving organ support are limited. Available data suggest that mortality is variable between 25% and 55%, despite emergency ERCP.<sup>27–29</sup> The timing of ERCP in these patients would appear to be important to achieve a favourable outcome, but there is no compelling existing data to support emergency ERCP in these patients. The definition of what constitutes an emergency ERCP has not been clearly reported. It could be defined as ERCP in a patient who is critically unwell and is unable to wait due to the severity of the illness until the next available elective ERCP session, assuming that it is within 24 h. It has also been

defined as an ERCP performed within few hours of presentation.<sup>30</sup> The Surviving Sepsis Campaign, however, recommends source control with attention to the balance of risks and benefits of the chosen intervention as soon as the diagnosis of severe sepsis is made to improve the outcome.<sup>31</sup> In our patient cohort we performed ERCP within 6–8 h of diagnosis of severe sepsis due to acute cholangitis not responding to standard therapy, with critical physiological deterioration. Our unit provides four scheduled ERCP lists a week and therefore most patients presenting during weekdays with mild to moderate acute cholangitis not requiring critical care support can undergo an ERCP on lists already in place. These were not considered as emergency ERCP in this study as these patients did not require ventilation or critical care support.

After agreeing to provide a tertiary emergency ERCP service, our endoscopic services underwent major reorganisation with collaboration from our critical care colleagues. A major component of this restructuring was the early involvement of critical care physicians facilitating the transfer of patients both from within the hospital and neighbouring referral hospitals to the critical care unit after assessment. Those who were deemed too unwell to undergo an ERCP in our unit with conscious sedation and monitoring had an ERCP performed in the emergency operating rooms. These facilities have appropriate fluoroscopic equipment with mobile digital C arm and support staff including on-call endoscopy nurses. Although the quality of cholangiogram is inferior to a fixed fluoroscopy unit, the quality was more than adequate for the type of procedure undertaken in these circumstances. All our procedures were performed by consultants who are specialists in hepatobiliary endoscopy. The critical care unit was considered inadequate to perform high quality ERCP because of the limitation of fluoroscopy, patient positioning and radiation risk to others.

The predominant underlying aetiology of severe cholangitis in both our cohort and the available literature is choledocholithiasis. Malignant biliary obstruction was the cause of cholangitis in two patients who both died within 30 days. Both had biliary stents in situ and presented with obstruction, which indicates that severe sepsis in patients with malignant stricture is often a secondary process after previous biliary interventions. In patients who required a repeat ERCP, it could be argued that a biliary stent placement to ensure biliary drainage would have prevented a subsequent repeat procedure. On the other hand, it is equally possible that placing a biliary stent in all patients undergoing emergency ERCP would subject all patients to an unnecessary ERCP at a later date. Therefore, we recommend that this decision should be left at the discretion of the endoscopists who can judge the adequacy of biliary drainage in an individual

case. Regarding the non-survivors, despite prompt and successful biliary decompression the mortality was considerable, with almost all patients dying within 24 h from overwhelming sepsis.

Our overall mortality is lower than 55%, as described by Saleem and colleagues,<sup>28</sup> although in their study there was a failure to achieve biliary cannulation in 18% of cases, which most likely would have caused delay in biliary decompression. Ramirez and colleagues<sup>27</sup> reported a similar mortality rate to ourselves of 25% in 32 critically unwell patients undergoing ERCP in the radiology department. The wide variability of mortality in both papers may reflect a heterogeneity of the patients as the number of ventilated patients was similar (47% vs 60%), but Saleem and colleagues<sup>28</sup> proposed that they had more severely ill patients and ERCP was performed in the intensive care unit where there were no adequate facilities to perform ERCP under fluoroscopy. The critical step to attain biliary drainage at ERCP is achieving deep biliary cannulation, which was 100% in our series. This was attained despite the majority of patients being naive to ERCP. Once biliary cannulation is achieved, biliary drainage can almost always be achieved, which is the primary aim. Stone therapy and duct clearance, although desirable, are of secondary importance in this cohort of critically ill patients.

A measure of successful ERCP in this situation is a drop in bilirubin levels, which has been demonstrated in our study within 24 h in those who survived. Failure to show a decrease in bilirubin levels within 24–48 h may be an early indicator of unsuccessful biliary decompression and correlate with increased mortality.

In the UK, the National Confidential Enquiry into Patient Outcome and Death (NCEPOD), which operates under the umbrella of the National Institute of Health and Clinical Excellence as an independent confidential enquiry and whose main aim is to improve the quality and safety of patient care, published their report on endoscopic services ‘Scoping our practice’. It was reported that many patients undergoing emergency endoscopy are severely ill, elderly and often poorly prepared for an interventional procedure. Furthermore, in 68% of cases the NCEPOD advisors considered the procedure futile.

We demonstrate a high degree of technical success with a good survival rate of 75% at 30 days after emergency ERCP in ventilated, critically ill and often elderly patients. It is likely that mortality would be extremely high and close to 100% in this patient cohort if emergency ERCP had not been carried out. It is difficult to predict in which patient an emergency ERCP would be successful and in which it would be futile. Our data suggest an aggressive approach is justified. Emergency ERCP should therefore not be considered futile. The type of service required to deliver emergency ERCP is not likely to be available in

smaller institutions. This study supports the concept of the concentration of ERCP services into fewer, higher volume units with appropriate critical care involvement facilitating the transfer and support of these patients. We believe that further studies in this area will support our findings and will help make this intervention in appropriate settings a standard practice.

### What is already known on this topic

- ▶ Acute severe cholangitis not responding to standard treatment is a life threatening emergency.
- ▶ Emergency ERCP may be beneficial in critically ill patients with acute severe cholangitis.
- ▶ There is a paucity of data on the utility of emergency ERCP in critically ill patients who require organ support including mechanical ventilation.

### What this study adds

- ▶ Emergency ERCP is feasible, safe and effective in critically ill patients with acute severe cholangitis in appropriate settings.
- ▶ Emergency ERCP is successful and results in a good outcome in this cohort of critically ill patients.
- ▶ Emergency ERCP in this cohort of critically ill patients should not be considered futile.

### How might it impact on clinical practice in the foreseeable future

- ▶ This study supports the concept of concentration of ERCP services into fewer, higher volume units with appropriate critical care involvement facilitating transfer and support of these patients.

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