Endoscopic Retrograde Cholangiopancreatography: A therapeutic modality in children and adolescents

Muhammed Ali Taj,[1] Aftab Leghari,[2] Sajida Qureshi,[3] Shahriyar Ghazanfar,[4]
Saad Khalid Niaz,[5] Muhammed Saeed Quraishy[6]
Department of Medicine, Indus Hospital,[1] Department of Surgery, Dow University of Health Sciences, Civil Hospital,[2-4,6]
Department of Gastroenterology, Civil Hospital,[5] Karachi.

Abstract

Objective: To evaluate the indications, clinical features, complications, and effect on patient management of Endoscopic retrograde cholangiopancreatography (ERCP) in paediatric patients of varying age.

Methods: A prospective, descriptive cross sectional study was conducted at the endoscopy suite, Surgical Unit 4, Civil Hospital Karachi; from January 2007 to August 2010. All ERCPs performed during a 3-year period in patients aged 18 years or less were prospectively analyzed. Success was defined as having authentic diagnostic information or a successful endoscopic therapy.

Results: A total of 40 children and adolescents (18 Males, 22 Females; mean age 13.6±3.37 years, range 3 to 18 years) underwent 52 ERCP procedures. Indications were biliary pathology in 21, and pancreatic pathology in 19. The ERCP findings were choledocholithiasis in 12 patients, choledochal cysts in 5, chronic pancreatitis in 8, pancreatic pseudocyst in 5, recurrent pancreatitis in 5, biliary ascariasis in 2, pancreatic divisum in 1, postoperative bile leak in 1, and benign biliary stricture in 1. ERCP was successful in 51 of 52 procedures. Single procedure was performed in 36 patients, where as two patients required 2 procedures and it was repeated 4 and 6 times in the remaining two patients. Endoscopic therapy was performed in 92% of the procedures. The complication rate was 1.9% (1/52 procedures) which included mild pancreatitis, whereas asymptomatic hyperamylasaemia was seen in 11% (6/52 procedures). No mortality related to ERCP occurred. ERCP affected management in 94% (49/52 patients).

Conclusion: ERCP is an effectual and safe therapeutic procedure in children and adolescents of different ages with a variety of pancreatobiliary disorders.

Keywords: ERCP, Paediatrics, Pancreatitis, Pancreaticobiliary disease (JPMA 62: 98; 2012).

Introduction

Since the advent of Endoscopic retrograde cholangiopancreatography (ERCP) in adults in 1968 and in children in 1976, it has become a benchmark therapeutic modality in pancreaticobiliary disorders both in adults as well as in children.[1] Initially it was restricted to the few centers in the west, now it has become more pervasive all over the world. Its standard use in children, however, has been limited by technical difficulties, low incidence of pancreaticobiliary disease, and lack of knowledge of ERCP by paediatric surgeons and paediatricians.[2] However, in a country like Pakistan, its use is further hampered by the low rate of clinical suspicion, dearth of expertise in this technique, and fear of complications. Through the years, the use of ERCP has changed from a mainly diagnostic tool to a procedure with a diverse range of therapeutic interventions.[3-5] To date and to the best of our knowledge, there is not a single report of diagnostic or therapeutic paediatric ERCP from Pakistan. This study was undertaken with an aim to describe our experience of ERCP in paediatric population in relation to its safety and success rate. Further evaluation was done for indications, clinical features, complications, and effect on patient management.

Patients and Methods

This prospective cross sectional study was conducted at the Endoscopic suite of Surgical Unit IV, Civil Hospital, Karachi. All the children referred to the unit for ERCP due to various biliopancreatic problems between January 2007 to August 2010, were included. All procedures were performed by an expert endoscopist, performing ERCPs for the last 20 years. Informed consent was obtained from the parents of the children. Most of the procedures were performed under propofol, while general anaesthesia and conscious sedation was used in the remaining patients, all under the supervision of a senior anaesthetist. Antibiotic

prophylaxis with an intravenous cephalosporin was prerequisite for the procedure. ERCP was performed by employing the standard technique, using adult therapeutic duodenoscope (TJF 180: Olympus America Inc.). The ionic contrast medium Urograffin (A mixture of salts of diatrizoic acid) was used to opacify the bile and the pancreatic duct. All patients were kept under observation in the ward for minimum of 4 hours. In case of an immediate complication, patients were admitted to the ward, under the care of a gastroenterologist or consultant surgeon. Complications were diagnosed and their severity graded according to the Cottons classification.[6]

Indications, findings, therapies, safety, technical success, effect on management and complications were assessed. Indications were classified into 2 broad categories: biliary and pancreatic pathology.

Technical success of the procedure[7,8] was defined as achieving the diagnostic information or succeeding with endoscopic therapy. The endoscopic and fluoroscopic findings, the therapeutic measures performed, and complications were recorded for each patient. ERCP was defined as directly affecting the patient management if a) therapeutic endoscopic intervention was performed based on diagnostic ERCP findings; b) ERCP led to the initiation of medical treatment or provided a diagnosis that allowed the patient to avoid potential surgery/invasive therapy; c) ERCP diagnosis led directly to surgery and aided in the planning of surgical intervention.

Statistical analysis included descriptive statistics and frequency analysis. Data was analyzed using SPSS version 15 (SPSS Inc., Chicago, IL, USA).

Results

A total of 40 children and adolescents (18 males, 22 females; mean age 13.6±3.37 years, range 3 to 18 years; median age 15 years) underwent 52 ERCP procedures. Three (5.7%) ERCPs were performed under general anaesthesia. Forty nine (94.2%) were performed under sedation using variable doses of intravenous nalbuphine and/or midazolam for conscious sedation, or propofol for deep sedation. Indications were biliary pathology in 21 (52.5%), and pancreatic pathology in 19 (47.5%). Clinical presentations varied, with biliary colic, nausea and vomiting, and jaundice being most common (Table). The ERCP findings were choledocholithiasis in 12 (30%) patients, choledochal cysts in 5 (12.5%), chronic pancreatitis in 8 (20%), pancreatic pseudocyst in 5 (12.5%), recurrent pancreatitis in 5 (12.5%), biliary ascariasis in 2 (5%), pancreatic divisum in 1 (2.5%), postoperative bile leak in 1 (2.5%), and benign biliary stricture in 1 (2.5%) patient. Single procedure was performed in 36 patients, whereas two patients required 2 procedures and it was repeated 4 and 6 times in the remaining two patients. ERCP was successful in 51 of 52 (98%) procedures. Endoscopic therapy was performed in 92% of the procedures. Some patients had different interventions during one procedure which included biliary sphincterotomy in 19 (36%) patients, pancreatic sphincterotomy in 14 (26.4%), pancreatic stenting in 9 (16.9%), CBD stent exchange in 6 (11.3%), precut sphincterotomy in 5 (9.4%), cystogastrostomy in 4 (7.5%), pancreatic stent removal in 3 (5%), CBD stent insertion in 3 (5.6%), balloon sphincteroplasty in 2 (3.7%), and minor papilla sphincterotomy in 1 (1.8%) patient. The success rate of ERCP in our study was 98% (51/52 procedures). The complication rate was 1.9% (1 of 52 procedures) for all ERCPs performed and 2.5% (1 of 40) per patient who underwent ERCP. One patient had a mild post-ERCP pancreatitis. Asymptomatic hyperamylasemia occurred in 11.5% (6 of 52 cases). There was no procedure-related mortality in our patients. ERCP affected management in 94% (49/52 procedures).

Table: Patient's characteristics.

Characteristics	Value
Total patients (n)	40
Male/Female (Ratio)	18 / 22 (0.8:1)
Age range (mean) years.	3-18 years (13.6 ± 3.7) years
Presentation (n)	
Biliary Colic	30
Nausea and Vomiting	25
Jaundice	24
Right upper quadrant tenderness	20
Generalised abdominal pain	5
Abdominal mass	4

In this series 12 patients were suspected of having choledocholithiasis on the basis of radiologic imaging studies, including ultrasound, laboratory results, or clinical information. ERCP was normal in one and five had a dilated CBD and gallstones and showed signs of recent stone passage (red, inflamed, oedematous papilla). Six patients had dilated CBD with stones which were removed. Biliary sphincterotomy was done in nine cases while two patients had biliary sphincteroplasty in addition.

Of the five patients with choledochal cyst (CC), also known as congenital biliary dilatation, two patients had type Ia while three patients had type Ib CC. Three of these patients also had CBD stones, biliary sphincterotomy was

done and stones were extracted. One patient had a stricture at common hepatic duct along with CC; requiring CBD stenting. All patients with CC were referred for definitive surgery.

Two patients had biliary ascariasis, diagnosed on ultrasound. In one patient live worm was extracted, following biliary sphincterotomy while the other patient just had a dilated CBD with no worm, for which sphincterotomy was done.One patient had presented with biliary injury after laparoscopic cholecystectomy. Type A biliary injury was confirmed by ERCP and sphincterotomy was performed.

One patient had a benign biliary stricture, for which he underwent six ERCP procedures over the study period. Biliary sphincterotomy with stent insertion was performed initially, and five consecutive stent exchanges.

The most common pancreatic indication was chronic pancreatitis, observed in eight patients. Other pancreatic indications included acute recurrent pancreatitis (5 patients), pancreatic mass (5 patients), and pancreatic divisum (1 patient). In patients with chronic pancreatitis all had a dilated pancreatic duct with pancreatic strictures seen in two patients, pancreatic sphincterotomy was done in all and pancreatic stenting performed in five.

Of the five patients with acute recurrent pancreatitis, pancreatic sphincterotomy was done in all and pancreatic stenting in three with dilated pancreatic duct.

Five patients had pancreatic pseudocyst, successful cystogastrostomy was done in four along with pancreatic sphincterotomy in three. One patient out of these had a normal ERCP.

One patient had divisum with recurrent pancreatitis and underwent endoscopic minor papilla sphincterotomy with stenting.

Discussion

ERCP has become a contemporary therapeutic modality in children with pancreaticobiliary disorders. ERCP is done with the same technique as in adults, and is not a difficult task altogether in experienced hands.[9-11] Although our number of patients was low as compared to the recent studies, but the therapeutic procedures performed were significantly high. More than two thirds of the (48/52) paediatric patients in this study underwent therapeutic interventions, with a technical success rate of 98% (51 of 52procedures). All the procedures were performed with a standard adult therapeutic doudenoscope. Even in the youngest child, a three year old boy, same doudenoscope was used to perform a successful therapeutic procedure, emphasizing that there is no need for a special paediatric endoscope except in patients younger than 12 months of age.[10] The rate of successful cannulation of the desired duct in children is as good as in adults.[12] ERCP success rates in children are reported to be between 89.5%[13] and 100%,[14] results that are comparable to ours. No difference has been described between procedures performed in older or younger children. In our study most of the procedures were performed under deep sedation, using propofol or short acting opiods and specific narcotic and benzodiazepine medications, an alternative to general anaesthesia.[15] General anaesthesia was still used for patients under twelve years of age, assuring an anticipated intolerance and the higher complexity of the procedure in patients with a smaller anatomy.

In our study, the most common indication was choledocholithiasis, as compared to the other indications in different Asian countries. For example, the most common indication in Japan, Korea and India was CC;[16,17] where as the most frequent indication in Saudi Arabia was also choledocholithiasis.[18] The indications for ERCP in Western children are mostly choledocholithiasis and pancreatitis.[4,8] Such patients were treated by endoscopic sphincterotomy, balloon sphincteroplasty and stone removal with basket/balloon. ERCP is considered the procedure of choice in children with CBD stones.[18] All the patients with gallstones or sludge subsequently underwent laparoscopic cholecystectomy.

Choledochal cyst (CC) was the second most frequent biliary indication for ERCP in our study population. Most patients (75%) with CC are diagnosed during the first decade of life, with only 20% remaining undiagnosed until adulthood.[19] ERCP can provide adequate visualization of the biliary tree, which is necessary before the operation. In our series, five (12.5%) patients were found to have choledochal cysts, all these patients were referred for surgery.

In the present study, ERCP was helpful in deciding the management in all eight (20%) cases of chronic pancreatitis. It also provided a roadmap for surgical approach. Our endoscopic therapy rate was comparable to the other series.[7,8]

The results of the present study reinforce the conclusions of the prior studies; ERCP has great influence on the care and management of the paediatric patients with pancreatobiliary disorders. In 85% of the cases, ERCP directly affected patient management which is comparable with that of other series.[2]

Conclusion

ERCP has proven to be a safe procedure for children of all age groups. In our study, the complication rate was 1.9%.

Limitation

The sample size calculation was a limitation of the study. The results have been presented of the data collected over three years. Due to non-availability of national data, accurate sample size could not be determined. Previously published international studies on the subject were consulted and the sample size of 40 was calculated. This study was considered as a hypothesis generating study.

References

1. Waye JD. Endoscopic retrograde cholangiopancreatography in the infant. Am J Gastroenterol 1976; 65: 461-3.
2. Hsu RK, Draganov P, Leung JW, Tarnasky PR, Yu AS, Hawes RH, et al. Therapeutic ERCP in the management of pancreatitis in children. Gastrointest Endosc 2000; 51: 396-400.
3. Varadarajulu S, Wilcox CM, Hawes RH, Cotton PB. Technical outcomes and complications of ERCP in children. Gastrointest Endosc 2004; 60: 367-71.
4. Cheng CL, Fogel EL, Sherman S, McHenry L, Watkins JL, Croffie JM, et al. Diagnostic and therapeutic endoscopic retrograde cholangiopancreatography in children: a large series report. J Pediatr Gastroenterol Nutr 2005; 41: 445-53.
5. Rocca R, Castellino F, Daperno M, Masoero G, Sostegni R, Ercole E, et al. Therapeutic ERCP in paediatric patients. Dig Liver Dis 2005; 37: 357-62.
6. Cotton PB. Outcomes of endoscopy procedures: struggling towards definitions. Gastrointest Endosc 1994; 40: 514-8.
7. Vegting IL, Tabbers MM, Taminiau JA, Aronson DC, Benninga MA, Rauws EA. Is Endoscopic retrograde Cholangiography valuable and safe in children? J Pediatr Gastroenterol Nutr 2009; 48: 66-71.
8. Pfau PR, Chelimsky GG, Kinnard MF, Sivak MV Jr, Wong RC, Isenberg GA, et al. Endoscopic retrograde cholangiopancreatography in children and adolescents. J Pediatr Gastroenterol Nutr 2002; 35: 619-23.
9. Dua K, Miranda A, Santharam R, Ramanujam S, Werlin S. ERCP in the evaluation of abdominal pain in children. Gastrointest Endosc 2008; 68: 1081-5.
10. Jang JY, Yoon CH, Kim KM. Endoscopic retrograde cholagiopancreatograptic in pancreatic and biliary tract disease in Korean children. World J Gastroenterol 2010; 16: 490-5.
11. Paris C, Bejjani J, Beaunoyer M, Ouimet A. Endoscopic retrograde cholagiopancreatography is useful and safe in children. J Pediatr Surg 2010; 45: 938-42.
12. Guelrud M, Mujica C, Jaen D, Plaz J, Arias J. The role of ERCP in the diagnosis and treatment of idiopathic recurrent pancreatitis in children and adolescents. Gastroint Endosc 1994; 40: 428-36.
13. Green JA, Scheeres DE, Conrad HA, Cloney DL, Schlatter MG. Paediatric ERCP in a multidisciplinary community setting: experience with a fellowship trained general surgeon. Surg Endosc 2007; 21: 187-92.
14. Kramer RE, Azuaje RE, Martinez JM, Dunkin BJ. The double - wire technique as an aid to selective cannulation of the common bile duct during padiatric Endoscopic retrograde cholagiopancreatography. J pediatr Gastroenterol Nutr 2007; 45: 438-42.
15. Green SM, Klooster M, Harris T, Lynch EL, Rothrock SG. Ketamine sedation for paediatric gastroenterology procedures. J Pediatr Gastroenterol Nutr 2001; 32: 26-33.
16. Poddar U, Thapa BR, Bhasin DK, Prasad A, Nagi B, Singh K. Endoscopic retrograde cholangiopancreatography in the management of pancreaticobiliary disorders in children. J Gastroenterol Hepatol 2001; 16: 927-31.
17. Teng R, Yokohata K, Utsunomiya N, Takahata S, Nabae T, Tanaka M. Endoscopic retrograde cholangiopancreatography in infants and children. J Gastroenterol 2000; 35: 39-19.
18. Issa H, Al-Haddad A, Al-Salem AH. Diagnostic and therapeutic ERCP in the paediatric age group. Pediatr Surg Int 2007; 23: 111-6.
19. Singham J, Schaeffer D, Yoshida E, Scudamore C. Choledochal cyst: analysis of disease pattern and optimal treatment in adults and paediatric patients. HPB 2007; 9: 383-7.
20. Rocca R, Castellino F, Daperno M, Masoero G, Sostegni R, Ercole E. Therapeutic ERCP in paediatric patients. Dig Liver Dis 2005; 37: 357-62.
21. Freeman ML. Adverse outcomes of ERCP. Gastrointest Endosc 2002; 56 (Suppl): S273-83.