

Utility and safety of laparoscopy for intra-abdominal cysts in small children: Single center experience

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ABSTRACT

Objectives: The objective of this study is to study the utility and safety of laparoscopy in the management of intra-abdominal cysts in small children. **Materials and Methods:** This is a retrospective analysis of patient data that underwent laparoscopy for intra-abdominal cystic lesions. The study period was from March 2010 to April 2015. Patients with adequate follow-up and complete data were included for study. The patients were divided into 3 age groups for analysis of the outcome *viz.* neonates, infants, and children between 1 and 5 years of age. The data were analyzed for spectrum of lesions managed, surgical procedure performed, operative time, intraoperative events, need for conversion, time to discharge, and the overall outcome. **Results:** A total of 106/121 patients with adequate follow-up are included for the study and most of the patients (63.6%) belonged to children between 1 to 5 years. Wide spectrums of lesions were managed laparoscopically, and majority 45 (42.4%) had cysts arising from the hepatobiliary system whereas genitourinary system lesions formed 2nd largest group with 21 (19.8%) patients. The procedure was completed laparoscopically in 86.6% (92) of the patients. The morbidity including wound infection, re-exploration, and recurrences, were seen in 5% of patients. The average duration of hospital stay was 4.6 days (range 2-21 days), and the average duration of follow-up was 96 months (range 6-180 months). **Conclusion:** Laparoscopic surgery is a fascinating technical development for pediatric surgeons. It is applicable for the wide variety of intra-abdominal cystic lesions in children. Excisional surgeries are best performed by laparoscopic technique even in small infants and neonates. In the hands of experienced surgeons, reconstructive surgeries have good outcome with minimal morbidity.

Key words: Abdominal, Children, Cysts, Laparoscopy

Historically, acceptance of laparoscopy in pediatric surgical practice was slow, and it was initially used for simple diagnostic and therapeutic procedures in children. The decade between 1990 and 2000 witnessed growth in pediatric laparoscopy; many minimally invasive surgery (MIS) procedures being performed in children with promising results by laparoscopic enthusiasts such as Holcomb et al. [1] and many series with good results were reported [2-4]. Despite the advances and innovation in the laparoscopy, many pediatric surgeons still perform open operations for many conditions which otherwise may benefit from laparoscopy procedure [5]. Many senior pediatric surgeons are skeptical about the laparoscopic surgery in small children and remain unconvinced that endoscopic surgery is valuable for routine treatment of pediatric surgical conditions [5,6].

Laparoscopy offers unique advantage in the management of intra-abdominal cysts in children; most of them are developmental and nonmalignant, hence, can be effectively managed without the associated morbidity of open surgeries.

It also gives an opportunity for exploring the whole abdomen and to select the most suitable and least invasive incision if conversion to open surgery is warranted. We planned this retrospective study to assess the utility and safety of laparoscopy in the management of intra-abdominal cysts in small children in our setup.

MATERIALS AND METHODS

This is a retrospective analysis of patients who underwent laparoscopy for intra-abdominal cystic lesions. Only neonates, infants, and children up to the age of 5 years were included in the study. The study period was from March 2010 to April 2015, and patients with adequate follow-up were included in the study. Total of 106 out of 121 patients who underwent laparoscopic procedure were included. In all the patients, first port was placed by open technique, 5 mm telescope was used and 3 mm working ports were used routinely in small babies. Appropriate surgery was performed depending upon the lesion. The data were

analyzed for the type of cyst, a procedure done, operative time, intraoperative events, need for conversion, time to discharge, and the overall outcome. The results are tabulated and the conclusions were drawn.

RESULTS

Total numbers of cases operated were 106 and included a wide variety of intra-abdominal cystic lesions (Table 1). Hepatobiliary group was the largest group with 45 (42.4%) cases; 31 had choledochal cyst (Fig. 1a and b) and remaining had hydatid and simple cysts of the liver. There were 21 (19.81%) patients having genitourinary cysts (Fig. 2a and b). The various other lesions managed laparoscopically were; mesenteric cysts and pseudocysts - (9 each), splenic cysts - (7), retroperitoneal cysts, omental cysts, and intestinal duplication cysts - (5) each. There was no significant difference in sex ratio and out of 106 patients, 55 (51.88%) were male and 51 (48.11%) were females. Of children who underwent laparoscopy, 77 (72.64%) were between 1 and 5 years, followed by infants (21, 19.81%), and neonates (8, 07.54%). The most common lesions observed were hepatobiliary (50.6%), gastrointestinal tract (GIT) (38%), and urological lesions (50%) in children, infants and neonates respectively (Table 1).

The overall conversion rate of 13.2% was observed and maximum conversion was noted in the GIT lesions in 28.5%

cases followed by hepatobiliary and pseudocyst group in 17.77% and 14.28% cases respectively. Maximum operative time noted in a hepatobiliary group with mean operative time of 170 min and the least operative time of 57 min was noted in omental cysts (Table 2). The common reason noted for conversion was a need for resection and anastomosis in GIT group. In hepatobiliary group, the most common indication for conversion was difficulty in dissection and suturing. One patient had bowel injury whereas surgery for cerebrospinal fluid pseudocyst requiring conversion. One patient in pseudocyst group had wound infection amounting to 14.28% morbidity and 3 patients required reoperation, 2 patients had a recurrence of cyst and one for anastomotic leak in hepatobiliary group amounting to 11.1% morbidity in this group (Table 3).

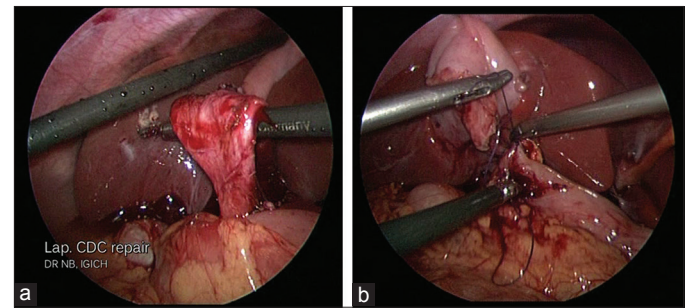


Figure 1: (a) Dissection of choledochal cyst in progress. (b) Hepaticoduodenostomy anastomosis

Table 1: Spectrum of lesions according to age and sex

Lesions/disease	Number (percentage) of patients					
	Total (%)	Sex wise distribution		Age wise distribution		
		M (%)	F (%)	N (%)	I (%)	C (%)
Cysts from hepatobiliary system	45 (42.45)	20 (45.5)	25 (55.5)	0	6 (13.3)	39 (82.7)
Liver hydatid	10	7	3	0	0	10
Liver proper	4	2	2	0	0	04
CDC	31	11	20	0	6	25
Cysts from genitourinary tract	21 (19.81)	9 (42.8)	12 (57.2)	4 (19.04)	3 (14.28)	14 (66.66)
Ovarian cysts	9	0	9	4	2	3
MCDK	8	5	3	0	0	8
Utricular cysts	2	2	0	0	1	1
Urachal cysts	2	2	0	0	0	2
Cysts arising from GIT	14 (13.20)	7 (50)	7 (50)	3 (21.4)	8 (57.2)	3 (21.4)
Mesenteric cysts	9	5	4	2	5	2
Duplication cysts	5	2	3	1	3	1
Pseudo cysts	9 (8.49)	6 (75)	3 (25)	0	2 (22.2)	7 (77.8)
Pancreatic	4	3	1	0	0	4
CSF	5	3	2	0	2	3
Splenic cysts	7 (6.60)	5 (71.4)	2 (28.6)	0	0	7 (100)
Omental cysts	5 (4.71)	4 (80)	1 (20)	0	0	5 (100)
Retroperitoneal cysts	5 (4.71)	4 (80)	1 (20)	1 (20)	2 (40)	2 (40)
Grand total	106 (100)	54 (51.88)	52 (48.11)	8 (07.54)	21 (19.81)	77 (72.64)

M: Male, F: Female, N: Neonate, I: Infant, C: Children between 1 and 5 years, CDC: Choledochal cyst, CSF: Cerebrospinal fluid, GIT: Gastrointestinal tract, MCDK: Multicystic dysplastic kidney

DISCUSSION

In many parts of the world, MIS in children is still restricted to standard procedures such as appendectomy, fundoplication, pyloromyotomy, and other diagnostic procedures. Advanced laparoscopic and thoracoscopic procedures are being performed in infants and neonates only at some specialized centers; it is not widely accepted by many pediatric surgeons. Laparoscopy as a tool for managing intra-abdominal cystic lesions in small babies is not widely advocated; though, it appears well suited for managing these lesions.

This concern is based mainly on the assumed physiological effects of MIS as well as the small surgical field in these tiny babies. It has been documented that neonates are very sensitive to the effects of CO₂ [7] and Gueugniaud et al. [8] reported that intra-abdominal pressure more than 10 mmHg is sometimes poorly tolerated by the neonates. The safety and efficacy of MIS procedures in neonates and infants was tested by us by

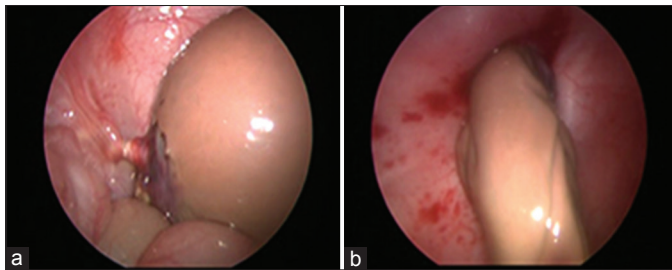


Figure 2: (a) Ovarian cyst with torsion laparoscopic view in a neonate. (b) Ovarian cyst decompression and extraction in a neonate

looking at some of the outcome measures such as complications, conversion rates, morbidity, and overall outcome.

In the last 5 years, we have performed more than 100 laparoscopic procedures in neonates, infants, and children for the management of various intra-abdominal cystic lesions with encouraging results. In 87% of the babies, the operation was completed successfully without conversion and the average operative time was 85 min when all the systems were grouped together. There was no mortality, and we observed overall morbidity of 5.0%. There was no morbidity in newborns; though, they comprised only about 7.5% of total. 6.6% morbidity was observed in the choledochal cyst group due to few reoperations for recurrence of cystic lesions.

Though conversion rates up to 10% are reported in other series, Al-Qahtani and Almaramhi [9] observed no conversions or complications. This highlights the safety and efficacy which can be achieved with time. Iwanaka et al. [10] reported that 3 conversions in 54 neonates and infants, weighing less than 5 kg, undergoing laparoscopic surgery, and this conversion rate was similar to the rates observed by us. According to a survey performed on more than 5400 laparoscopies [11], the method used to obtain pneumoperitoneum was an important determining factor for complications. Significant complications were more frequent with the veress needle (2.5%) compared with open technique (1.2%). In all our patients, we have used open access for obtaining the pneumoperitoneum without any access port complications.

We observed no conversion or complications in the genitourinary group and the mean operative time was 75±11 min.

Table 2: Operative time and conversion rate (overall-13.2%)

Parameters	Hepatobiliary	GU	GIT	Pseudo-cysts	Splenic	Omental	Retroperitoneal
Range (min)	45-250	50-155	40-155	45-130	50-95	40-75	75-155
Average (min)	170	75	60	65	69	57	100
Conversion rate	8/45 (17.77)	0/21 (0)	4/14 (28.5)	1/7 (14.28)	0/7 (0)	0/5 (0)	1/5 (20)

GIT: Gastrointestinal tract, GU: Genitourinary

Table 3: Indication for conversion, morbidity, mortality, and hospital stay

Parameters	Hepatobiliary	GU	GIT	Pseudo-cysts	Splenic	Omental	Retroperitoneal
Indication for conversion	Difficult dissection and anastomosis	Nil	Requiring R/A	Bowel injury and difficult dissection	Nil	Nil	Difficult dissection
Morbidity	5/45 (11.1%) 1. Anastomotic leak- reoperation 2. Recurrence of cyst 3. Reoperation for technical issues	Nil	Nil	Wound infection 1/7 (14.28%)	Nil	Nil	Nil
Mortality	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Hospital stay							
Range (days)	3-21	2-7	3-7	3-9	2-3	2-3	4-8
Average (days)	7	3.5	5	5	2.7	2.5	5.5

GIT: Gastrointestinal tract, GU: Genitourinary

This mean operative time is bit longer when compared what observed by Hashish (45±12 min) [12] in their series. However, they had only included babies with ovarian cysts whereas more complex genitourinary cystic lesions were operated by us including multicystic dysplastic kidney and utricular cyst which increased the average operative time. In the groups with splenic and omental cysts, there was no conversions and morbidity with the average operative time of 69 and 57 min, respectively.

The overall complication rate in the series of Chen et al. [5] was 2%. Olivares and Tovar [14] reported 5.3% minor and 1.2% major complications. In our study, we observed 5% overall complications rate with pseudocysts and hepatobiliary group having 14.28 and 11.1% complication rates respectively and no complications in other groups. This highlights the efficacy and safety of the procedure in wide variety of pediatric intra-abdominal cystic lesions in children. The average duration of hospital stay was 4.6 days (range 2-21 days); omental and splenic cysts had least hospital stay (2.5 and 2.7 days, respectively) whereas hepatobiliary group had an average stay of 7 days. The longer hospital stay in this group was due to increased morbidity and redo surgery in the initial part of the series. The overall hospital stay was comparable to other series reported in the literature. In a series published by Lee et al., mean hospital stay was 5.5 days for choledochal cysts and biliary atresia [15].

Ure et al. observed that more than 60% of the abdominal surgeries in children can be performed endoscopically [16]. The impact of laparoscopy for the management of intra-abdominal cystic lesions was tremendous, and nearly 87% of the procedure could be completed effectively.

CONCLUSION

Laparoscopic surgery is a fascinating technical development for pediatric surgeons. It is applicable for wide variety of intra-abdominal cystic lesions in children. Excisional surgeries are best performed by laparoscopic technique even in small infants. In the hands of experienced surgeons, reconstructive surgeries have good outcome with minimal morbidity.

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