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Complications of Endoscopic Retrograde Cholangiopancreatography Requiring Surgical Intervention: One-Year Experience in A Tertiary Care Centre

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Abstract **Aim:** To study the complications of endoscopic retrograde cholangiopancreaticography requiring surgical intervention in a tertiary care centre, occurring during a one year period. **Background:** ERCPs are a commonly performed, safe, diagnostic and therapeutic modality routinely used for evaluation of pancreatico-biliary pathologies. Most complications are mild and resolve with conservative medical management. This article focuses on those complications that required emergency surgical intervention, surgical techniques employed, difficulties associated with management and post-operative complications. Materials & Methods: Between March 2012 and February 2013, a total of 710 ERCPs were performed at M.S. Ramaiah Hospital for a variety of indications. All data with respect to procedure were collected – indications, whether ERCP was diagnostic or therapeutic, nature of intervention performed, post-procedural complications, subsequent hospitalisation, length of hospital stay and management of complications, whether medical or surgical. **Results:** Four major complications (0.56%) occurred, requiring surgical intervention – two duodenal perforations, one case of an ERCP basket becoming trapped within the common bile duct and a case of gastric outlet obstruction following pancreatic duct stent migration. The first three complications were noted during the procedure and the last was diagnosed on follow-up one month later. Other complications included 12 cases of moderate to severe pancreatitis (1.69%), 16 cases of cholangitis (2.25%) and 3 cases of haemorrhage (0.42%). **Discussion:** Major complications of ERCP, though rare, cause significant morbidity, and occasionally mortality. This article discusses the risk factors, incidence of major complications and detailed surgical management of these conditions, including technical difficulties associated with these surgeries, post-operative pitfalls and their management. Additionally, our data is compared and contrasted with similar literature.

Keywords: *ERCP perforation, complications, surgery*

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1. Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is one of the most indispensable diagnostic and therapeutic modality in hepatopancreaticobiliary pathologies, and is one of the most commonly performed endoscopic procedures. However it is a technically complex procedure, with a major complication rate of around 10% and a mortality rate of 1-1.5%, even in high-volume centres [1]. Some of the major complications include cholangitis, gastroduodenal perforations, gastrointestinal bleeding, biliary tree and pancreatic duct injury. Depending on the severity, they can be a cause of severe morbidity or even mortality. The management of these complications, whether conservative, endoscopic or surgical, has been a constant source of debate [2]. One of the major factors in determining mortality following these complications is the time-to-diagnosis and initiation of treatment, as even major complications may be clinically in apparent [3].

This study was a prospective study of post-ERCP complications occurring during a one year period, with a special emphasis on those complications requiring surgical management. It also covers various considerations in management, prognostic factors, standard-of-care in these injuries and a review of literature.

2. Aim

To study the complications of endoscopic retrograde cholangiopancreatography (ERCP) occurring in a tertiary care centre during a one year period, with a special emphasis on those requiring surgical intervention.

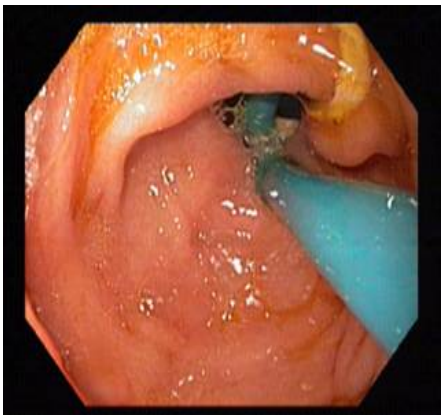
3. Materials and Methods

Between March 2012 and February 2013, a total of 710 ERCPs were performed at M.S. Ramaiah Hospital for a variety of indications. All data with respect to procedure was collected – indications, whether ERCP was diagnostic or therapeutic, nature of intervention performed, post-procedural complications, subsequent hospitalisation, length of hospital stay and management of complications, whether medical or surgical.

3.1. Case 1

A 47 year old female having choledocholithiasis was being subjected to an ERCP procedure, during which cannulation was difficult, and a large duodenal perforation occurred below the sphincter of Oddi. The diagnosis was confirmed by pneumoperitoneum on fluoroscopy and the patient was planned for immediate surgical exploration. Intra-operatively, a 2x3 cm perforation was noted at the D_2-D_3 (second and third part of duodenum) junction. Also found were pneumo-retroperitoneum, an inflamed gall bladder with multiple small (<1 cm) calculi and multiple small calculi in the cystic duct and common bile duct. Open cholecystectomy with common bile duct clearance and repair of the perforation were undertaken after Kocherisation of the duodenum. A feeding jejunostomy was also created distal to the perforation.

The patient had prolonged paralytic ileus (>72 hours) post-operatively – and bilious drain output confirmed a duodenal fistula. Feeding via jejunostomy was started on post-operative day 4. Her daily drain output continued to be bilious; noted to be 50-100 ml per day for the first week. On post-operative day 9 it was noted to be 1 litre overnight. Over the next 5 days, the drain volume fluctuated between 550-1750 ml. Contrast enhanced computerized tomography (CT) of the abdomen and pelvis was done to rule out any intra-abdominal post-operative fluid collection, which was absent. Over the course of the next 4 days, she had three high-grade fever spikes, for which antibiotics were escalated. Additionally, subcutaneous octreotide was started to reduce fistula output**.** Over the next 8 days, drain output reduced to 10-50 ml per day. The drain was removed on post-operative day 31 and discharge was on post-operative day 33. She has been asymptomatic on follow up, one year after discharge.



Picture 1. Endoscopic image depicting the distal end of double J stent in pylorus causing functional gastric outlet obstruction

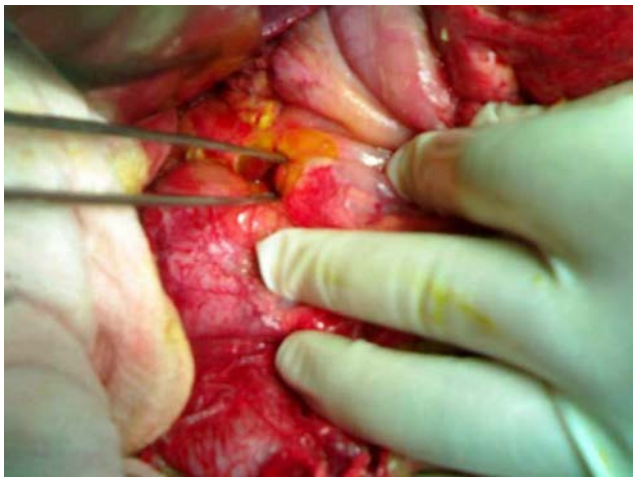
3.2. Case 2

A 75 year old male presenting with obstructive jaundice was diagnosed to have terminal common bile duct obstruction with multiple calculi. Cannulation of the sphincter of Oddi was found to be difficult, and a perforation of the duodenum was suspected. Post procedure, the patient developed gross abdominal distension with extensive surgical emphysema of the chest wall and neck. An immediate contrast enhanced CT scan of the abdomen showed perforation of the D_2 (second part of the duodenum) into the retroperitoneum, with extensive surgical emphysema, pneumomediastinum and bilateral pneumothorax. The patient underwent immediate surgical exploration. Laparotomy showed dense upper abdominal adhesions from a previous surgery, (details were unavailable), perforation of lateral wall of D2 with minimal bile leak, and multiple 1.5-2 cm stones in the common bile duct with the stent in situ. The perforation was repaired and common bile duct clearance was achieved, with placement of a T-tube. A feeding jejunostomy was created.

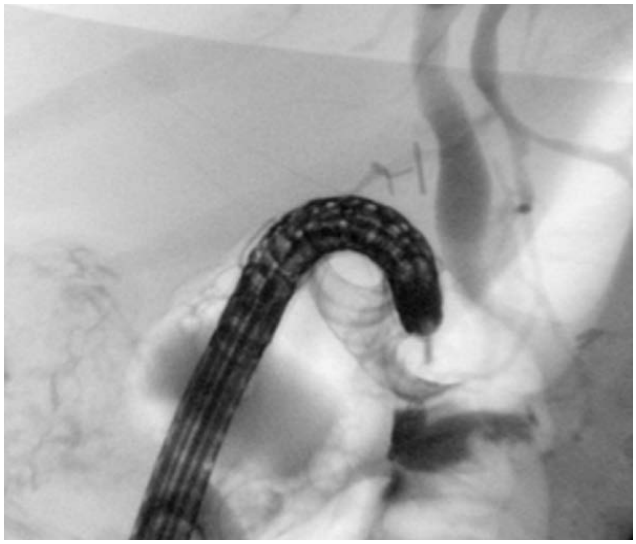
Post-operatively the patient was stable, with T-tube drainage volume ranging 70-300 ml per day on first 3 days. Over next 6 days, T-tube output had a range of 100-600 ml per day. On post-operative day 10, patient had fever spikes and abdominal pain, which on further evaluation revealed elevated white count and a collection in hepatorenal pouch with a right-sided mild pleural effusion. A diagnosis of post-operative pneumonia was made and it was treated aggressively, with escalation of antibiotics, chest physiotherapy and breathing exercises. Over the next week the T-tube output fell to between 50-75 ml per day. On post-operative day 23, patient developed severe abdominal pain after starting full jejunostomy feeds (200 ml second hourly), for which feeds were stopped. However repeat blood parameters and sonology were within normal limits; feeds were gradually restarted and tolerated well. Patient was discharged on post-operative day 37. His last follow up was 6 months after discharge, during which he had no complaints.

3.3. Case 3

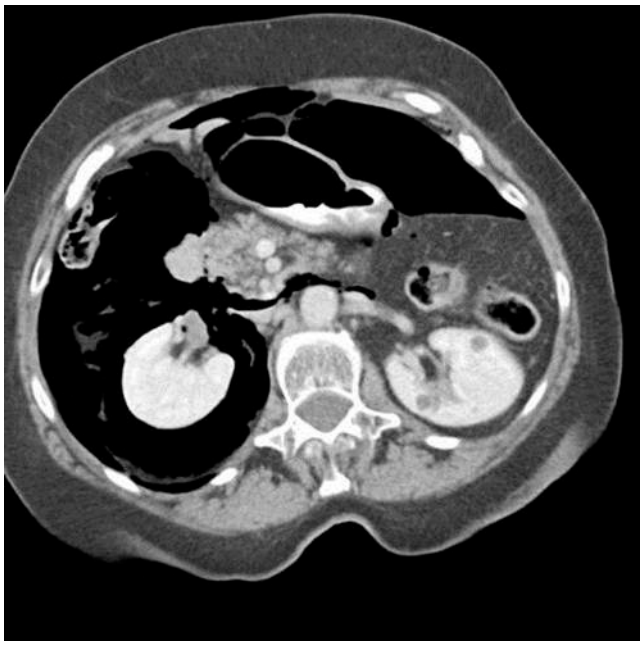
An 88 year old male with right upper abdominal pain on evaluation had cholelithiasis, choledocholithiasis and cholecystitis. He had a history of choledocholithiasis several years ago and had undergone endoscopic stenting of the common bile duct but was lost to follow-up – the stent was never removed. Suspecting early cholangitis he was posted for an ERCP for stent removal. During the procedure the stent was removed and basketing of the stones was attempted, however the basket became entangled and impacted in the common bile duct. In spite of extensive efforts and manipulation, disimpaction could not be achieved. He was posted for immediate surgical exploration. Intra-operatively, a common bile duct stricture with proximal dilatation of the common bile duct (2.5 cm) was noted. Choledochotomy showed a large solitary gallstone of around 2.5 cm and impacted basket, both of which were removed. An open cholecystectomy and a wide end to side choledocho-duodenostomy were performed after excision of the stricture.



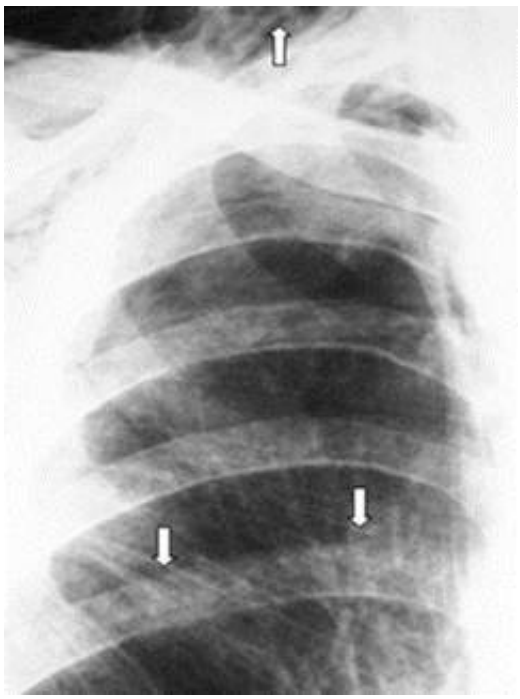
Picture 2. intra-operative image showing large endoscopic duodenal perforation



Picture 3. fluoroscopic image captured during ERCP confirming perforation

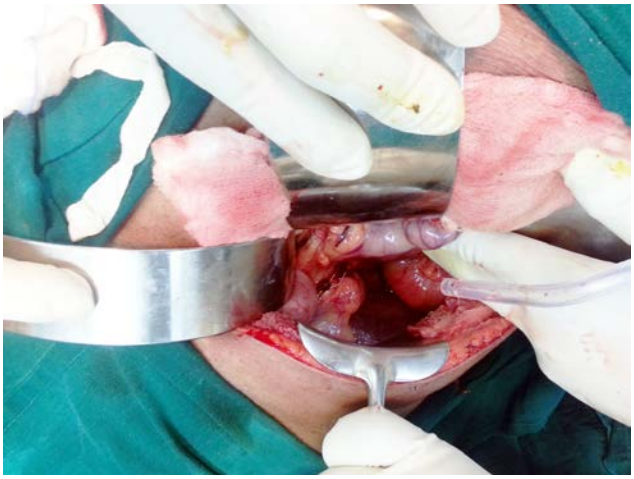


Picture 4. abdominopelvic contrast enhanced CT showing gross pneumoperitoneum and pneumoretroperitoneum following ERCP-induced perforation



Picture 5. chest X-ray showing an unusual sign of severe surgical emphysema: air between the muscle fibres of the right pectoralis major

ERCP 1. image showed impacted guide-wire with basket in situ



ERCP 2. image showing impacted basket in the common bile duct

Post-operatively patient was stable. Drain output was around 100 ml per day for the first 5 post-operative days. On post-operative day 6 the patient was diagnosed to have

left lower lobe pneumonia for which aggressive treatment was initiated. Drain removed on post-operative day 7. Fever spikes continued for the next 5 days, however patient was symptomatically better and oxygen saturation was adequate on minimal oxygen supplementation (2-4 litres per minute). From post-operative day 12, there were no further fever spikes. He was discharged onpost-operative day 18. On follow-up eight months later he was comfortable, without any complaints.

3.4. Case 4

A 33 year old female presented with a pancreatic pseudocyst following trauma. Endoscopic cystogastrostomy was done with a double pigtail stent and pancreatic duct stenting was done through ERCP. The patient was comfortable and discharged two days later.

One month later, she presented with repeated episodes of abdominal pain and non-bilious vomiting. Endoscopy revealed that the distal end of the stent in pylorus which could not be repositioned using only endoscopic foreign body retrieval forceps, hence a laparoscopic gastrotomy and extraction was undertaken and the stent was freed. The gastrotomy was closed using a running intra-corporeal suture with 3/0 vicryl. Post-procedure, she was comfortable and stable, discharged on post-operative day 6. She was symptom-free on follow-up three months later.

4. Results

A total of 710 ERCPs were performed in our institution during the study period of 12 months. Of these, 432 were (60.8%) were for diagnostic purposes, and the remaining 278 (39.2%) were for therapeutic purposes in patients with established diagnoses. The most common interventions were sphincterotomy and stent placement. The incidence of major complications requiring surgical intervention in our study was 4 (0.6%), which is comparable to literature. There were no mortalities. Of the 4 major complications, the 2 perforations had post-operative fistulae that responded to conservative management. The remaining 2 had uneventful post-operative period. Average hospital stay for patients with perforation was 35 days, which was comparable to literature [4].

The incidence of minor complications was also comparable to the rates in literature – pancreatitis occurred in 12 (1.69%), cholangitis occurred in 16 (2.25%), gastrointestinal hemorrhage 3(0.42%) and paralytic ileus in 8 (1.1%). Those with no complications underwent ERCP as a day-care procedure, not requiring admission (or additional hospital stay if the patient was already admitted), but those with minor complications, as mentioned above, had an average hospital stay of 4 days.

5. Discussion

ERCP perforations, with an incidence of 0.3-1.3% [3], although rare, are serious and potentially lethal (16-18%) [5]. Although many classifications exist, a simple and reliable classification from a diagnostic and therapeutic point of view was proposed by Howard [6], who divided ERCP perforations into guide-wire perforations, peri-ampullary perforations and duodenal perforations. These injuries offer unique surgical challenges, as they may a combination of these. Additionally, duodenal perforations are common in the D_2 segment are often retroperitoneal, requiring kocherisation [7]. Major injuries to the common bile duct and the pancreatic duct may also require biliary-enteric or pancreato-enteric anastomoses.

Guide-wire perforations are often very small and respond well to conservative management by keeping the patient nil per oral, administering antibiotics and symptomatic treatment. Any clinical deterioration, however, necessitates operative management [8]. Peri-ampullary perforations can also be considered for a trial of conservative management in the absence of features of peritonitis or clinical instability. In addition to keeping the patient nil per oral, a biliary stent or naso-biliary drainage is advisable, with antibiotics and symptomatic treatment. If contrast enhanced CT shows retroperitoneal fluid or the patient shows clinical deterioration, operative management is required [9]. Duodenal perforations always require operative management – conservation should be considered only in very poor surgical candidates and even then, only in the absence of peritoneal signs, when the patient is stable [10].

One of the major determinants in outcomes following ERCP is the timing and effectiveness of intervention. Studies showed that mortality in perforations initially treated with surgery the mortality of 5-10% rose to 50% when surgery followed a failure of conservative management [11]. This is most likely due to the high mortality resulting from systemic inflammatory response syndrome and subsequent multiple organ dysfunction syndromes following peritonitis. Hence, early diagnosis of complications is paramount importance. Post ERCP abdominal pain should not be ignored and warrants investigation in the form of contrast enhanced CT- it has a pick-up rate of up to 29% for asymptomatic complications, making it an important diagnostic tool [12]. Intra- or retroperitoneal contrast extravasation is an indication for operative management, but retroperitoneal free air without contrast extravasation can be considered for a trial of conservative management [13]. Interestingly, the presence of massive subcutaneous emphysema following endoscopy at duodenal diverticula also requires surgery [14], which may represent a clinically significant retroperitoneal perforation unlikely to heal with conservative management.

Gastrointestinal haemorrhage is another potentially major complication, having an incidence of around 1-2%, 50% of which are associated with sphincterotomy. Mortality is around 1%, and the risk is higher in portal hypertension and cirrhosis [15]. Haemorrhage very rarely requires surgical intervention and can be classified into mild, moderate and severe, depending on transfusion requirements [16].

6. Conclusion

Although major complication rate in ERCP is low, in major complications the most important prognostic factor is the timing of intervention. Having considered this, it is important that the threshold for investigating potential complications should be low and CT is the investigation of choice. Management plan for these patients should be

tailor-made for each individual, and conservative management should not be taken lightly – delay in operating on patients with failed conservative management may result in a steep increase in mortality.

In our experience, although guidelines are varied, the role of biliary drainage, especially in the form of T-tube placement is controversial and should be decided by the surgeon. Although post-operative morbidity and hospital stay following duodenal perforation is significant, majority of cases do not need re-exploration except in exceptional cases. Also, in elderly patients with significant co-morbidities, aggressive management of associated post-operative complications, like pneumonia, is crucial to prevent additional morbidity and possibly mortality.

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