LAPAROSCOPY IN PAEDIATRIC SURGERY – OUR EXPERIENCE AT SRMC

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ABSTRACT

a) *Aim of the study: To review the current status of laparoscopic surgery at Sri Ramachandra Medical University Hospital (SRMCH), a paediatric tertiary child care hospital in Chennai. We highlight our experience in terms of feasibility, safety cost effectiveness and effect on standard practices.*

b) *Methodology: It is a retrospective case series study. All patients who were admitted to Paediatric Surgery at SRMCH and underwent laparoscopic surgery were included in the study group. We reviewed the literature in comparison to our results.*

c) *Results: 25 cases were operated in a span of 9 months, majority of the cases were appendicectomies followed by diagnostic laparoscopy. We had only one case converted to open.*

The mean operating time was 65 minutes, median post operative stay of 2.3 days for lap appendicectomies and there were no intra operative or post operative procedure related complications. Duration of hospital stay was reduced compared to open appendicectomies due to less post operative pain and early recovery.

d) *Discussion: Laparoscopic appendicectomy is still the most common emergency operation performed laparoscopically. Diagnostic laparoscopy was the second largest group in our series. Initial results at our institution are very encouraging and comparable to international literature meta-analysis. We feel laparoscopic procedures are safe for a wide range of indications in children. In our centre they account for all appendicectomies, diagnostic laparoscopies, female herniotomies and few advanced procedure. Although laparoscopic procedures have gained an integral place in paediatric surgery and are relatively safe, advanced laparoscopic procedures should be developed, practiced and evaluated in dedicated surgical units to ensure a broad base of experience on which to base future decisions and guidelines.*

Key words : *Laparascopy, appendicitis, child*

INTRODUCTION

One of the significant changes in medical practice that has evolved gradually during the last three decades is the reduction of the traumatic insult inevitable and incidental to surgical interventions.

Laparoscopic surgery in children is not new. Paediatric surgeons were among the pioneers of laparoscopic surgery in the early 1970s,[1] but the vast potential of this "minimally invasive" approach to treat children with surgical conditions has only recentlybegun to be realised. For over three decades, paediatric laparoscopy was restricted mainly to diagnostic use. In the early 1990s, an explosive expansion of laparoscopic surgery occurred in adults as a result of the success of laparoscopic cholecystectomy [(1)].

Nevertheless, interest in laparoscopic surgery in children remained confined to a few enthusiasts initially,[2-4] while the rest of the paediatric surgical community adopted a "wait and see" attitude. More recently however, with increasing experience in paediatric laparoscopic procedures,[5-7] and advances in miniaturised instrumentation, laparoscopy's place in the modern paediatric surgical armamentarium has finally become accepted.

In the USA, it is estimated that 82% of paediatric surgeons perform laparoscopic surgery.[8] The question is no longer whether laparoscopic surgery should be done in children, but what conditions should be treated laparoscopically.

HOW IS LAPAROSCOPIC SURGERY DIFFERENT IN CHILDREN?

It is important to recognize that in infants and small children, the surface area for access is small, the abdominal wall is thin and compliant, the liver margin is below the rib cage, the bladder is largely an intra-abdominal structure, the viscera is close to the anterior abdominal wall and the abdominal cavity is small. In small infants, 400ml CO_2 may be required to establish, a pneumoperitoneum. The so-called obliterated structures, umbilical vein and arteries, and urachus remain relatively large and partially patent in infants.

These anatomical characteristics make access and manipulation in the younger age group a more demanding and difficult task when compared to grown up children or adults. On the other hand, young children have well-defined anatomical landmarks due to lack of excess fat, making recognition and dissection of structures a relatively easy task.

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OUR EXPERIENCE AT SRMC:

Keeping in pace with demand for Paediatric laparoscopy we started laparoscopic surgery in our department in 2005. With the available infrastructure, we made a modest start and within a span of 9 months had 26 cases of laparoscopy done in paediatric age group (Table-1). Our youngest child was 8 months old and oldest child was 18 years old. The cases ranged commonly from appendicectomies (73%) to diagnostic laparoscopy (19%), intrabdominal lymph node biopsies, ovarian cyst removal etc.

We usually prefer the open Hasson's technique of first umbilical port insertion in children as it is done under vision and considered safe in children.

We tend to follow the principle of "triangularisation" in the placement of 3 ports for most of the laparoscopic surgeries in compliance with the ergonomics of laparoscopic surgery. Appendicectomy being the commonly performed procedure in our department (73%), we have standardized the procedure and follow the same principle in all cases.

We use 3 ports inserted at the infraumbilical, suprapubic and left iliac fossa. After skeletonising the appendix, we pass 2 endoloops for ligating the appendix at the base and do an appendicectomy in between the 2 endoloops. The appendix is usually removed by the infraumbilical port. The wound at the umbilicus is closed in layers and the rest of the wound are closed only at the skin level. Of all the cases we had to convert to open laparotomy in one case where the appendix had necrosed and the patient had fecal peritonitis as a result of sloughing of the appendix in entirety.

Table 1. shows an analysis of the children who underwent laparoscopic surgery for various reasons - at SRMC from 2005 till date.

TABLE-1. (n=26)

ANALYSIS OF CHILDREN WHO UNDERWENT LAPAROSCOPIC SURGERY

Sl.No	Name	Age	Sex	Diagnosis	Procedure
1.	M	12	F	AC APPENDICITIS	LAP APPENDIX
2.	RR	14	F	AC APPENDICITIS	LAP APPENDIX
3.	K	7	M	MESENTERIC LYMPHADENOPATHY	LAP LYMPH NODE BIOPSY
4.	SS	15	F	AC APPENDICITIS	LAP APPENDIX
5.	SS	10	F	AC APPENDICITIS	LAP APPENDIX
6.	G	14	M	AC APPENDICITIS	LAP APPENDIX
7.	B	1	M	LEFT NON PALPABLE TESTIS	DIAG LAP WITH LEFT ORCHIDECTOMY
8.	S	13	F	PERFORATED APPENDIX	LAP CONVERTED TO OPEN
9.	D	8	M	PERFORATED APPENDIX	LAP APPENDIX
10.	RN	10	M	AC APPENDICITIS	LAP APPENDIX
11.	JE	8	M	REC. APPENDICITIS	LAP APPENDIX
12.	S	8	F	REC APPENDICITIS	LAP APPENDIX
13.	P	16	F	AC APPENDICITIS	LAP APPENDIX
14.	SF	15	F	LEFT OVARIAN TUMOR	LEFT OVARIECTOMY
15.	T	8 MTHS	M	SUB HEPATIC CYST- CYSTIC DUCT PERF.	DIAG LAP – OPEN CHOLECYSTECTOMY
16.	G	12	M	ACUTE APPENDICITIS	LAP APPENDIX
17.	M	3	F	B/L INGUINAL HERNIA	B/L LAP HERNIOTOMY
18.	SS	15	F	ACUTE APPENDICITIS	LAP APPENDIX
19.	LA	18	F	ACUTE APPENDICITIS	LAP APPENDIX
20.	L	16	F	TB ABDOMEN	DIAGNOSTIC WITH BIOPSY
21	KV	1 ½	M	HIRSCHSPRUNG'S DISEASE	DIAGNOSTIC LAP
22	A	9	M	ACUTE APPENDICITIS	LAP APPENDIX
23	E	9	F	ACUTE APPENDICITS	LAP APPENDIX
24	DP	10	F	ACUTE APPENDICITIS	LAP APPENDIX
25	AK	12	F	ACUTE APPENDICITIS	LAP APPENDIX
26	N	16	F	ACUTE APPENDICITIS	LAP APPENDIX

One of our patient who had fecal peritonitis and had to be converted to open appendicectomies had wound infection and fecal fistula. She had her total appendix sloughed out and stump blow out at the cecum. No other patient had wound infection. All the patients recovered early, had less post-operative pain and returned to school early compared to open appendicectomy group.

While the costs of performing laparoscopic surgery per se was found to be higher compared to open surgery however, all the parents expressed satisfaction post operatively.

Fig. 1 : Photograph showing Laparosocpic appendicectomy in progress

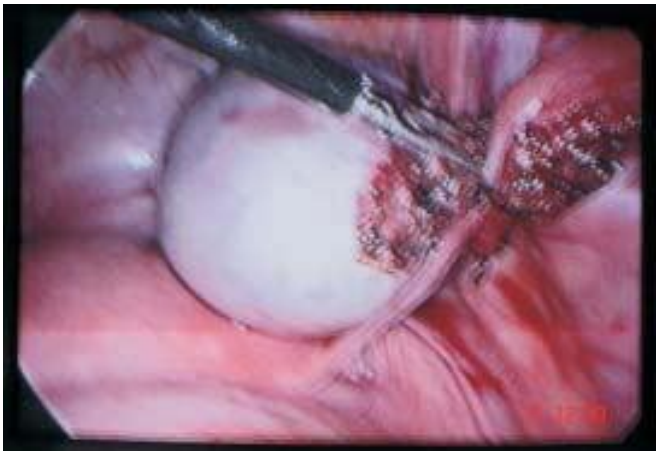

Fig. 2 : Photograph showing Laparoscopic ovariectomy in progress

DISCUSSION:

The traditional Hippocratic ethos provides the background of the idea that the less invasive the procedure, the better. In conditions in which the body wall itself is not affected, it is a pity that the body wall must be opened in a classic open surgery. Body wall related complications do occur, for example infection dehiscence and incisional hernia. Even in the absence of body wall complications, opening of the body wall results in morbidity. The larger the wound, the more fascia, muscles and nerves are transected and more morbidity can be expected. Pain related to access trauma may not only be limited to the immediate post operative period, but also may become chronic. Hypertrophic scars also may become a source of annoyance causing pain, parasthesia and itching. Hypothermia and desiccation of tissues are other adverse effects more prominently noticed in open surgery.

Creation of pneumoperitoneum and extremes of patient position, pose challenges to paediatric anesthesiologists in laparoscopy. An ideal insufflating gas should have minimum physiologic effect, should be absorbed minimally, excretion should be rapid, should have high blood solubility and should be non-combustible. Rarely, complications arise from CO_2 insufflation for pneumoperitoneum during laparoscopy. These include gas embolism, cardiovascular compromise, hypercapnia. The risks are minimised by the use of low pressure CO_2 insufflation in children. Intrabdominal pressure (IAP) up to 12 mm Hg has minimal effects on cardiac output but IAP levels > 15 mm Hg are not well tolerated. Elevated IAP shifts the diaphragm upwards and reduces its excursions. Slight increases in end tidal CO_2 and peak airway pressures might be detectable intraoperatively. This can usually be compensated for by slight hyperventilation.[9]

Laparoscopy in children have been shown to have distinct advantage over the traditional open methods in causing less post-operative pain and wound complications, faster recovery as well as shorter hospital stay. This decrease in morbidity could be attributed to smaller access wound, hence less fascia, muscles, nerves being transected and reduced water and heat loss[10-11]

In our study group though the cost of laparoscopic surgery is marginally higher than open surgery, but taking all the factors (e.g.: reduced analgesia requirement, less hospital stay, early return to school) into consideration, the cost may be same compared to open surgery.

Operating time was more than open surgeries. Comparatively we feel operating time may be reduced in cases of retrocecal or complicated appendicitis. Finding and dealing with a buried or retrocecal appendix will be less time consuming and less traumatic laparoscopically than by open method. We feel laparoscopy is a very important tool when the diagnosis is not certain.

In a Meta analysis report by Aziz O et al [12], they compared studies published between 1992 and 2004 of laparoscopy versus open appendicectomy in children. 23 studies including 6477 children (43% laparoscopic and 57% open were included. They report suggests that laparoscopic appendicectomy in children is associated with less wound infection than open appendicectomy (1.5% Vs. 5%)Operative time was not significantly longer in the laparoscopic group, and post-operative stay was significantly shorter. This study results are comparable to ours.

Incidence of postoperative adhesions is also reduced[13]. Due to magnification and good illumination, endoscopic surgery gives a much better view of the operative field than open surgery. This is particularly true in the pelvis and cardiac end of the oesophagus.

Paediatric laparoscopy is here to stay. It has already invaded the surgical domain. Therefore it would be prudent for all of us not to be endoresistant. "Key hole surgery revolution'' has begun. Laparoscopic cholecystectomy and, to an extent lap appendicectomy have become patient demand operations and surgeons would lose patients if they cannot deliver the 'keyhole' approach.

LONG TERM OBJECTIVES:

1. Recognize the common pediatric conditions that may be treated with minimally invasive surgery

2. Prospective randomized clinical trials of laparoscopic surgery in infants with miniaturized instruments.

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REFERENCES:

1. Gans SL and Berci G. Advances in endoscopy of infants and children. J Pediatr Surg 1971, 6:199-33

2. Sackier JM. Laparoscopy in pediatric surgery. J Pediatr Surg 1991, 26:1145-47

3. Miller SS. Laparoscopic operations in paediatric surgery. Br J Surg 1992, 79:986-87

4. Najmaldin A. Minimal access surgery in paediatrics. Arch Dis Child 1995, 72:107-09

5. Lobe T. Laparoscopic surgery in children. Curr Probl Surg 1998, 35:862-48.

6. Rothenberg SS, Chang JHT, Bealer JF. Experience with minimally invasive surgery in infants. Am J Surg 1998, 176:654-58

7. Chung DH and Georgeson KE. Fundoplication and gastrostomy. Semin Pediatr Surg 1998, 7:213-19

8. Firilas AM, Jackson RJ, Smith SD. Minimally invasive surgery: the pediatric surgery experience. J Am Coll Surg 1998, 186:542-44

9. Tobias JD. Anesthetic considerations for laparoscopy in children. Semin Laparosc Surg 1998, 5:60-66

10. Bessell JR, Karatassas A, Patterson JR et al. Hypothermia induced by laparoscopic insufflation. A randomized study in pig model. Surg. Endosc. 1995, 9:791-96.

11. Mansvelt B, Arnould P, Bertrand C et al. Utilization of gas heater humidifier in the course of colioscopies. Acta Chir. Belg. 1995, 95:100-02.

12. Aziz O, Athanasiou T, Tekkis PP et al. Laparoscopic versus open appendectomy in children: a meta-analysis. Ann Surg. 2006, 243:17-27.

13. Jorgenson JO, Lalak NJ, Hunt DR. Is laparoscopy associated with lower rate of pot-operative adhesions than laparotomy? A comparative analysis in the rabbit. Aust. NZ. J. Surg. 1995, 65:342-44.