

Original Article



Endoscopic Retrograde Cholangiopancreatography in Bangladeshi Children: Experiences and Challenges in a Developing Country

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ABSTRACT


Purpose: Although endoscopic retrograde cholangiopancreatography (ERCP) has been used for more than five decades, its applicability in Bangladeshi children has recently become more common. Therefore, this manuscript aims to describe our experience in performing ERCPs in Bangladeshi children with hepatopancreaticobiliary diseases, focusing on presenting diseases, as well as the diagnostic and therapeutic efficacy.

Methods: Between 2018 and 2021, 20 children underwent 30 ERCP procedures at the Bangladesh Specialized Hospital, Dhaka. A single trained adult gastroenterologist performed all procedures using a therapeutic video duodenoscope. The indications for ERCP, diagnostic findings, therapeutic procedures, and complications were documented.


Results: The median age of the study patients was 10 years (range, 1.7–15 years). Successful cannulation of the papilla was achieved in 28 procedures and failed in 2 cases. Repeated ERCP was required in seven patients. Nine patients had biliary indications and 11 had pancreatic indications. Choledocholithiasis was the most common indication for ERCP in patients with biliary disease, while chronic pancreatitis was common among patients with pancreatic indications. Pancreatic divisum was observed in only one patient. Pancreatic and biliary sphincterotomy was performed in 14 and 9 cases, respectively. A single pigtail or straight therapeutic stent was inserted in seven cases and removed in five cases. Stone extraction was performed in six procedures, and balloon dilatation was performed in five procedures. The post-procedural period for these patients was uneventful.

Conclusion: We found that ERCP is a practical and successful therapeutic intervention for treating hepatopancreaticobiliary disorders in children when performed by experienced endoscopists.

Keywords: Endoscopic retrograde cholangiopancreatography; Sphincterotomy; Dilatation

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Conflict of Interest

The authors have no financial conflicts of interest.

INTRODUCTION

In 1968, McCune et al. [1] performed the first endoscopic pancreatography as a diagnostic tool, which was the precursor of modern-day endoscopic retrograde cholangiopancreatography (ERCP). Since then, it has been used as an essential tool in diagnosing and treating biliary and pancreatic disorders. Although its applicability in pediatric patients was recorded as early as in 1976 [2], this procedure has only become more common in recent years.

Pancreaticobiliary disorders are being diagnosed with increasing frequency in children [3,4], possibly owing to the rise in predisposing risk factors for hepatopancreaticobiliary (HPB) disease and improvements in the sensitivity and availability of diagnostic tools to detect these conditions [5]. However, ERCP in children is still relatively rarely performed due to a lack of awareness of the indications or limited local availability of advanced endoscopists who can perform these procedures [6].

Furthermore, there is no unified algorithm for ERCP in children; guidelines for adults are being used in this population. Nevertheless, indications and clinical requirements often differ between children and adults. Therefore, we need to focus on establishing specific indications, procedure preparation, equipment usage, and technical and clinical requirements for ERCP in children.

Although ERCP may be associated with adverse events—such as acute pancreatitis—the frequency of these events depends on the indication for the procedure, the patient's comorbidities, and the endoscopist's experience. Some case series have reported much higher rates (up to 33%) of these adverse events in the pediatric population [5].

Therefore, we describe our 3-year experience in performing 30 ERCPs in 20 Bangladeshi children with HPB disease, focusing on the presenting diseases, diagnostic and therapeutic efficacy, and safety.

MATERIALS AND METHODS

Between September 2018 and October 2021, 20 children underwent 30 ERCP procedures at the Bangladesh Specialized Hospital, Dhaka. Only three procedures were performed under general anesthesia (GA). The remaining 27 procedures were performed using a combination of injectable midazolam and propofol as the sedative. A dose of 0.05–0.1 mg/kg of midazolam was applied intravenously 5 minutes preoperatively, with a maximum dose of 5 mg. A loading dose of 1–1.5 mg/kg of propofol was applied intravenously, with doses of 0.25–0.5 mg/kg at 3–5-minute intervals. Sedation was maintained for 90–120 minutes on average, and endoscope insertion was performed for 60–80 minutes. All the patients underwent GA or deep sedation under the supervision of an anesthesiologist, and constant cardiovascular and respiratory monitoring was performed.

Before performing ERCP, a probable diagnosis was made in all cases using imaging studies such as ultrasonography and magnetic resonance cholangiopancreatography (MRCP). The patients were kept nil by mouth for 8 hours preoperatively. Prophylactic antibiotics were administered before the procedure, and an indomethacin suppository was administered

immediately before the procedure. A single trained adult gastroenterologist performed all procedures, and a pediatric gastroenterologist assisted in some recent procedures. All procedures were performed using an adult-type therapeutic video duodenoscope (TJF-Q180V; Olympus Medical Systems). Sphincterotomy was performed using either a triple-lumen sphincterotome (5.5F) or a triple-lumen needle knife (5.5F; Boston Scientific).

The patients were actively monitored for 24 hours postoperatively. Abdominal radiography was usually performed the day after the procedure. Serum lipase was measured if the patient complained of abdominal pain. We started oral feeding the morning after the procedure if the abdominal radiograph was normal, the abdomen was soft, and there was no complaint of abdominal pain.

The indications for ERCPs included biliary disease, pancreatic disease, and recurrent abdominal pain. Successful ERCP was defined as cannulation of the bile or pancreatic duct (PD) and completion of any planned diagnostic study or therapeutic procedure. We documented the basic patient characteristics, types of sedation and medication used, indications for ERCP, success of the procedure, diagnostic findings, therapeutic procedures, and complications. Informed written consent was obtained from the parents of all patients. The hospital management requested to review the personally identifiable information presented in this study. Therefore, the authors submitted the protocol, and the internal review board exempted this study (reference no. 2018/05/002).

RESULTS

During this 3-year period, our team performed 30 procedures on 20 children with a median age of 10 years (range, 1.7–15 years). Among these children, 13 (65.0%) were male and 7 (35.0%) were female. Successful cannulation of the papilla was achieved in 28 procedures (93.3%). Two successive attempts within a fortnight for a 10-year-old female patient with chronic pancreatitis (CP) failed. Repeated ERCP was required in seven patients; four and three patients required ERCP to be performed twice and thrice, respectively. Nine (45.0%) patients had biliary indications and 11 (55.0%) had pancreatic indications.

Among the 28 successful procedures, 3 were performed for diagnostic purposes and 25 were performed for therapeutic purposes.

Cholelithiasis was the most common indication for ERCP in the patients with biliary disease (**Table 1**). The clinical manifestations in most of these patients were abdominal pain and obstructive jaundice. One of our study patients presented with a choledochal cyst (CC); this patient was suspected to have cholelithiasis. **Table 2** shows the diagnostic findings of the nine patients with biliary indications. Of these nine patients, bile duct stones and common bile duct (CBD) dilatation were observed in six patients each. A 3.5-year-old female child presented with abdominal pain and a benign biliary stricture with multiple liver abscesses.

Among the 11 patients with pancreatic indications, the most common indication was CP, which was observed in 7 patients. There were two cases of acute recurrent pancreatitis and two cases of chronic calcific pancreatitis. Although there are no symptomatic differences between chronic calcific and CP, we mentioned chronic calcific pancreatitis separately due

Table 1. Indications and final diagnoses of the study patients (20 children)

Indication and diagnosis	Patient (n=20)	Procedure (n=30)
Indication (according to patients' presentation)		
Severe abdominal pain*	6 (30.0)	8 (26.7)
Chronic pancreatitis	5 (25.0)	9 (30.0)
Choledocholithiasis	4 (20.0)	4 (13.3)
Acute recurrent pancreatitis	2 (10.0)	6 (20.0)
Obstructive jaundice	2 (10.0)	2 (6.7)
Choledocholithiasis with choledochal cyst	1 (5.0)	1 (3.3)
Diagnosis (after further evaluation)		
Chronic pancreatitis	7 (35.0)	12 (40.0)
Choledocholithiasis	4 (20.0)	4 (13.3)
Acute recurrent pancreatitis	2 (10.0)	6 (20.0)
Chronic calcific pancreatitis	2 (10.0)	3 (10.0)
Choledocholithiasis with choledochal cyst	2 (10.0)	2 (6.7)
Choledochal cyst with cholangitis	1 (5.0)	1 (3.3)
Cholelithiasis	1 (5.0)	1 (3.3)
Biliary stricture	1 (5.0)	1 (3.3)

Values are presented as number (%).

*Patients with severe abdominal pain were diagnosed with chronic pancreatitis, chronic calcific pancreatitis, choledocholithiasis with choledochal cyst, and biliary stricture.

Table 2. Diagnostic findings in nine patients with biliary indications

Diagnosis (n) (n=9)	ERCP findings			
	Bile duct stone	CBD dilatation	CBD stricture	Stone in gall bladder
Choledocholithiasis (4)	4	3		
Choledocholithiasis with choledochal cyst (2)	2	2		
Choledochal cyst with cholangitis (1)		1		
Cholelithiasis (1)				1
Biliary stricture (1)			1	

ERCP: endoscopic retrograde cholangiopancreatography, CBD: common bile duct.

Table 3. Diagnostic findings in 11 patients with pancreatic indications

Diagnosis (n) (n=11)	ERCP findings					
	PD dila-tation	PD stenosis	Pancreati-colith	Pancreatic divisum	Irregular*	Failure
Chronic pancreatitis (7)	4	1	2		4	1
Acute recurrent pancreatitis (2)	2			1	2	
Chronic calcific pancreatitis (2)	2	1	1			

ERCP: endoscopic retrograde cholangiopancreatography, PD: pancreatic duct.

*Irregular contour of the pancreatic duct due to stricture or dilatation.

to its rarity in children. **Table 3** shows the diagnostic findings of 11 patients with pancreatic indications. The most common finding in ERCP in these patients was PD dilatation and irregularities. We observed pancreaticoliths in two patients. Pancreatic divisum was observed in only one patient. All the patients presented with recurrent abdominal pain.

Of the 30 ERCP procedures, pancreatic sphincterotomy was performed in 14 (46.7%) cases using a standard wire-guided sphincterotome (**Table 4**). Access was obtained via the major papilla in all cases except in the patient with pancreatic divisum. Biliary sphincterotomy was performed in 9 (30.0%) cases (**Table 4**). A single pigtail or straight therapeutic stent (e.g., 5Fr×12 cm single pigtail plastic stent, 5Fr×7 cm Geenen stent, 10Fr×7 cm plastic biliary stent) was inserted in seven (23.3%) cases and removed in five (16.7%) cases. Therapeutic stents are typically left in place for 3–6 months. Stone extraction was performed in six (20.0%) procedures. Balloon dilatation was performed in 5 (16.7%) procedures using 8-mm hurricane balloon dilators. We used a needle papillotome for all procedures.

Table 4. Therapeutic intervention during 30 endoscopic retrograde cholangiopancreatography procedures

Type of endoscopic therapy	Procedure (n=30)
Biliary sphincterotomy	9 (30.0)
Pancreatic sphincterotomy	14 (46.7)*
Stone extraction	6 (20.0)
Stent insertion	7 (23.3)
Stent removal	5 (16.7)
Balloon dilatation	5 (16.7)

Values are presented as number (%).

*Repeated pancreatic sphincterotomy was required in three patients.

ERCP failed twice in a 10-year-old female patient within a fortnight. No main PD (MPD) opening was seen in the main papilla, nor could it be cannulated through the accessory papilla. The lower end of the CBD was narrowed, and the rest of the CBD, common hepatic duct, and intrahepatic ducts were mildly dilated. Further extension of papillotomy was performed using a conventional papillotome.

We found a single case of pancreatic divisum in a 4-year-old female. The MPD in this patient was irregular, narrow in the head region, and dilated in the tail region. In this case, papillotomy of the minor papilla was performed using a needle papillotome, but the guidewire could not be passed into the MPD.

Complications such as acute pancreatitis, infection, hemorrhage, and perforation were observed in our study patients. However, no significant complications occurred, and the post-procedural period was uneventful.

DISCUSSION

ERCP has become a new diagnostic and therapeutic modality for children with pancreaticobiliary disease [7,8]. Therapeutic ERCP can significantly impact the management of children with a range of HPB conditions by offering a minimally invasive alternative to surgical treatment [5].

Most studies similar to ours have been performed on Western children, with only a few focusing on Asian children. The most common indications for ERCP among Western children are choledocholithiasis and pancreatitis [7,8]. However, these indications differ in Asian countries. In pediatric patients in India and Japan, the most common indication was a CC [9,10]. Choledocholithiasis was the main indication in Saudi Arabian children [11]. Similar to Indian and Japanese children, a CC was the most common indication in Korean children [12]. In this study, CP was observed as the most frequent indication for ERCP.

In our study, choledocholithiasis was the most frequent biliary indication for ERCP. These patients underwent endoscopic sphincterotomy and stone removal with balloon extraction. Jang et al. [12] found similar results in their study population of Korean children. ERCP is considered the treatment of choice in children with CBD stones [11]. In our study, we found that six out of nine patients with biliary indications had CBD stones.

The most common pancreatic indication in our study was CP, which was observed in seven patients who underwent 12 ERCPs, with multiple ERCPs in four patients. This observation resembles the findings of the study by Jang et al. [12]. Dilated PD and irregular PD were

commonly observed findings among our patients with pancreatic disorders. We found only one case of pancreatic divisum.

The diagnostic value of ERCP has significantly decreased with the development of MRCP [13,14]. It has replaced ERCP in assessing CCs, recurrent pancreatitis, primary sclerosing cholangitis, and biliary stenosis [15,16]. Currently, ERCP is mainly restricted to therapeutic procedures. This observation was reflected in both our study and the work of Asenov et al. [17], in which a purely diagnostic procedure was not performed after 1999.

In this study, we used only adult-type duodenoscopes to perform all ERCPs. We planned to procure and use pediatric-type duodenoscopes, but could not afford them due to the low incidence of these cases. We also used the Triple Lumen Needle Knife with utmost care, and we discouraged the use of this by beginners. Our interventional gastroenterologist was highly skilled and performed over 12,000 ERCPs during his career.

Pediatric gastroenterology departments often do not have sufficient experience with this demanding procedure. It has been suggested that a minimum of 200 ERCPs are necessary to achieve competency and, subsequently, more than 50 cases per year are necessary to maintain this competency [18,19]. Earlier literature data on pediatric ERCP mainly comprise case series performed by experienced adult endoscopists [17]. In our country, only a few centers are equipped with the necessary setup and instrumentation to perform ERCP, and adult endoscopists solely perform these procedures. There are only two tertiary-level institutes for endoscopy and colonoscopy in their pediatric gastroenterology departments, with limited setups. Furthermore, pediatric gastroenterology is an emerging subject in our country, with only a few fellows.

We faced several challenges during the different phases of this study. Considerable challenges during the preprocedural period included lack of awareness and patient motivation toward ERCP due to its high expense. During the interprocedural period, we had to use adult instruments and therefore faced patient body size and instrument mismatch. In addition, maintaining sedation during the procedure was critical; however, all patients experienced rapid recovery without any adverse effects of sedation. After the procedure, we observed that many patients did not undergo long-term follow-up. The higher expenditure of these procedures also impacted the lack of follow-up on these patients. We believe that this behavior is also typical in other developing countries. We have observed that the main difference between developed and developing countries is the lack of well-equipped pediatric setups and personnel. Furthermore, developed countries have better awareness of ERCP and better referral systems than developing countries.

In our experience, the primary advantage of ERCP is successful avoidance of surgery. Furthermore, the exact anatomical features can be well-observed during these procedures, when a diagnostic dilemma is present; therefore, it was possible to efficiently formulate a further treatment plan. The major disadvantage of ERCP performed by adult endoscopists is that these individuals are not always well-educated about HPB diseases in the pediatric population. Ensuring the presence of a pediatric gastroenterologist during the procedures may increase the success rate of ERCP in children.

The notable limitations of this study included its small sample size and absence of a control group. Since these conditions are rare in the pediatric population and there is a lack of comprehensive expertise in pediatric ERCP, it is difficult to conduct a case-control study.

ERCP is a practical and successful therapeutic intervention for treating pediatric HPB disorders when performed by experienced endoscopists. Although there are controversies regarding the proper indications for ERCP, its importance is undeniable. Therefore, further large-scale studies are required to develop evidence-based guidelines for ERCP in children.

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