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Original Article

PEDIATRIC LAPAROSCOPIC SURGERY: FOUR YEARS EXPERIENCE IN DHAKA MEDICAL COLLEGE HOSPITAL

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Abstract:

Purpose: Laparoscopy is gaining popularity over laparotomy in various surgical conditions. Now a day, an increasing number of diagnostic and therapeutic surgical procedures are being done laparoscopically. The aim of this study was to assess the safety and feasibility of laparoscopy in children.

Materials and Methods: This retrospective study was carried out in the Department of Pediatric Surgery of Dhaka Medical College Hospital over a period of 52 (Fifty two) months from June 2009 to August 2013. A total of 123 patients were operated laparoscopically up to 12 years of age for different surgical conditions. Data was collected from the hospital records and analyzed retrospectively.

Results: Out of these 123 laparoscopically performed cases, Appendectomy was performed in 39 cases, closure of internal inguinal ring for Inguinal Hernia was done in 36 patients, 20 patients underwent Cholecystctomy, 16 patients had laparoscopic procedures for impalpable Undescended Testis (UDT), 5 patients were operated for Adnexal Mass of which one case was converted into open procedure due to technical difficulties and 1 for Pancreatic Pseudo cyst. Diagnostic Laparoscopy was performed for 2 patients with Biliary Atresia and 4 patients for Ambiguous Genitalia. Median age of the patients was 6.08 years (ranging from 2 months to 12 years of age). The length of post operative hospital stay was 2-3 days. All the laparoscopic procedures for Inguinal Hernia and impalpable UDT were performed as day care surgery. Operative and post operative complications were minimal. Other advantages of the laparoscopic procedures were smaller incisions, incidental diagnosis of other associated pathology, lesser post operative pain, earlier oral feeding, quicker mobilization and a better cosmetic result.

Conclusion: With the recent development of laparoscopic surgical techniques and equipments, laparoscopic surgical procedures are becoming popular day by day and can be performed safely for both diagnostic and therapeutic purposes in pediatric surgical patients.

Introduction:

Laparoscopic surgery has replaced conventional laparotomy in various surgical conditions. With the gradual advancement of minimally invasive surgery, it is now practiced in many centers as both diagnostic and therapeutic tool in increasing number.

Additional benefit of laparoscopic procedure are excellent visual exposure, smaller incision, minimal tissue dissection, fewer trauma, less post operative pain, early recovery, shorter hospital stay and better cosmetic result.

Materials and Method:

It was a retrospective observational study, carried out to see the feasibility and outcome of laparoscopic procedure in different surgical conditions in pediatric age group of patients in the Department of Pediatric Surgery of Dhaka Medical College Hospital from June 2009 to August 2013 (52 months). 123 patients under went laparoscopic procedure for various surgical problems as both therapeutic and diagnostic procedures. Detailed history, findings of complete physical examinations and relative investigations were recorded before the procedures.

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The various conditions for which laparoscopic procedures were carried out are: recurrent and acute Appendicitis, Inguinal Hernia, Cholelithiasis, impalpable UDT, Adnexal Mass, Ambiguous Genitalia, Biliary Atresia and Pancreatic Pseudo cyst.

Some routine investigations were performed for fitness for general anesthesia. Besides these, ultra sonograms of specific regions were performed according to need in all the cases except in those with Inguinal Hernia. Some specific investigations like PBF, different tumor markers (eg. CEA, CA125, CA19.9, AFP), hormonal assay, LFT, S.Amylase was performed as required in different cases.

Laparoscopic Appendectomy (by clipping/endoloop) was performed for recurrent and acute Appendicitis. For Inguinal Hernia, closure of internal inguinal ring was done by intracorpreal knot. Laparoscopic Cholecystectomy (by clipping) was performed for Cholelithiasis. In case of impalpable UDT laparoscopic detection of testis followed by orchiopexy (single or staged)/orchiectomy was done. Aspiration and excision or salphingo-oophorectomy was done for Adnexal Masses. In cases of Ambiguous Genitalia, laparoscopic examination was performed. Diagnostic laparoscopy followed by liver biopsy was performed in patients with Biliary Atresia. Diagnosis and drainage procedure was done by laparoscopy in the patient with Pancreatic Pseudo cyst.

The patients with Inguinal Hernia and UDT were discharged on the day of operation after satisfactory recovery from anesthesia. The others were discharged in between 1st-5th post operative day except the patients with Ambiguous Genitalia and Biliary Atresia who had a longer stay in the hospital, not because of the laparoscopic procedure that they have under gone but for their further evaluation and management.

Requirement of post operative analgesic and cosmetic appearance of wounds were assessed in all the patients.

All the patients are followed up post operatively for six months- on the 1st week, 1st month, 2nd month, 3rd month and lastly on the 6th month.

Results:

In the study period of 52 months, out of 123 patients, 39(31.71%) patients had Recurrent and Acute Appendicitis, 36(29.27%) presented with Inguinal Hernia, 20 (16.26%) patients had Cholelithiasis and 16 (13%) patients presented with impalpable UDT, (Table-1). Adnexal Mass was present in 5(4.07%) cases, 4(3.25%) patients presented with Ambiguous Genitalia. The number of patients with Biliary Atresia were 2(1.63%) and 1(0.81%) patient presented with Pancreatic Pseudo cyst.

Table-I

Clinical presentations of patients (n=123)

Presentation	No.	(%)
Recurrent Appendicitis	39	(31.71)
Inguinal Hernia	36	(29.27)
Cholelithiasis	20	(16.26)
Impalpable UDT	16	(13.00)
Adnexal Mass	05	(04.07)
Ambiguous Genitalia	04	(03.25)
Biliary Atresia	02	(01.65)
Pancreatic Pseudo cyst	01	(00.81)

The age range of the patients was from 2 months to 12 years of age (Table-2), out of which 84(68.29%) patients were male and 39(31.71%) patients were female.

Table-II

Age distribution of patients (n=123)

Clinical Conditions	Age range	Mean
Inguinal Hernia	2.5-12 y	08.42 y
Recurrent Appendicitis	06-12 y	10.08 y
Impalpable UDT	03-12 y	06.43 y
Cholelithiasis	04.5-12 y	08.31 y
Adnexal Mass	07-12 y	09.9 y
Ambiguous Genitalia	9 mo-2y	01.25 y
Biliary Atresia	02-03 mo	02.5 mo
Pancreatic Pseudo cyst	09y	

Out of the 36 patients with Inguinal Hernia, 29 patients had unilateral pathology and 7 patients were found to have bilateral pathology on laparoscopy though they presented with unilateral problem. Repair of the contra lateral defects were performed in the same sitting.

In the 16 cases of impalpable UDT, after laparoscopic detection of the undescended testes, single staged

Orchipexy was performed in 10 cases. First stage of Fowler Stephen's technique was done in 3 patients and second stage was done in 2 patient. Orchiectomy had to be done in 1 case.

Among the 5 patients with Adnexal Mass, 3 patients had laparoscopic aspiration followed by excision of the cystic masses. Salphingo-oophorectomy had to be done in 1 case and 1 case had to be converted into open procedure (Table-III).

All the 4 cases of Ambiguous Genitalia showed karyotype 46XY. Laparoscopic examination was done to detect the gonads and to exclude Mullerian Duct remnants.

In the 2 cases of Biliary Atresia and 1 case of Pancreatic Pseudo cyst laparoscopic examination followed by liver biopsy and laparoscopic evaluation followed by drainage was done respectively.

Table-III

Laparoscopic procedures done in different cases (n=123)

Clinical conditions	Procedure done		Number
Recurrent & Acute Appendicitis	Laparoscopic appendectomy (by endoloop or clipping)		: 39
Inguinal Hernia	Closure of internal inguinal ring (by intracorporeal knot)	Unilateral repair	: 29
		Bilateral repair	: 07
Cholelithiasis	Laparoscopic cholecystectomy (by clipping)		: 20
Impalpable UDT	Laparoscopic orchiopexy/orchiectomy	Single stage orchiopexy	: 10
		1st stage F-S technique	: 03
		2nd stage F-S technique	: 02
		Orchiectomy	: 01
Adnexal Mass	Laparoscopic aspiration and excision	Aspiration & excision	: 03
		Salphingo-oophorectomy	: 01
		Conversion to open procedure	: 01
Ambiguous Genitalia	Laparoscopic evaluation		: 04
Biliary Atresia	Laparoscopic examination and liver biopsy		: 02
Pancreatic Pseudo cyst	Laparoscopic detection and drainage		: 01

The patients with Inguinal Hernia and impalpable UDT were operated as day case surgery. The mean hospital stay for the patients with laparoscopic Appendectomy and Cholecystectomy were 2.3 days and 2.6 days respectively. The patients with Adnexal Mass had an average hospital stay of 4.2 days and that with Pancreatic Pseudo cyst stayed for 6 days (Table-IV).

Table- IV

Duration of hospital stay (n=123)

Clinical conditions	Day of discharge	Mean hospital stay
Inguinal Hernia	On the day of surgery	Day care surgery
Impalpable UDT	On the day of surgery	Day care surgery
Recurrent Appendicitis	1st-2nd POD	2.3 days
Cholelithiasis	2nd-3rd POD	2.6 days
Adnexal Mass	4th-5th POD	4.2 days
Ambiguous Genitalia	Longer stay	
Biliary Atresia	Longer stay	
Pancreatic Pseudo cyst	4th POD	6 days

Table-V

Children's Hospital-of-Eastern Ontario Pain Score (CHEOPS) [1]

	0	1	2
Crying	None	Moaning/crying	Screaming
Facial expression	Smiling	Composed	Grimace
Verbal expression	Positive	None/other complaints	Complaints of pain
Torso	Neutral	Shifting/tense/upright	Restrained
Legs	Neutral	Squirming/kicking/drawn-up	Restrained

Table-V

Morbidity and mortality after laparoscopic intervention (n=123)

Clinical conditions	Morbidity and mortality	No	%
Laparoscopic Appendectomy (39)	Hernia at umbilical port	01	2.56
Closure of internal inguinal ring (36)	Port Hematoma	02	5.56
	Stitch Abscess	01	2.78
Cholecystectomy (20)	Secondary hemorrage	01	5
Orchiopexy (16)	Recurrance	01	6.25
Adnexal mass (05)	Conversion to open procedure	01	20
Others	None		
Mortality	None		

The patients with CHEOPS > 4 (Table-V) were given specific doses of Diclofenac Sodium or Paracetamol 1.5mg/kg/dose or 15mg/kg/dose respectively, per rectally. All the patients required 1-4 doses of analgesic to control the post operative pain.

The scoring system for wound appearance used in this study was "Visual Analog Scale"(VAS). Parents of the patients were explained and demonstrated about worst possible scar and almost normal skin and were asked to score 0 and 100 respectively for these two extreme and other possible scores for wound appearance in between these. The majority of the patients' parents scored the wound appearance according to VAS in between 80-100.

The post operative period (Table-6) was uneventful in most of the cases except a few. Out of the 39 patients with laparoscopic Appendectomy, only 1(2.56%) patient developed hernia at umbilical port. Among the 36 patients with laparoscopic repair of internal inguinal ring, only 2(5.56%) patients had port site hematoma and 1(2.78%) patient suffered from stitch abscess. 1(5%) patient suffered from secondary hemorrhage after laparoscopic Cholecystectomy in 20 cases. After laparoscopic procedure for impalpable UDT in 16 patients, only 1(6.25%) patient had recurrence. Out of the 5 cases with Adnexal Mass, 1(20%) case had to be converted to open procedure.

Discussion:

In 1910, Hans Christian Jacobaeus of Sweden, reported the first laparoscopic surgery in humans.[2] In the ensuing several decades many individuals refined and popularized laparoscopic procedures further. Due to improved patient outcomes, in the last two decades, laparoscopic surgery has been adopted by various surgical sub-specialties including gastro intestinal surgery, gynecologic surgery, urology and pediatric surgery.

Inguinal Hernia is one of the commonest conditions encountered in pediatric surgical practice. Owing to advances in pediatric laparoscopic instrumentation and increased experience with the technique of laparoscopy, a number of centers routinely perform laparoscopic inguinal hernia repair in children. Laparoscopic repair of Inguinal Hernia is technically easier as high ligation of sac is the only procedure necessary in most children[3,4] Now a day, this

procedure is becoming more popular, more feasible, less invasive, and less painful and with a better cosmetic result. Moreover an advantage of this procedure is that, it allows detection and repair of the contra lateral hernia in same setting.[4,5,6]

Laparoscopic suturing and knot tying are becoming integral part of the skill that any laparoscopist must acquire and intracorporial suturing and knot tying for closure of the internal inguinal ring may need a long learning curve.[7]

In our study, out of the 36 patients with Inguinal Hernia, 29 patients had unilateral pathology and 7 patients were found to have bilateral pathology on laparoscopy though they presented with unilateral problem. Repair of the contra lateral defects were performed in the same sitting.

Cryptorchidism is the most common genitourinary anomaly in male children. About 20% of cryptorchid testicles are non-palpable. In these cases, the laparoscopic technique is a useful alternative method of diagnosis and treatment.[8,9]

Laparoscopy was first used in 1976 for diagnosis of impalpable undescended testes.[10] Only after 1990, laparoscopy was used for the treatment of impalpable testes as the urologists gained experience with the method and since then laparoscopic orchiopexy and orchiectomy have been increasingly used.[11,12]

In our country, laparoscopy for the impalpable undescended testis is gaining popularity and the surgeons are becoming more familiar with the procedure. In the 16 cases of impalpable UDT in our study, after laparoscopic detection of the undescended testes, single staged Orchiopexy was performed in 10 cases. First stage of Fowler Stephen's technique was done in 3 patients and second stage was done in 2 patients. Orchiectomy had to be done in 1 case.

All the patients of Inguinal Hernia and impalpable UDT were dealt as day case surgery. In DMCH, we had followed Day Case Surgery protocol for all the patients and after operation patients were discharged 4-6 hours after the operation except one patient of UDT who was kept admitted for another 24 hours due to extra handling of abdominal viscera during operation.

Among the 36 patients with laparoscopic repair of internal inguinal ring, only 2(5.56%) patients had port site hematoma and 1(2.78%) patient suffered from stitch abscess. After laparoscopic procedure for impalpable UDT in 16 patients, only 1(6.25%) patient had recurrence.

Appendectomy is a common surgical procedure in the pediatric population. Though open appendectomy is the 'gold standard' for the treatment of acute appendicitis, laparoscopic appendectomy is widely practiced now a day.[13] In 1981, Semm, from the Universitats Frauenklinik, Keil, Germany performed the first laparoscopic appendectomy[14] which is now considered as a safe alternative to open appendectomy in pediatric patients and results in shorter hospital stays, less post operative pain, less post operative complications, less postoperative ileus and of course, a better cosmesis.[13,14,15,16,17]

In our study, out of 39 patients of laparoscopic Appendectomy, the bases of the Vermiform Appendices were tied with endoloops in most of the cases and in some, laparoscopic clips were used. The patients were discharged on 1st-2nd post operative day. Only 1(2.56%) patient developed hernia at umbilical port.

Laparoscopic cholecystectomy is the most common laparoscopic procedures performed.[14] It has now replaced open cholecystectomy as the first choice of treatment for gall stones and inflammation of gall bladder unless there is contraindication to the laparoscopic approach. This is because open procedure leaves the patients more prone to infection.[18] This procedure can be safely practiced in pediatric age group of patients with additional advantages of less post operative pain and ileus, quicker recovery, better cosmesis.[19,20] Patients can be discharged on the same day in case of early morning procedures.[14]

Our study includes 20 cases of laparoscopic Cholecystectomy in which clips were used for closing both the cystic arteries and cystic ducts. 2 clips were used proximally and 1 was used distally.

1(5%) patient suffered from secondary hemorrhage after laparoscopic Cholecystectomy. Patients were discharged on 2nd-3rd post operative day.

Laparoscopy is a technically feasible and safe method in the diagnosis and treatment of benign ovarian masses in children and young females, associated with shorter hospitalization, minimal analgesic requirement and a good cosmetic appearance.[21,22] Most surgeons agree on the use of laparoscooy when a young female patient complains of vague lower abdominal pain and there are many reports showing

that laparoscopy improves diagnosis and provides proper therapeutic option.[23]

In our study, among the 5 patients with Adnexal Mass, 3 patients had laparoscopic aspiration followed by excision of the cystic masses. Salphingo-oophorectomy had to be done in 1 case and 1 case had to be converted into open procedure.

The patients were discharged on 4th-5th post operative day.

Laparoscopy is widely used as both a diagnostic, as well as a therapeutic tool in children with ambiguous genitalia. Laparoscopic detection of gonads, excision of dysgenetic gonads or, removal of residual mullerian duct structures or vise versa as well as management of other anomalies can be done in these patients by means of laparoscopy.[24,25]

In our 52 months study period; we have performed laparoscopic evaluation of 4 patients with Ambiguous Genitalia. 1 patient had associated cystoscopic and vaginoscopic examination.

Minimal invasive surgery has overcome many technical limitations and has evolved into a safe alternative treatment of many complex pediatric surgical procedures. The use of this approach for the correction of biliary tract anomalies had to wait until instruments and surgeons' skills improved enough. Now a day, laparoscopic portoentorostomy is practiced in many centers for the treatment of Biliary Atresia and different studies have shown to have good early outcome.[26, 27]

In our study, 2 patients with Biliary Atresia underwent only laparoscopic evaluation and liver biopsy. Both the patients were 2-3 months of age with a mean age of 2.5 months.

The available treatment options of symptomatic Pancreatic Pseudo cyst are endoscopic drainage, percutaneous catheter drainage and surgical drainage either via open surgery or laparoscopic surgery.[28, 29,30]

A laparoscopic approach for Pancreatic Pseudo cyst is proved to be safe and effective with complete resolution, minimal morbidity and rapid recovery.[28,29,30]

The only patient with Pancreatic Pseudo cyst in our study had diagnostic laparoscopy followed by drainage. The patient was discharged on 4th post operative day.

Objective behavioral and physiological parameter scoring systems, CHEOPS (Children's Hospital-of-Eastern Ontario Pain Score) [1] was used in the present study. Patients with CHEOPS e" 4 were given specified doses of Diclofenac Sodium, 1.5 mg/kg/dose or Paracetamol, 15mg/kg/dose, per rectally, and the dose was repeated every 8 hours, if necessary. Only 1-4 doses of analgesics were required in all the patients.

The scoring system for wound appearance used in this study was "Visual Analog Scale" (VAS). Parents of the patients were explained and demonstrated about worst possible scar and almost normal skin and were asked to score 0 and 100 respectively for these two extreme and other possible scores for wound appearance in between theses. Most of the parents of the patients gave excellent scores to their children's wound cosmesis according to Visual Analog Scale following laparoscopy.

All the patients required significantly lesser amount of analgesic, recovered faster, had significantly better wound cosmesis, had shorter hospital stay and suffered from minimal complication.

While laparoscopic surgery is advantageous in terms of patient's outcomes, the procedure is more difficult from the surgeon's perspective when compared to traditional open surgery.[24] Moreover, operative cost is much more due to costly instrument set up, takes longer operating time.

As we are practicing laparoscopic surgery, in our department, for the last four and a half years only, we need much more practice to develop our skills in this era. Moreover, follow up schedule is not complete in all the patients as the study includes the patients who are operated in August, 2013.

Conclusion:

Laparoscopic surgery is taking its upper hand over many open surgical procedures not only in adults but also in patients with pediatric age group. It can be performed safely, has both diagnostic and therapeutic value. It has additional benefits of shorter hospital stay, less post operative pain and superior cosmetic result and less morbidity and mortality. But it needs to be evaluated in wider group of patients, in multiplke centres with a longer period of follow-up and needs more practice.

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