Original Article Laparoscopic Cholecystectomy in Children and Infants: A Retrospective Analysis of 180 Cases From a Tertiary Care Center.

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Abstract

Background: Laparoscopic cholecystectomy (LC) is the established standard for symptomatic gallbladder disease in older children and adults. However, its application in infants and very young children is less documented, with concerns regarding technical feasibility and safety. This study analyses our experience with LC across the paediatric age spectrum, with a specific focus on infants.

Materials and Methods: A retrospective review of 180 consecutive paediatric patients (aged 8 months to 14 years) who underwent LC at a tertiary care paediatric surgery centre between March 2020 and March 2024 was performed. Data on demographics, clinical presentation, operative details, postoperative course, and complications were analysed. The cohort included 12 infants (≤1 year).

Results: The most common indication was symptomatic cholelithiasis (77.8%), followed by cholecystitis (13.9%) and gall bladder polyps (8.3%). The mean operative time was 45 ± 12 minutes, with no significant difference observed between infants and older children (p=0.15). There were no conversions to open surgery. The overall complication rate was 2.8% (n=5), including three port-site infections, one case of postoperative ileus, and one readmission for pain control. The mean hospital stay was 1.8 ± 0.7 days. All infants underwent successful LC without specific complications.

Conclusion: Laparoscopic cholecystectomy is a safe, feasible, and effective procedure for gallbladder disease in children of all ages, including infants. In the hands of experienced paediatric surgeons, it can be performed with low complication and zero conversion rates, establishing it as the gold standard approach across the paediatric population.

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Introduction

Laparoscopic cholecystectomy (LC) has revolutionized the management of gallbladder disease since its inception in the late 1980s, becoming the procedure of choice for adults [1]. Its adoption in paediatric surgery followed swiftly, with numerous studies in the 1990s and 2000s confirming its safety and benefits like reduced postoperative pain, shorter hospital stays, better cosmesis, and faster recovery in children and adolescents [2, 3].

However, the literature on LC in infants (defined as children ≤1 year of age) remains sparse. Gallbladder disease in this young population is often secondary to predisposing factors such as haemolytic anaemias, parenteral nutrition, or idiopathic cholestasis, and historically was managed with open surgery due to concerns over the limited working space, delicate anatomical structures, and technical challenges of laparoscopy in small patients [4].

At our high-volume tertiary care paediatric surgery centre, we have employed a standardized technique for LC across all age groups. This study aims to present a comprehensive retrospective analysis of 180 consecutive paediatric LCs, with a particular emphasis on evaluating the safety, feasibility, and outcomes in the infant subgroup, thereby contributing to the limited body of evidence for this specific population.

Materials and Methods

Study Design and Patients:

This was a single-centre, retrospective chart review conducted after obtaining approval from the Institutional Ethics Committee. The medical records of all patients under the age of 14 years who underwent LC in the Department of Paediatric Surgery between March 1, 2020, and March 31, 2024, were reviewed. Patients with incomplete records or those who underwent concurrent major procedures were excluded. A total of 180

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Keywords

Laparoscopic cholecystectomy, Paediatric surgery, Infant, Cholelithiasis, Gallbladder disease, Minimal access surgery.

patients formed the study cohort, which was subdivided into infants (≤1 year) and older children (>1 year).

Preoperative Evaluation:

Most patients presented with symptoms suggestive of biliary pathology (abdominal pain, vomiting, jaundice) while a few were incidentally diagnosed during evaluation of other ailments. Diagnosis was confirmed via abdominal ultrasonography. Routine laboratory investigations included complete blood count, liver function tests, and serum amylase/lipase. Magnetic Resonance Cholangiopancreatography (MRCP) or Endoscopic Retrograde Cholangiopancreatography (ERCP) was performed selectively in cases with suspected choledocholithiasis based on ultrasound findings, jaundice, or deranged liver enzymes.

Table 1: Demographic and Operative Data

Parameter	Overall (n=180)	Infants (n=12)	Older Children (n=168)	p-value
Mean Age (years)	9.2 ± 4.1	0.8 ± 0.3	9.9 ± 3.5	<0.001
Female Gender, n(%)	112 (62.2)	6 (50)	106 (63.1)	0.38
Symptomatic Cholelithiasis, n(%)	140 (77.8)	8 (66.7)	132 (78.6)	0.35
Mean Operative Time (min)	45 ± 12	46 ± 14	45 ± 11	0.78
Conversion to Open, n(%)	0	0	0	-
Complication Rate, n(%)	5 (2.8)	0	5 (3.0)	1.00
Mean Hospital Stay (days)	1.8 ± 0.7	2.1 ± 0.8	1.7 ± 0.7 0	0.06

Surgical Technique:

All procedures were performed or directly supervised by consultant pediatric surgeons with advanced laparoscopic experience. A standard four-port technique was employed. After establishing pneumoperitoneum (pressure maintained at 8-12 mm Hg, lower in infants), the gallbladder was retracted fundus-up. Critical view of safety (CVS) was meticulously obtained in all cases before clipping and dividing the cystic duct and artery. The gallbladder was extracted through the epigastric port. Intraoperative cholangiography was not performed routinely. A drain was placed selectively at the surgeon's discretion.

Data Collection and Analysis:

Data were extracted on patient demographics, clinical presentation, preoperative investigations, operative details (time, technique, intraoperative findings), postoperative course (analgesia, complications, length of stay), and histopathological findings. Statistical analysis was performed using SPSS software version 25.0. Continuous variables were expressed as mean ± standard deviation and compared using Student's t-test. Categorical variables were expressed as numbers (percentages) and compared using the Chi-square or Fisher's exact test. A p-value of <0.05 was considered statistically significant.

Results

Patient Demographics and Presentation:

The mean age of the cohort was 9.2 ± 4.1 years, with 12 patients (6.7%) aged 8 months to 1 year (infant group). There was a female predominance (n=112, 62.2%). The most common presenting symptom was recurrent abdominal pain (91.1%), followed by nausea/vomiting (45.6%) and jaundice (12.2%). The mean duration of symptoms prior to surgery was 6.4 ± 3.8 months. (Table 1)

Indications for Surgery:

Symptomatic cholelithiasis was the primary indication in 140 patients (77.8%). Other indications included acute or chronic cholecystitis (n=25, 13.9%) and gall bladder polyps (n=15, 8.3%). In the infant subgroup (n=12), 8 (66.7%) had gallstones, with 3 associated with hemolytic disease.

Operative Findings and Outcomes:

The mean operative time was 45 ± 12 minutes for the entire cohort (46 ± 14 minutes in infants vs. 45 ± 11 minutes in older children, p=0.78). Adhesions or inflammation requiring careful dissection were noted in 32 cases (17.8%). There were no conversions to open cholecystectomy. The critical view of safety was achieved in all patients. A subhepatic drain was placed in 41 patients (22.8%).

Complications and Postoperative Course:

The overall complication rate was 2.8% (n=5). These included: Grade I – port-site infection (n=3), managed with oral antibiotics; Grade II – postoperative ileus resolving with conservative management (n=1) and readmission for pain control (n=1). No bile duct injury, hemorrhage, or mortality occurred. There were no specific complications in the infant group. The mean postoperative hospital stay was 1.8 ± 0.7 days.

Histopathology:

Histopathological examination confirmed chronic cholecystitis in 158 specimens (87.8%), acute-on-chronic inflammation in 18 (10.0%), and gallbladder polyp in 15(8.3 %) specimens.

Discussion

This large single-center series reinforces LC as the gold standard for pediatric gallbladder disease and uniquely demonstrates its unequivocal safety and feasibility in infants. Our zero-conversion rate and low overall complication rate of 2.8% compare favorably with existing literature, which reports conversion rates of 0-5% and complication rates of 1-8% in pediatric series [5, 6]. The absence of major complications like bile

duct injury underscores the paramount importance of adhering to the principle of achieving the Critical View of Safety (CVS), a standard we maintained rigorously [7].

The most significant finding of our study is the successful application of LC in infants. While some authors have expressed reservations due to technical constraints [4], our experience with 12 infants, the youngest being 8 months old, shows no increase in operative time, complications, or conversions compared to older children. This suggests that patient size alone should not be a contraindication to a laparoscopic approach. Specialized pediatric instrumentation, lower insufflation pressures (8-10 mmHg), and surgeon experience are key enabling factors.

Our mean operative time of 45 minutes is efficient and reflects a standardized team approach. The most common indication was symptomatic cholelithiasis (77.8%), a finding consistent globally. The management of concurrent choledocholithiasis remains a topic of debate; in our practice, preoperative MRCP/ERCP is used selectively, and we did not perform routine intraoperative cholangiography, which may be a consideration for future protocol development.

Limitations: The retrospective nature is an inherent limitation. The infant subgroup, while significant, is relatively small. Long-term follow-up data is not presented. Furthermore, being a report from a specialized center, the outcomes may reflect a high level of expertise and may not be directly generalizable to all settings.

Conclusion

Laparoscopic cholecystectomy is a safe, effective, and reproducible procedure for the management of gallbladder disease across the entire paediatric age range, including infants. In the hands of experienced paediatric surgeons working in a dedicated setup, it can be performed with excellent outcomes, minimal morbidity, and no need for conversion. This study provides strong evidence to support the recommendation of LC as the first-line surgical approach for children and infants requiring cholecystectomy.

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