

Cholecystectomy and ERCP in management of gall stone disease in children: a five-year single-centre experience from eastern India

Antaryami Pradhan¹, Sudhansu Sekhar Patra¹, Ayaskanta Singh², Saroj Kanta Sahu³

¹Associate Professor, Department of Pediatric Surgery, IMS and SUM Hospital, Siksha 'O' Anusandhan University, Bhubaneswar, Odisha, 751003, India

²Professor, Department of Gastroenterology, IMS and SUM Hospital, Siksha 'O' Anusandhan University, Bhubaneswar, Odisha, 751003, India

³Consultant Gastroenterologist, Sum Ultimate Medicare, Bhubaneswar, Odisha, 751003, India
[Corresponding Author]

Email: antaryamipg@gmail.com; sudhansusekharpatra@soa.ac.in; ayaskant1ce@gmail.com; saroj31121987@gmail.com

Abstract:

Background: Gall stone disease (GSD) being rare in children needs particular attention. Gallstones, when associated with bile duct stones, require ERCP and clearance of bile ducts. The safety and periprocedural course of ERCP and cholecystectomy in children with gall stone disease along with choledocholithiasis have sparingly been studied previously. **Material and methods:** We did a retrospective analysis of the data retrieved from electronic healthcare records. This data comprised demographic, laboratory, details of ERCP, cholecystectomy and periprocedural course of the patients. **Results:** In our centre, 43 children underwent cholecystectomy from April 2015 to May 2020. Open cholecystectomy (OC) and laparoscopic cholecystectomy (LC) were performed in two and forty-one children. All patients were symptomatic at the time of presentation, recurrent biliary colic being the most common symptom. Among the 43 children, four children and seven children were obese and overweight, respectively. The only significant risk factor accountable for gall stone disease was obesity. Preoperative ERCP was required in 7 patients; among them, 2 had cholangitis. No significant complications noted in any of the children who underwent ERCP. **Conclusion:** ERCP is a safe therapeutic tool for choledocholithiasis in children, as it is in adults. ERCP followed by cholecystectomy in children is the most common technique for addressing combined gall bladder and bile duct stones. Cholecystectomy is useful in children with typical biliary symptoms. The only significant risk factor for GSD in our patients was obesity.

Background:

Gall stone disease is a common problem in adults, whereas it is uncommon in children with a prevalence of 0.13% to 0.2% [1]. However, the incidence of gall stone disease and its complications are on the rise in pediatric population—the most probable reason being better diagnostic facilities and the widespread use of ultrasonography. However, there are not many epidemiological studies which can pinpoint the exact prevalence of gall stone in children. Common causes of gall stone disease in children are hemolytic disease, total parenteral nutrition, obesity, ileal disease, congenital hepatobiliary diseases, use of ceftriaxone and idiopathic [2]. Cholecystectomy is not indicated for silent gallstones, except in children with a predisposing illness such as chronic hemolysis, where prophylactic cholecystectomy is performed. However, there is very scarce data on the prevalence of gall stones without hemolytic anaemia in children. Again there is not much information on prevalence, clinical presentation and management of cholelithiasis in children from India [1]. Laparoscopic cholecystectomy (LC) is the 'gold standard' surgical procedure for cholelithiasis in adults, with a vast amount of published data supporting this. However, there is a paucity of reports in the literature about the clinicopathological characteristics and laparoscopic management of gallstones in children.

This study aimed to identify the prevalence of gall stones, clinical presentation and management in children at a tertiary care centre from Odisha, a state in eastern India.

Methods:

This is a retrospective study which was done at IMS and SUM Hospital; Bhubaneswar. Data of all the children who had presented with complicated or uncomplicated gallstone disease and admitted to the pediatric surgery department for cholecystectomy were retrieved from the hospital's electronic health record. Laparoscopic and open cholecystectomy was performed by different surgeons using the standard four ports technique. Preoperative MR cholangiography was performed in all of the patients with suspected choledocholithiasis based on ultrasound abdomen report.

Statistical analysis: Categorical data were expressed as percentages. Continuous data are expressed as mean SD, median and ratio. All values of $P < 0.05$ were considered to indicate statistical significance.

Result:

Forty-three children underwent cholecystectomy over a five year period, from April 2015 to May 2020. Among the children, there were 23 boys and 20 girls (male to female ratio 1.15). The patients' median age was nine years (range 2 to 14 years) [Table 1]. Gender distribution of the children who underwent cholecystectomy is presented in table 2. As shown in the table, gall stone disease in children is as frequent in boys as in girls. The number of girls with gall stone disease is more in the higher age group. Among the 43 children, four children and seven children

were obese (BMI > 30 Kg/m²) and overweight (BMI 25- 29.9 Kg/m²) respectively. Rest of the children was under the normal weight category according to age and gender.

| Table 1 : Clinical parameters | |
|--------------------------------------|-------------------------------|
| Age | 9 years (Range 2 to 14 years) |
| Male to female ratio | 1.15 |
| Lap: Open | 41: 2 |

| Table 2: Gender distribution in patients who underwent cholecystectomy | | |
|---|-------------|----------------------|
| Age group (in years) | Boys: Girls | Male to female ratio |
| 0 -5 | 5: 6 | 0.83 |
| 6-10 | 8: 7 | 1.14 |
| 11-15 | 8 : 9 | 0.88 |

All of the patients were symptomatic at the time of presentation [**Table 3**]. The symptoms, in decreasing order of frequency, were abdominal pain (100%), jaundice (16%), and fever (4%). Recurrent abdominal pain was the most common pattern of abdominal pain (90%). One child presented with acute mild gall stone pancreatitis also had a history of recurrent abdominal pain. Patients with evidence of cholangitis according to Tokyo criteria had a fever. All patients had gallstones in ultrasound; multiple calculi were observed in 26 (60.4% of all patients), and 17 (39.6% of all patients) had few (<3) calculi in the gallbladder.

| Table 3: Symptoms in patients with gall stone disease (n=43) | |
|---|------------|
| Symptom | Percentage |
| Recurrent abdominal pain | 100% |
| Jaundice | 16% |
| Fever | 4% |

| Table 4: Clinical presentation of gall stone disease (n=43) | |
|--|------------|
| Type of presentation | Percentage |
| Uncomplicated | 81.7% |
| Complicated | |
| Cholelithiasis [with cholangitis] | 16% [4%] |
| Acute pancreatitis | 2.3% |

A total of 8 (18.3%) patients presented with complications due to gall stone disease (complicated gall stone disease) [Table 4]. Choledocholithiasis was the most common complication (16%), followed by acute pancreatitis (2.3%). Among patients with choledocholithiasis, cholangitis was the presenting clinical feature in almost one-third (2 out of 7) patients.

Seven children who had Choledocholithiasis underwent preoperative ERCP. The mean age of patients who underwent ERCP was ten years (range 10 to 12 years).

Preoperative MRCP was done in all patients who showed dilated CBD with stones (1 patient), dilated CBD and intrahepatic biliary tree along with CBD stones (5 patients), and normal CBD with stones (1 patient). Among these 7, two patients had cholangitis. The mean stone size in patients with choledocholithiasis was 7.2 mm (range 4 mm to 12 mm) in patients without cholangitis and 9 mm (7 mm to 11 mm) in patients with cholangitis. The mean overall procedure time in patients who underwent ERCP was 40 ± 15 mins and almost comparable in cholangitis and non-cholangitis groups. Sphincterotomy and balloon sweeping were performed meticulously in all seven patients. One patient with large CBD stone of size 12 mm required sphincteroplasty. Complete bile duct stone clearance was achieved in all seven patients (100% success rate). There were no intraprocedural complications. Post-procedure 3 patients had nausea (two children from cholangitis group), and four patients (two children from cholangitis group) had mild pain over the right hypochondrium for a few days, which were managed accordingly. There were no significant complications in our patients. There was no bile duct or vascular injury.

According to pediatric acute pancreatitis severity (PAPS) and Balthazar computed tomography severity index (CTSI), one patient presented with gall stone pancreatitis, which was mild in severity. Hence he was managed conservatively. Patients with cholangitis were managed with preoperative and postoperative antibiotics.

Laparoscopic cholecystectomy (LC) was performed in 41 patients, and open cholecystectomy (OC) was performed in two patients. First, all cases were approached via laparoscopic technique, but two cases (4.6% of all patients) required conversion to open cholecystectomy. The reason for open cholecystectomy in these patients was complicated pathology.

Altered anatomy (accessory duct), adhesion and bleeding were the reasons for converting laparoscopic into open cholecystectomy. Among these 41 patients of laparoscopic cholecystectomy, 7 had pre-ERCP biliary stone extraction. Laparoscopic cholecystectomy was performed in the same setting as ERCP in six children. One child underwent interval cholecystectomy after 6 weeks of ERCP. For patients who underwent laparoscopic cholecystectomy, the average duration of the procedure was 130 ± 26 mins. The median duration of postoperative hospital stay in these patients was four days (range: 3-5 days) and six days

(range: 4-8 days) who underwent laparoscopic cholecystectomy and open cholecystectomy respectively.

There were no significant complications in patients with cholecystectomy. Few minor complications like mild right hypochondrium pain and nausea occurred in 4 and 3 patients, respectively.

Discussion:

In this study, gall stones were equally common in boys and girls. Two previous studies have suggested that gallstone disease in children does not show any gender predilection, slightly commoner in boys [19, 20]. This is in contrast to the adult population where GSD is more common in females due to sex hormone exposure and oral contraceptives.

Cholelithiasis is considered an uncommon condition in children; however, multiple studies have confirmed have experienced an increased incidence of pediatric cholecystectomy last few decades [3, 4, 5]. The widespread availability of diagnostic ultrasound has led to improved detection of gallstone disease [4, 6]. The current epidemic of obesity in children might also have contributed to such growing prevalence of with gallstones in the general pediatric population [3, 7, 8-9]. Children who do not suffer from haemolysis, and therefore, most likely do not have pigment but cholesterol gallstones, have a significantly higher BMI [10]. Obesity-related gall bladder kinetics in children with high BMI may be a partial contributing factor for gall stone formation in children with a nonhemolytic disorder related to gallstone disease [11]. In conclusion, this study suggested an association between rising obesity rates in the pediatric population and increased frequency of symptomatic cholelithiasis in children [12].

All children were symptomatic at the time of presentation. Gallstones in children are more often (60%) symptomatic than in adults (20%) [13]. No predisposing factor was found in any of the children. Cholelithiasis in children, unrelated to hemolytic disorders, has also been reflected in this study. This is in agreement with a study by Ainsworth et al., who found no predisposing factor for the development of gall bladder stones in most (10 out of 13) children undergoing cholecystectomy [14]. The mechanism of gallstone formation without any predisposing factors is probably due to a combination of interacting processes, including dehydration, transient hepatic dysfunction; dietary, inflammatory, hereditary and endocrine influences the composition of bile.

Perisurgical aspects of laparoscopic cholecystectomy differed from that of open cholecystectomy. Lesser operative time, shorter hospital stay, decreased pain, avoidance of upper abdominal muscle cutting incision, faster return to activity and cosmetically better scar are well known benefits of laparoscopic cholecystectomy.

Endoscopic retrograde cholangiopancreatography (ERCP) is seldom used in children. Seven children required ERCP. MRCP was performed before ERCP in all of them, and it showed bile

duct stones with or without bile duct dilatation and IHBR dilatation. The basis for performance MRCP was deranged LFT showing hyperbilirubinemia, high alkaline phosphatase, and clinical and laboratory evidence suggestive of cholangitis. Two (28.5%) out of the seven patients had cholangitis. Patients with choledocholithiasis and cholangitis had similar periprocedural (ERCP) course to those without cholangitis. Patients with cholangitis had a slightly more extended hospital stay than those without cholangitis. There was no mortality. Complication rates were not significantly different between these two groups. Keil et al. have done a retrospective analysis of 626 pediatric patients who underwent ERCP between 1999 and 2018. They found a high (96%) technical success rate, which agrees with our study [15]. Rosen et al., in their research, also confirmed the safety of ERCP in the pediatric population with success rate, safety and complication rates similar to adults [16].

Conclusion: Preoperative ERCP is safe in children with concomitant cholelithiasis and choledocholithiasis. ERCP should be considered in children with concomitant CBD stones who are candidates for laparoscopic cholecystectomy. Laparoscopic cholecystectomy should be the standard procedure for cholecystectomy in children due to its proven efficacy and safety.

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