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ORIGINAL ARTICLE

Endoscopic Retrograde Cholangiopancreatography in Patients with Choledochal Cyst, A Tertiary Care Experience

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ABSTRACT

Objective: Our aim of this analysis was to evaluate the clinical features, laboratory values, radiological findings, endoscopic management, and technical success in patients with Choledochal cyst (CC).

Materials & Methods: This retrospective study was carried out at our Endoscopy suite, between January 2010 to January 2022. All patients of choledochal cyst who underwent ERCPs in last 12 years were analyzed. Technical success was defined as achieving a biliary cannulation and successfully acquiring the desired goal. Descriptive and Frequency analysis were incorporated in Statistical analysis with SPSS.

Results: Procedures performed in 100 patients with suspected choledochal cyst either for a diagnostic or therapeutic purpose were evaluated. 48 ERCPs (48%) were performed for therapeutic purpose and 52 (52%) for diagnostic purpose. Diagnostic findings after successful ERCP were CC in 67 (67%), CC with stone in 28 (28%), CC with cholangiocarcinoma in four (4%) and CC with biliary stricture in one (1%). No mortality was documented in our patients who underwent Procedure. Patients referred for surgery were 92 (92%) and ERCP affected management in 100% (100/100 procedures).

Practical Implications: This study will determine the clinical features, laboratory values, radiological findings, endoscopic management, and technical success in patients with Choledochal cyst.

Conclusion: ERCP is a contemporary procedure, its utility in cases with CCs in a developing country with scarce resources and limited availability of gold standard modality (MRCP), is astounding and safe.

Keywords: Endoscopic retrograde cholangiopancreatography; Choledochal cyst; Classification; Endoscopic management.

INTRODUCTION

Choledochal cysts (CCs) are defined as cystic dilatation of different parts of bile duct and can be either intrahepatic or extra-hepatic or both. They account for about 1% of all benign biliary tract diseases and are most common in Asian population [1,2]. Their exact pathogenesis remains unclear ; however an abnormal pancreaticobiliary union (APBDU) and subsequent biliary contents reflux of into the biliary tree is observed to play a role[3]. The initial classification of CC was modified by Todani and colleagues in 1977[4,5]. They classified choledochal cyst in to five basic types[6].

Abdominal pain, jaundice and a palpable mass in right upper quadrant is the classic symptom triad but the majority of patients present with complications[7,8]. Bile stasis causes a variety of complications in patients with choledochal cyst including cholangitis, pancreatitis, stone formation, portal hypertension, liver fibrosis, secondary liver cirrhosis and spontaneous cyst perforation[8]. There is an association of choledochal cyst with malignancy. It is a premalignant condition in which cancer develops 10–15 years earlier than in the general population[9,10].

Choledochal Cyst should be diagnosed early and managed appropriately as mortality and morbidity associated with CC increases as the age of the patient increases. Ultrasonography, computed tomography, endoscopic retrograde cholangiopancreatography, and magnetic resonance cholangiopancreatography are all important in the diagnosis of CC. There have been technological advances in noninvasive cross-sectional imaging modalities during the last four decades, including the development of magnetic resonance cholangiopancreatography (MRCP)[11]. MRCP is not readily available in this part of the world and there are cost issues. Although ERCP is invasive, it is still the most precise diagnostic method for CCs. ERCP completely delineates biliary anatomy, assisting in the detection of an aberrant pancreaticobiliary duct junction or CBD filling abnormalities, which can range from simple stones to malignancies[12,13].

Our purpose of this research was to evaluate the clinical features, laboratory values, radiological findings, endoscopic management and technical success in CC patients.

METHODS

This study was carried out at our Department of Gastroenterology; between January 2010 to January 2022. Medical data of patients procedure done was assessed and analyzed retrospectively. For the purpose of this evaluation, demographic and clinical records were assessed including age, sex, medications used, signs and symptoms, co-morbid conditions, previous surgery, laboratory tests and imaging modalities used, indications for ERCP, complications, cannulation attempts, cannulation time, total procedure time, mode of therapy and referrals to surgical team. All the procedures were performed by a team of expert endoscopists, performing ERCPs for the last many years. Consent was taken from all patients and it was a part. Approval was taken from the institutional review board of DUHS. Procedures were performed under conscious sedation by a combination of nalbuphine (Agorid; Standpharm) and midazolam (Dormicum; Roche), all under the supervision of a senior anesthesia nurse. Deep sedation with propofol (Diprivan; AstraZeneca) by anesthesia specialist was used in selected cases, at the discretion of the endoscopy specialist. Cephalosporin was used as a pre requisite antibiotic prophylaxis during the procedure which was continued in an oral form of the same group for 5 days. 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 pancreatic duct. Pulse oximeter was used to monitor oxygen saturation continuously during the procedure. In cases of an overactive duodenum, we also administered intravenous atropine 0.5 mg as required in increments, not to exceed a total of 3 mg or 0.04 mg/kg. A triple-lumen sphincterotome (CleverCut3™; Olympus Medical) was used, which allows the injection of contrast without removing the wire. A wire-guided cannulation technique (WGC) was used in all, with an intention to reduce the rate of complication notably post-ERCP pancreatitis (PEP). We attempted biliary cannulation with the sphincterotome for a maximum of eight times or no more than ten minutes, if unable to cannulate, we shifted to the other alternative cannulation techniques (needle knife sphincterotomy). Sphincterotomy and stent was placed, if required and bile duct stones were removed with the help of Dormia basket

and/or balloon catheters; all at the discretion of the endoscopist. If there was a suspicion of a tumor or mass biopsy specimens were taken. Technical success was defined as achieving a biliary cannulation and successfully acquiring the desired goal. Procedural complications were identified and their severity graded according to the Cottons classification[14]. CCs were classified according to the Todani et al[5] and type VI by Maheshwari[15]. Serum amylase and lipase were checked when clinically indicated.

Statistical analysis included descriptive statistics and frequency analysis. Data was analyzed using SPSS version 17 (SPSS Inc., Chicago, IL, USA).

RESULTS

From January 2010 to January 2022, procedures performed in 100 patients with suspected choledochal cyst either for a diagnostic or therapeutic purpose were evaluated. There were 33 (33%) men and 67 (67%) women with a mean age of 34.4 ± 1.75, range of 4 years to 65 years and a median of 34 years. 48 ERCPs (48%) were performed for therapeutic purpose and 52 (52%) for diagnostic purpose. Clinical features were abdominal pain in 76 (76%), jaundice in 20 (20%), nausea in 20 (20%), fever in 11 (11%), vomiting in 7 (7%) and abdominal mass in 1 (1%). Laboratory investigations were; median alanine aminotransferase (ALT) of 24 U/L, median serum alkaline phosphatase of 455 U/L, median bilirubin of 4 mg/dl and a median leukocyte count of 7,000/mm^3. Tran-sabdominal ultrasound was abnormal in 100 (100%) and computed tomography (CT) scan was performed in 59 (59%) patients and was abnormal in all. Magnetic resonance cholangiopancreatography (MRCP) was performed in only seven (7%) patients. Main indications for ERCP were deranged liver function tests with dilated common bile duct (CBD) (LFTs) in 68 (68%), suspected choledocholithiasis with dilated CBD in 28 (28%) and suspectd mass with dilated CBD in4 (4%). Technical success was achieved in all the cases (100%); first procedure success rate was 97% in 97 patients, with a repeat procedure and success in the remaining 3 (3%). Successful cannulation of the native papilla was achieved in first attempt in 97 (97%), second attempt in 2 (2%) and third attempt in 1 (1%). Total number of ERCPs performed in all the patients were 117; three (3%) had four, six (6%) had three, three (3%) had two and 81 (81%) had one. Median time from referral time to ERCP was 11 days with a range of 4 to 32 days. Biliary access was achieved after mean attempts of 3.34 (range: 1-8); mean time of successful cannulation was 4.8 min (range: 1 min to 12 min) and median total time of a single procedure was 11 min with a range of 7 min to 25 min. Techniques used to cannulate the desired duct were sphincterotome in 91 (91%), sphincterotome with guidewire impacted first in 6 (6%) and needle knife pre-cut sphincterotomy in 3 (3%). Assumed factors related to a difficult cannulation were small ampulla in twelve (12 %), unstable position in 8 (8%), long and floppy ampulla in 6 (6%); cannulation was effortless and straightforward in 74(74%). Type and associated features of choledochal cysts on imaging techniques are shown in table 1. Diagnostic findings after successful ERCP were CC in 67 (67%), CC with stone in 28 (28%), CC with cholangiocarcinoma in 4 (4%) and CC with biliary stricture in 1 (1%). Total number of therapeutic interventions performed in all the patients were 110; endoscopic biliary sphincterotomy in 32 (29%), CBD balloon traction in 31 (28.1%), biliary stent placement in 19 (17.2%), biliary stent exchange in 11 (10%), biliary balloon sphincteroplasty in 7 (6.3%), endoscopically guided biopsy in 4 (3.6%), basket stone extraction in 3 (2.7%) and needle knife pre-cut sphincterotomy in three (2.7%). Varying sizes of 30 single plastic biliary stents in different sessions were placed in 19 (20.4%) patients; 10F 10-cm in fifteen (50%), 10F 9-cm in six (20%), 10F 7-cm in three (10%) and 10F 12-cm in six (20%). PEP occurred in two (2%) patients; both the patients had mild PEP with an asymptomatic recovery. Immediate bleeding after sphincterotomy was noted in 3 (3%) patients which was stopped with balloon-tamponade by using standard occlusion balloons and spraying with adrenaline (epinephrine) (1/10000), followed by injection of adrenaline (epinephrine) into the papilla between 10 and 12 o'clock. One (1%) patient was admitted with delayed bleed, he was discharged with a smooth recovery after being monitored for 72hrs. There was no procedure-related mortality in our patients. Patients referred for surgery were 89 (89%) and ERCP affected management in 100% (100/100 procedures).

Table 1:

	Types of choledochal cysts n/100	Frequency
1	IA 57	61.2%
2	IC 22	23.7%
3	III 3	3.2%
4	IVA 9	9.7%
5	IVB 1	1.1%
6	VI 1	3.2%
7	APBDJU* 12	12.9%

Table 1

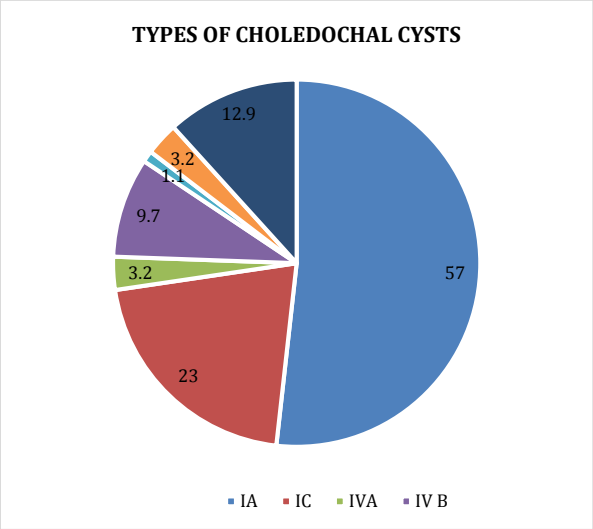

Figure 1:

Table 2: ERCP

Indications	Findings	Frequency
Diagnostic 52	● CC in 67 (67%), ● CC with stone in 28 (28%), ● CC with cholangiocarcinoma in 4 (4%) ● CC with biliary stricture in 1 (1%).	
Therapeutic 48	● endoscopic biliary sphincterotomy in 32 (29%), ● CBD balloon traction in 31 (28.1%), ● biliary stent placement in 19 (17.2%), ● biliary stent exchange in 11 (10%), ● biliary balloon sphincteroplasty in 7 (6.3%), ● endoscopically guided biopsy in 4 (3.6%), ● basket stone extraction in 3 (2.7%) ● needle knife pre-cut sphincterotomy in three (2.7%).	

DISCUSSION

Endoscopic retrograde cholangiopancreatography (ERCP) is a dynamic procedure, with an evolution from a diagnostic to a leading-edge therapeutic procedure for a variety of pancreatobiliary disorders. CC are uncommon congenital defects of the bile ducts; abnormal and disproportionate cystic dilatation of the bile ducts are the hallmarks. The incidence of CC is lower in

western population but higher in the Asian population with two third cases are reported from Japan and the reason is still unknown[16]. Type I are the most common with a distribution of 50% -80%, type II are 2 %, type III are 1.4%-4.5%, type IV are 15%-35% and type V are 20 %[17]. In our series, most common presentation was of type I CC and one patient had a rare type VI CC.

In 1959, Alonso-Lej and colleagues devised the initial classification system for CC, which included three types of CC[4]. In 1977, Todani and colleagues expanded this classification system, which is most commonly used by clinicians[5]. Another classification based on the cyst's relation to the ampulla of Vater and the pancreatic duct was coined by Sarris and colleagues; they subdivided CC into five types. Another entity of CC described by Lilly and colleagues[18] was "form fruste" CCs with a spectrum of clinical features including abdominal pain, obstructive jaundice and abnormal pancreaticobiliary duct junction (APBDJU) but with normal bile ducts. There are few case reports where different type of cysts can be combined together in one patient as described by Kaneyama[19]. Visser and colleagues recently proposed a new classification system, grouping together different diseases, marking different causes, natural courses, surgically viable options and ensued complications[20,21]. We used Todani classification system[5] in our series for type I to type V CC and Maheshwari[15] for type VI CC.

The etiology of CCs is still not known and many notions have been proposed, among them a much acclaimed one is the Babbitt's theory[22]. According to this theory an abnormal pancreaticobiliary duct junction (APBDJ) is identified as etiological factor contributing in development of choledochal cyst. This results in mixing of the pancreatic and biliary juice activating the pancreatic enzymes causing inflammation and degradation of the biliary duct wall, leading to ductal expansion[22]. There are other theories with lesser impact, Davenport and Basu[23] proposed that CCs are purely congenital anomalies and Ohkawa and colleagues suggested deficiency of elastin is the major factor behind the etiology[24]. Variety of developmental anomalies can occur with CCs[17]. We did not encounter any of the above mentioned anomalies in our series.

CCs are considered to be a premalignant condition; there is predisposition for an early cancer, manifesting 10–15 years earlier[25]. An estimated 10%-15% overall risk of cancer has been reported in patients with CC and this risk as well as histopathological dysplasia enhances as the patients age increases[26,27]. Spectrum of cancers found in patients with CC and adenocarcinoma is the most common with a percentage of 73%–84%[28]. The extrahepatic bile duct was the most common site in 50%–62%, followed by gallbladder in 38%–46%, intrahepatic bile ducts in 2.5%, and liver and pancreas in 0.7% each[29]. In our series, 4% of the patients presented with carcinoma and surgical referral was deferred in all of them.

Timeline of clinical presentation is diverse and can occur at any time but in the majority of patients occurs earlier, coinciding with our series. Abdominal pain, jaundice and a palpable abdominal mass is the most common clinical triad with which the patient presents but occurs in less than 20% of patients[30]. Spectrum of diversifying complications occurs due to bile stasis leading to recurrent super infection, inflammation and stone formation in patients with CC[30]. Ultrasonography is generally the first modality used for the diagnosis of CCs due to noninvasiveness, easy availability and economic viability, with a sensitivity of 71%–97% and is best for follow-up surveillance[31]. In our series, it was abnormal in all the cases. Hepatobiliary iminodiacetic acid (HIDA) scans can be used but is limited by its decreased ability to visualize the intrahepatic ducts, its sensitivity is variable i.e. 100% for type I but only 67% for type IV cysts[31]. HIDA scan was not done in any of our patients. Computed tomography (CT) scans have many advantages as it shows complete biliary system, surrounding structures are well delineated with a good depiction of malignancy[32]. Magnetic resonance imaging (MRI) and MRCP, being noninvasive is the gold standard modality for CC. MRI has some limitations as its sensitivity and specificity decreases in the presence of intraductal air, blood, debris, stones or protein plugs, which leads to the interference with signal intensity and modifies visualization. Situation is quite different in this part of the world as MRI is not readily available and is expensive, only seven patients in our series were able to perform it. In patients with CCs, MRI has some disadvantages: intraductal air, blood, debris, stones or protein plugs, can interfere with the signal and alter visualization[32]. In spite of all these limitations the sensitivity of MRI is above 90%. In post-operative anastomosis the sensitivity of MRI is only 84% and for pancreaticobiliary junction abnormalities decreases to as low as 46%–60%[32].

Current treatment of CCs is essentially surgery. Historically, cystenterestomy was considered the method of choice but due to increased incidence of malignancy (30%) in the remnant tissue, the procedure has been abandoned[33]. Complete removal of the cyst and biliary diversion is the modality of choice either through hepaticodoudenostomy, , or hepaticojejunostomy[33]. ERCP has been invasive but it is still the most precise diagnostic modality for CCs. ERCP completely delineates biliary anatomy preoperatively, helps in revealing an abnormal pancreaticobiliary duct junction or filling defects in the CBD, which can be from simple stones to cancers[33]. The sensitivity of ERCP decreases in cases of recurrent inflammation and scarring where the procedure becomes difficult[34]. Being an invasive procedure, ERCP has been associated with an increase in the rate of cholangitis and post-ERCP pancreatitis[34]. Despite some of these drawbacks we performed ERCP because our surgeons required a precise knowledge of the pancreaticobiliary ductal systems along with that most of our patients are from lower socioeconomic class and MRCP is not conveniently available as well as the imaging modality is expensive. In comparison, ERCP is easily available, technicians are skilled and endoscopists are expert at our institution as well as it is superior to MRCP in delineating minor ductal anomalies of the pancreaticobiliary ductal systems. We performed ERCP-guided interventions in complicated CCs, where required, all at the discretion of the endoscopist. Jang et al. [3] (27) has concluded an effective role of ERCP in complicated cases of CCs prior to surgery and inferred that preoperative ERCP provide surgeons a more precise anatomical knowledge of the pancreaticobiliary ductal system thus making situation easier during total surgical excision of the CC. We had three patients of choledochocele (type III CC) endoscopic sphincterotomy was performed in all the patients. Endoscopic sphincterotomy is the prime treatment for choledochoceles, it allows the drainage of bile and stones, even if the patients are asymptomatic, and some authors recommend prophylactic endoscopic sphincterotomy[36]. Complication rate in our patients was low, two patients had mild PEP and four had a bleeding episode with an uneventful recovery.

CONCLUSION

ERCP is a contemporary procedure, its utility in cases with CCs in a developing country with scarce resources and limited availability of gold standard modality (MRCP), is astounding and safe. Its role in delineating the pancreaticobiliary junction anatomy and associated obstructive pathologies is considerable and is of great help in planning the surgery.

Conflict of Interest: No conflict of interest

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REFERRENCES

1. Ndoye NA, Wellé IB, Cissé L, Guèye D, Diouf C, Mbaye PA, Lo FB, Seck NF, Sagna A, Ndour O, Ngom G. Choledochal cyst in children in dakar: Diagnostic and therapeutic aspects. Afr J Paediatr Surg. 2021 Jul-Sep;18(3):168-170. doi: 10.4103/ajps.AJPS_4_20. PMID: 34341203; PMCID: PMC8362915.
2. Jabłońska B. Biliary cysts: etiology, diagnosis and management. World J Gastroenterol. 2012 Sep 21;18(35):4801-10. doi: 10.3748/wjg.v18.i35.4801. PMID: 23002354; PMCID: PMC3447264.

3. ASoares KC, Goldstein SD, Ghaseb MA, Kamel I, Hackam DJ, Pawlik TM. Pediatric choledochal cysts: diagnosis and current management. Pediatr Surg Int. 2017 Jun;33(6):637-650. doi: 10.1007/s00383-017-4083-6. Epub 2017 Mar 31. PMID: 28364277.
4. da Fonseca-Neto OC, de Albuquerque-Neto MC, de Miranda AL. Surgical management of cystic dilatation bile ducts in adults. Arq Bras Cir Dig. 2015; 28(1):17-9.
5. Todani T, Watanabe Y, Narusue M, Tabuchi K, Okajima K. Congenital bile duct cysts: Classification, operative procedures, and review of thirty-seven cases including cancer arising from choledochal cyst. Am J Surg. 1977 Aug; 134(2):263-9.
6. Khandelwal C, Anand U, Kumar B, Priyadarshi RN. Diagnosis and management of choledochal cysts. Indian J Surg. 2012 Feb; 74(1):29-34.
7. COh C, Cheun JH, Kim HY. Clinical comparison between the presence and absence of protein plugs in pediatric choledochal cysts: experience in 390 patients over 30 years in a single center. Ann Surg Treat Res. 2021 Nov;101(5):306-313. doi: 10.4174/astr.2021.101.5.306. Epub 2021 Oct 29. PMID: 34796147; PMCID: PMC8564075.
8. Soares KC, Arnaoutakis DJ, Kamel I, et al. Choledochal cysts: presentation, clinical differentiation, and management. J Am Coll Surg. 2014 Dec; 219(6):1167-80.
9. F Drabek J, Keil R, Stovicek J, Lochmannova J, Hlava S, Snajdauf J, Rygl M, Nevoral J. The role of endoscopic retrograde cholangiopancreatography in choledochal cysts and/or abnormal pancreatobiliary junction in children. Prz Gastroenterol. 2017;12(4):303-309. doi: 10.5114/pg.2017.72107. Epub 2017 Dec 14. PMID: 29359001; PMCID: PMC5771456.
10. Ronnekleiv-Kelly SM, Soares KC, Ejaz A, Pawlik TM. Management of choledochal cysts. Curr Opin Gastroenterol. 2016 May; 32(3):225-31.
11. G Keil R, Drábek J, Lochmannová J, Šťovíček J, Koptová P, Wasserbauer M, Frýbová B, Šnajdauf J, Matouš J, Kotalová R, Rygl M, Hlava Š. ERCP in infants, children, and adolescents-Different roles of the methods in different age groups. PLoS One. 2019 Jan 17;14(1):e0210805. doi: 10.1371/journal.pone.0210805. PMID: 30653580; PMCID: PMC6336232.
12. BWang Q, Moon SB, Zang J, Liu J, Weng H, Wang X, Wang J, Chen J. Usefulness of pre-operative endoscopic retrograde cholangiopancreatography in diagnosis and management of forme fruste choledochal cyst in children. ANZ J Surg. 2020 Jun;90(6):1041-1045. doi: 10.1111/ans.15674. Epub 2020 Jan 14. PMID: 31943672.
13. Moslim MA, Takahashi H, Seifarth FG, Walsh RM, Morris-Stiff G. Choledochal Cyst Disease in a Western Center: A 30-Year Experience. J Gastrointest Surg. 2016 Aug; 20(8):1453-63.
14. Cotton PB. Outcomes of endoscopy procedures: struggling towards definitions. Gastrointest Endosc 1994; 40: 514-518.
15. Maheshwari P. Cystic malformation of cystic duct: 10 cases and review of literature. World J Radiol. 2012 Sep 28; 4(9):413-7.
16. Machado NO, Chopra PJ, Al-Zadjali A, Younas S. Choledochal Cyst in Adults: Etiopathogenesis, Presentation, Management, and Outcome-Case Series and Review. Gastroenterol Res Pract. 2015; 2015:602591.
17. Singham J, Yoshida EM, Scudamore CH. Choledochal cysts: part 1 of 3: classification and pathogenesis. Can J Surg. 2009 Oct; 52(5):434-40.
18. Lilly JR, Stellin GP, Karrer FM. Forme fruste choledochal cyst. J Pediatr Surg 1985; 20:449-51.
19. Kaneyama K, Yamataka A, Kobayashi H, Lane GJ, Miyano T. Mixed type I and II choledochal cyst: A new clinical subtype? Pediatr Surg Int 2005; 21:911-3.
20. Visser BC, Suh I, Wy LW, Kang SM. Congenital choledochal cysts in adults. Arch Surg 2004; 139:855-62.
21. Wiseman K, Buczkowski AK, Chung SW, Francoeur J, Schaeffer D, Scudamore CH. Epidemiology, presentation, diagnosis, and outcomes of choledochal cysts in adults in an urban environment. Am J Surg 2005; 189:527-31.
22. Babbitt DP. Congenital choledochal cyst: new etiological concept based on anomalous relationships of the common bile duct and pancreatic bulb. Ann Radiol (Paris) 1969; 12:231-40.
23. Davenport M, Basu R. Under pressure: choledochal malformation manometry. J Pediatr Surg 2005; 40:331-5.
24. Ohkawa H, Sawaguchi S, Yamazaki Y, Ishikawa A, Kikuchi M. Experimental analysis of the ill effect of anomalous pancreatobiliary ductal union. J Pediatr Surg 1982; 17:7-13.
25. Ronnekleiv-Kelly SM, Soares KC, Ejaz A, Pawlik TM. Management of choledochal cysts. Curr Opin Gastroenterol. 2016 May; 32(3):225-31.
26. Alatise OI, Oke OA, Adesunkanmi AK, Olaofe OO, Asaleye CM. Management of Adult Choledochal Cyst Coexisting with Gallbladder Carcinoma: A Case Report and Review of Literature. Niger J Surg. 2016 Jan-Jun; 22(1):43-7.
27. Tsuchiya R, Harada N, Ito T, Furukawa M, Yoshihiro I. Malignant tumors in choledochal cysts. Ann Surg 1977; 186:22-8.
28. Verma D, Damor K, Kumar N, Kothari N. Adenocarcinoma in Choledochal Cyst-a Case Report. Indian J Surg. 2015 Apr; 77 (Suppl 1):24-5.
29. Benjamin IS. Biliary cystic disease: the risk of cancer. J Hepatobiliary Pancreat Surg 2003; 10:335-9.
30. Soares KC, Arnaoutakis DJ, Kamel I, et al. Choledochal cysts: presentation, clinical differentiation, and management. J Am Coll Surg. 2014 Dec; 219(6):1167-80
31. Todani T, Watanabe Y, Fujii M, et al. Carcinoma arising from the bile duct in choledochal cyst and anomalous arrangement of the pancreatobiliary ductal union. J Biliary Tract and Pancreas 1985; 6:525-35.
32. Suthar M, Purohit S, Bhargav V, Goyal P. Role of MRCP in Differentiation of Benign and Malignant Causes of Biliary Obstruction. J Clin Diagn Res. 2015 Nov; 9(11):TC08-12.
33. Moslim MA, Takahashi H, Seifarth FG, Walsh RM, Morris-Stiff G. Choledochal Cyst Disease in a Western Center: A 30-Year Experience. J Gastrointest Surg. 2016 Aug; 20(8):1453-63.
34. Singham J, Yoshida EM, Scudamore CH. Choledochal cysts: part 2 of 3: Diagnosis. Can J Surg. 2009 Dec; 52(6):506-11.
35. Jang JY, Yoon CH, Kim KM. Endoscopic retrograde cholangiopancreatography in pancreatic and b iliary tract disease in Korean children. World J Gastroenterol. 2010 Jan 28; 16(4):490-5.
36. Horaguchi J, Fujita N, Kobayashi G. Clinical study of choledochocele: Is it a risk factor for biliary malignancies? J Gastroenterol 2005; 40:396-401.