

## Endoscopic Retrograde Cholangiopancreatography in Children: A Single-center Experience From Northern India

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**Objective:** To evaluate spectrum, efficacy and safety of Endoscopic retrograde cholangiopancreatography (ERCP) in pediatric population. **Methods:** Retrospective case record review of pediatric patients (age  $\leq 15$  y) undergoing ERCP between January 2011 to June 2015 at a tertiary care referral hospital in New Delhi, India. The Indications for ERCP, cannulation success rate, procedure success rate and complications were recorded. **Results:** The mean (SD) age of the participants were 11.5 (3) years. 164 ERCP procedures were done in 126 patients (67 males). All procedures were done under conscious sedation. The common indications for ERCP were choledocholithiasis (50, 30.5%), chronic calcific pancreatitis (38, 23.2%), main pancreatic duct injury with leak (21, 12.8%), and bile leak (12, 7.3%). The cannulation success rate was 90.4% (114 out of 126), while procedural success rate was 86% (141 out of 164). Overall 8 complications were encountered; all were successfully managed conservatively. **Conclusions:** ERCP in children can be successfully performed at centers with such expertise.

**Keywords:** Choledocholithiasis, Diagnosis, Endoscopy, Management.

Therapeutic endoscopic retrograde cholangiopancreatography (ERCP) is an important modality for managing biliopancreatic diseases in adults. After the first report of ERCP in a child in 1976, it has been used extensively in the pediatric population over the time establishing its role; with efficacy and safety comparable to adults [1-7]. However, most studies in pediatric patients are from the developed countries with limited reports from low- and middle-income countries [8-11]. We aimed to share our experience of ERCP in pediatric patients with emphasis on spectrum of diseases, efficacy and safety.

### METHODS

Data for this retrospective study was collected from records of patients undergoing ERCP at GB Pant Hospital, New Delhi from January 2011 to June 2015. Patients from pediatric age group (age  $\leq 15$  years) were included. The following data were reviewed and analyzed: indications of ERCP, sedation used, successful cannulation of desired duct, ERCP findings, therapeutic interventions performed, technical success, complications and follow up if available. The ERCP related complications were defined as per American Society for Gastrointestinal Endoscopy definitions [12]. Bile leaks were classified into low grade (leak identified only after opacification of intrahepatic duct system) and high grade (leak observed before opacification of intrahepatic duct system) [13]. Patients

with incomplete data were excluded from the study. Informed consent was waived by the institutional ethical committee as the data were retrospective.

All the ERCP procedures were performed by adult gastroenterologists using Olympus adult duodenoscope. A combination of intravenous midazolam and propofol/ketamine in appropriate dosage was used for sedation [14]. Statistical analysis was done with SPSS version 19.0.

### RESULTS

A total of 11,179 ERCP procedures were performed during study period; of these, 170 were performed in children. Complete data were available for 164 procedures. These 164 procedures were done in 126 children (67 boys) with mean (SD) age of 11.5 (3) years (range 1-15 years). Thirteen children were aged below 5 years. Thirty-eight (23%) were repeat procedures. Only seven ERCPs were diagnostic, while 157 (95.7%) were therapeutic. Indications of ERCP were: choledo-cholithiasis (50, 30.5%), chronic calcific pancreatitis (CCP) (38, 23-2%), pancreatic duct disruption (21, 12.8%), choledochal cyst with cystolithiasis (CDC) (12, 7.3%), bile leak (12, 7.3%) and biliary ascariasis (7, 4.3%) (Table I). Successful cannulation of the naïve duct was achieved in 90.4% (114 out of 126) patients (biliary 93%, pancreatic 85%) and procedure was completed in 86% (141 out of 164). Biliary interventions done were: sphincterotomy in 70, stone extraction in 22, stenting in 30

**TABLE I** INDICATIONS FOR ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY IN CHILDREN  $\leq 15$  YEARS ( $N=126$ )

Indication	Number of procedures/patients
<i>Biliary Indications</i>	
Choledocholithiasis	50/37
Choledochal cyst/Cystolithiasis	12/8
Biliary leak	12/9
Ascariasis	7/7
Benign biliary stricture	5/5
Hydatid cyst with biliary communication	3/3
Portal biliopathy	2/2
Liver abscess with biliary communication	1/1
Pancreatic tumour/Biliary obstruction	1/1
Choledochal cyst (diagnostic)	3/3
Periapillary carcinoma (diagnostic)	1/1
Primary sclerosing cholangitis (diagnostic)	1/1
<i>Pancreatic Indications</i>	
Chronic pancreatitis	38/24
Pancreatic leak	21/17
Pseudocyst	3/3
Recurrent acute pancreatitis	2/2
Pancreatic divisum	2/2

and removal of ascaris in 3 procedures. Of 37 children with choledocholithiasis, 18 had calculus, and in 15 calculi were extracted. Calculus extraction was also done in 7 children with CDC. In nine children with suspected biliary leak, seven had leaks (4 minor, 3 major, 6 post-cholecystectomy leak, 3 post-traumatic). Biliary sphincterotomy was performed in all nine patients with stent being placed in three patients. In seven children with suspected biliary ascariasis, ascaris was seen and removed in three children. In benign biliary stricture, all patients were stented (4 post cholecystectomy, 1 tubercular). Patient with tuberculosis had periportal necrotic lymph nodes causing compression at lower end, probably eroding into it. After ERCP, jaundice improved; complete improvement was noted with antitubercular therapy, and stent was removed later. In three children with hydatid cyst, no communication could be seen. Two patients with portal biliopathy, one patient with pancreatic malignancy and one patient having liver abscess with biliary communication (**Fig. 1**) also underwent biliary stenting.

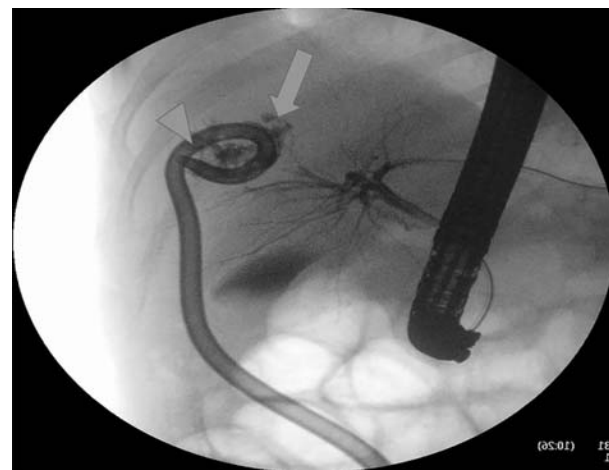
Sixty-six procedures were performed on 48 children with pancreatic disease. The interventions done were sphincterotomy in 46, duct stenting in 20, and stone removal in nine children. Twenty-four cases with CCP underwent endotherapy for pain. Major pancreatic duct dilatation was seen in 18, whereas stricture and ductal calculi were each seen in ten each. Stricture dilatation was

done in eight patients, followed by stenting. Thirteen patients had pain improvement at three months, but long-term follow-up of these patients was not available. Pancreatic duct leak was documented in 17 children with duct disruption; sphincterotomy was done in all with stenting in 10 children. Post-traumatic leak was most common etiology (13), followed by acute pancreatitis (2); one each had CCP and post-surgical duct leak. Three children underwent transpapillary drainage for pancreatic pseudocyst. In two children with pancreatic divisum, minor duct sphincterotomy was done, while two children having recurrent acute pancreatitis underwent ERCP for diagnostic purpose.

Twelve patients had cannulation failure [mean (SD) age: 11 (2) years]. Five of these had chronic pancreatitis, four had choledocholithiasis, two had pancreatic duct leak while one had biliary leak. Repeat procedure was attempted in ten patients and was successful in nine of them. Two failures were sedation related, and repeat procedure was successful. Eight (4.8%) children developed complications following the ERCP procedure: mild pancreatitis (2), retroperitoneal duodenal perforation (2), sphincterotomy-related bleed (2) and hypoxia (2). All were managed conservatively, and there was no mortality.

## DISCUSSION

ERCP is still underutilized in pediatric patients, especially in low- and middle-income countries. In 164 ERCP procedures in 126 patients, we observed good observed cannulation success (90.4%) and procedure completion rate (86%). The most common indication for the ERCP procedure was choledocholithiasis, followed by chronic pancreatitis. Complications occurred in very few patients, and all of them were successfully managed conservatively.



**Fig. 1** Cholangiogram showing liver abscess with drain in situ (arrowhead) with biliary communication (arrow).

#### WHAT THIS STUDY ADDS?

- Pediatric ERCP is safe and efficacious with acceptable adverse event rate.
- Conscious sedation seems to be effective and safe in children during ERCP procedure.

The main limitations of this study is retrospective nature of data. Long-term follow-up is not available, which is especially more relevant to endotherapy in chronic pancreatitis. Moreover, risk factors for complications could not be studied due to small number.

Only few studies have been published from India till date on pediatric ERCP, two of these studies were primarily diagnostic. Sharma, *et al.* [8] studied 8 patients with CDC preoperatively (all diagnostic), while Poddar, *et al.* [9] reported a series in which 84% procedures were diagnostic. Two recently published studies from India, which report therapeutic ERCPs, focused mainly on pancreatic disorders [10,11]. Majority of the procedures were done for pain in CCP. In comparison, the present study described the whole pediatric ERCP spectrum. Present study had choledocholithiasis in biliary group while CCP in pancreatic group as the most common indication for ERCP, which is comparable with recent reports [3,7]. This study also had cannulation success rate of 90% which is slightly less compared to 95% from published studies, but complication rate in present study was also less compared to these studies (4.8% vs 7.7%) [4,6]. We used conscious sedation in all compared to the practice in Western countries where majority use general anesthesia [9].

In conclusion, our study suggests that ERCP is safe and effective in pediatric population. Also, conscious sedation may be safely used in pediatric population.

*Contributors:* ASD: designed the study, acquired, analyzed and interpreted the data. He also drafted manuscript and revised it critically for intellectual content; ASP: substantial contribution to design of work and interpretation of data. He was also involved in drafting of work as well as its revision regarding intellectual content; SS: contributed to design of study and interpreted data. He revised the draft critically for its intellectual content; AK: contributed to acquisition, analysis and interpretation of data. He contributed to manuscript drafting as well as critically revising it. All authors approved the final version of manuscript, and agree to be accountable for its accuracy and integrity.

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