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# PROSPECTIVE STUDY OF LAPAROSCOPIC VERSUS OPEN APPENDECTOMY IN CHILDREN:

Surgery

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## ABSTRACT

Despite advances in the diagnostic imaging for acute abdomen, acute appendicitis in young children remains a diagnostic challenge. The incidence of acute appendicitis gradually increases after birth, peak during teens and then gradually decreases. Though neonatal appendicitis is rare, it is often more complicated. Laparoscopic appendectomy has gained much popularity for adult appendicitis. In paediatric age group citing the technical difficulties and common late presentations of the disease, the usage of laparoscopic appendectomy is not common.

In this prospective study, we have analyzed the intraoperative and post-operative outcome, hospital stay, complications in open versus lap appendectomy in 100 randomised appendectomy done in our department during the period of one year from 2017 April to 2018 march. Mean age group for the patients were 10:8 years. Mortality was 0 in both the groups. Male: female ratio is 9:7. In the laparoscopic group there is 10% minor complication and no severe complication. But in open group there were 18% major complication and 20% minor complication. Post-operative pain and duration of stay were also significantly less in Lap appendectomy group.

Based on our study, we propose and conclude Laparoscopic appendectomy in paediatric age group does not carry a greater risk of intra or post-operative complications and can therefore safely be used and established as a standard operative procedure for appendicitis in Children.

## KEYWORDS

Appendicitis, appendectomy, open, sepsis, laparoscopy.

## INTRODUCTION:

Acute appendicitis is one among the most common acute surgical emergencies in children. Appendectomy incidence peaks between the ages of 10 to 12 years and has the life time risk of 7-9 % [(1)]. Based on epidemiological studies it is noted apart, 12% male and 23% females undergo emergency appendectomy during their lifetime.

In 1886, Reginald Fitz provided an accurate description of clinical features and progression of disease process of Appendicitis. In 1887, Thomas Morten performed the first successful open appendectomy. However first laparoscopic appendectomy in a child was performed by Kurtsem in 1983. [(2)] Since then lap appendectomy gained popularity in adults and about 20% of cases are managed by lap. Procedure worldwide for appendectomy.[(3)] However the use of lap appendectomy as the first choice in the treatment of acute appendicitis in children are debated because of longer operating time, perceived higher incidence of intra-abdominal abscess post-operatively, higher cost and more chances of vascular and bowel injuries.[(4,5)] Several studies have proved beyond doubt, the concerns about the increased post-operative complications in complicated Appendicitis operated laparoscopically are a myth and some studies have demonstrated lower complication rate and shorter hospital stay in lap Appendectomy.[(6,7).]

Diagnosis of appendicitis in children especially in infants is always difficult. Paediatric appendicitis score combines clinical manifestation, predictive laboratory findings and radiological investigations on a 10 point score [(8).] Pediatric appendicitis score

| Symptom | Score |
|---|---|
| Anorexia | 1 |
| Pyrexia | 1 |
| Nausea or vomiting | 1 |
| Migration of pain | 1 |
| Raised white cell count | 1 |
| Raised neutrophil count | 1 |
| RIF tenderness | 2 |
| Cough/percussion/hopping tenderness | 2 |
| TOTAL | 10 |

The history of anorexia and vague periumbilical pain, followed by migration of pain to the right lower quadrant (RLQ) and onset of fever and vomiting, which are the classical symptoms are observed in fewer than 60% of patients. In infants diagnosis is difficult due to atypical presentation and rapid evolution to generalized peritonitis and appendicular perforation. Substantial rise in the incidence of perforation and generalized peritonitis are often observed in younger age groups.

In this study we compared and evaluated factors such as operating time, post-operative pain, hospital stay, major and minor complication as a prospective study in patients assigned laparoscopic versus open appendectomy procedure.

## METHODOLOGY

It is a prospective randomized controlled study carried out in the Department of Paediatric Surgery in a teaching hospital in South India. Both open and laparoscopy surgeries were carried out by the Surgeon who had rich experience in laparoscopic procedures and the institution has a full-fledged laparoscopic surgical instruments. The study was conducted between April 2017 and March 2018.

The process of randomization is by sequential allotting. The total patients enrolled in the study were grouped in to two groups with each arm having 50 patients.

All children were diagnosed on the basis of Paediatric appendicitis score including clinical examination, laboratory finding in the form of total leukemia count and C reactive protein. Ultrasound and X-ray abdomen done for all cases. Based on randomization, group "A" patients were subjected to three port lap appendectomy and group B McBurney open appendectomy.

### Inclusion Criteria

1. All Paediatric age group patients upto 12 years diagnosed as acute appendicitis.
2. Patients willing for study and surgical therapy.
3. Consent by parents or legal guardian.

### Exclusion Criteria

1. Patient who had incidental appendectomy
2. Comorbid condition
3. Bleeding Diathesis

### Ethical Clearance

The study prospect was presented and approved by the institutional ethics committee. All patients were subjected to informed consent protocols.

### Group A Lap appendectomy

All surgeries were carried out under general anaesthesia following

standard safety protocols. Pre-operative cephalosporin antibiotic is given with induction. We used three ports laparoscopy for this procedure. One 10mm part in the umbilicus used as a camera port with 30 degree telescope .Two 5mm ports , one on (L) mid spino umblical line and another 5mm part in the hypogastrium were used for operative instruments. Exploration of the peritoneal cavity done, followed by identification of the diseased appendix.

Mesoappendix is identified and cauterized using bipolar cautery. The appendix is dissected free from adhesions and mesoappendix. Base of appendix are ligated with intracorporeal sutures. Appendectomy done and specimen removed through umbilical port. Peritoneal toileting carried out with suction irrigations. Drains not placed routinely and wounds closed.

**Group B Open Appendicectomy:**
Under General anaesthesia, using classic McBurney approach appendectomy done and wound closed. Drains placed when there is peritoneal pus collection.

**Data Analysis:**
Data collected for variables including Demographic factors, operative time, intraoperative problems, conversion, length of hospital stay, post-operative complication. data were tabulated for statistical analysis and tested for significance by Chi square test, a p value <0.05 was considered as significant.

**Minor complication**
1. Superficial Surgical site infection
2. Post-operative fever, leukocytosis
3. Paralytic illness

**Major Complication**
1. Subcutaneous abscess requiring re operative procedures under Anaesthesia
2. Intra-abdominal abscess
3. Mechanical ileus
4. Post-operative renal insufficiency

**RESULTS**
Total 100 cases were operated and randomized with Group A (Lap. Appendectomy) Group B (Open Appendectomy). There were 70 boys and 30 girls and mean age group was 10.8 years. The mean duration of symptoms, total leukocyte count, C-reactive protein values and Ultrasound findings were tabulated in Table I and Figure1.

**Table 1: Demographic and Preoperative data**

| Variable | Group A (Lap. Appendectomy) | Group B (Open Appendectomy) | Chi Square | P Value | Mean |
|---|---|---|---|---|---|
| I. Sex<br>i. Male<br>ii. Female | <br>33<br>17 | <br>37<br>13 | 0.7619 | 0.3827 | |
| II. Age | 10.7 | 10.9 | 0.105 | 0.254 | 10.8 yrs. |
| III. Weight (mean in kg) | 28 | 28.6 | 0.862 | 0.124 | 28.3 |
| IV. Duration of symptoms in days | 3.82 | 3.79 | 0.087 | 0.231 | 3.805 |
| V. Total WBC count in thousans | 15.75 | 15.73 | 0.102 | 0.25 | 15.74 |
| VI. CRP | 59.84 | 63.37 | 0.359 | 0.451 | 61.60 |

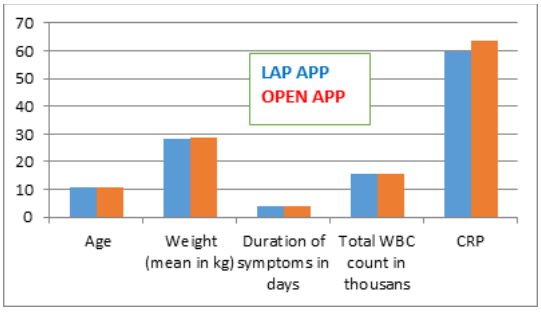


**Figure 1: Demographic and preoperative data.**

The mean preoperative symptoms duration for both the groups together was 3.805 days and the mean total count was 15740 cells and mean CRP value was 61.60. Total Leucocyte count and CRP values were raised in all cases.

Ultra sonogram could identify inflamed appendix in 82 cases and periappendicular collection in 48 cases. The differences of these values in each group were not statistically significant.

**Intraoperative and post-operative results :**
The mean operative time for Lap. Appendectomy Group A was 46.28 minutes and for open appendectomy it was 53.37 minutes.. This is statistically significant with P value 0.001. There were no cases of conversion to open in assigned group.

**Group A:**
In 50 cases of Lap appendectomy, 26 cases had omental adhesions with adhesion and it was meticulously dissected. 15 cases had intra peritoneal turbid pus collection and free fluid which was aspirated using suction irrigation.. The appendix was gangrene at this tip in 12 cases. Appendix was perforated in 14 cases. No accidental visceral or vascular injury occurred.

All patients were observed in the post-operative ward and treated with antibiotics and analgesic. Mean hospital stay was 5.5 days. 5 cases had SSI in the umbilicus and responded to conservative management. One case of Intra-abdominal pelvic collection noted and aspirated under USG guidance and responded to treatment. Mean duration of return to normal activities were 8.8 days.

**Group B:**
In open appendectomy out of 50 patients there were fluid collection and localized pus in 18 cases. The peritoneal wash given and post operatively drain kept. Appendix was gangrene in 11 cases and perforation in 16 cases. 6 cases needed extension of the incision to deal with retrocoecal and sub hepatic appendicitis. No accidental injury to bowel or vascular structures occurred. Mean hospital stay was 7.6 days.

Minor wound infection was noted in 10 cases, with 8 cases responded to conservative managements and 2 cases needed sub cutaneous abscess drainage under anesthesia. One patient developed faecal fistula and responded to conservative management. Pelvic collection with intraabdominal abscess developed in 6 cases. 5 cases responded USG guidance aspiration and antibiotic therapy. However in one case we needed to reopen under anesthesia and do peritoneal lavage and after stormy post-operative period patient recovered. No fatal incidents noted.

Mean duration for return to normal activity was 12.39 days.
The data were tabulated in Table II.

**Table 2: Intra Operative Post-operative Data**

| | Group A | Group B | P Value |
|---|---|---|---|
| Operating time | 46.28 | 53.37 | 0.0001 |
| Visceral injury | nil | Nil | |
| Conversion to open | Nil | | |
| Minor wound infection | 5 | 10 | 0.0001 |
| Major wound infection | 0 | 2 | 0.0001 |
| Post-operative pelvic collection | 1 | 5 | 0.0001 |
| Hospital stay mean | 5.5 | 7.6 | 0.002 |
| Normal activity retained | 8.95 | 12.39 | 0.005 |

The major complications in each group were tabulated in table 3 and Figure 2

**Table 3: Major complications**

| Major Complication | Group A | Group B |
|---|---|---|
| Subcutaneous Abscess requiring drainage under Anaesthesia | - | 2 |
| Pelvic Collection | 1 | 5 |
| faecal Fistula | 0 | 1 |
| Mechanical Ileus | 0 | 1 |

**Table 3: Major complications**

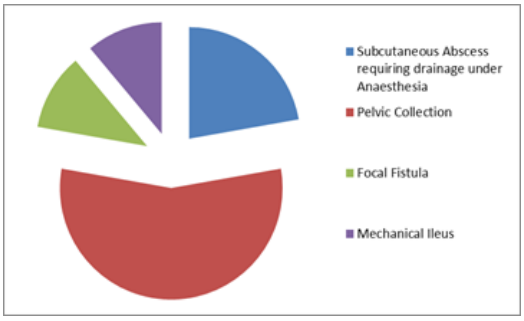


**Figure 2: Major complications in open appendectomy**

## DISCUSSION:

Although universally in view of shorter duration of hospitalization, lesser post-operative period, minimal wound complication, shorter usage of antibiotics, early recovery to normal activities and better cosmetics, minimally access laparoscopy procedures are generally accepted [9]. There is still persistent perception that there is a higher rate of intraoperative complications in children such as injury to vessels and bowels due to the smaller abdominal cavity and also increased intraabdominal abscess. [10].

We have shown through our study this is a perceived misconception and a unwarranted fear. If adequate care is given and open trocar approach is followed, injury by trocars to the vessels and viscera can be avoided.

In our study there were 5 minor wound infections in Lap. Appendectomy group and 8 minor wound infections in Open Appendectomy group. This is quiet comparable. Kurosh Paya et al in their study of comparison of Open versus Laparoscopic Appendectomy in children, comprising 500 cases have reported 4:7 percentage of minor wound infection in Lap Appendectomy versus Open Appendectomy. In our study the ratio was 5:7. [11]

In our study we encountered one case of major complication which resulted in pelvic collection of abscess in lap appendectomy group which was resolved with conservative therapy. But in open surgery group we had 9 cases of major complication including 2 cases of sub cutaneous abscess, 5 cases of intra-abdominal abscess, one case of mechanical ileus and one case of fecal fistula.

In the study reported in the journal of society of laparo endoscopic surgeons Kurosh Paya have reported all severe complications for appendectomy occurred in the open group (n=11, 3%); the difference is statistically significant (p=0.04). There were significantly fewer minor complications in the laparoscopic group (n=17, 12.8%) than in the conventional group (n=72, 19,9%), p=0.007.

Mean operative time for Lap Appendectomy versus open appendectomy in our series was 46.41minutes and 53.42 minutes. It denotes more operative time is required for open appendectomy. Li et al have reported mean operative time of 55.8 minutes versus 57.94 minutes ([12]. Mohammed G. Kairallal et al have reported 56.41 and 63.42 minutes respectively [13]. All these studies have implied more operative time for open appendectomy. However Frauguzzmann etal have in their study shown for Lap. Appendectomy mean operative time was 112 minutes and in open appendectomy it was only 72 minutes. With advanced optics and technical skill, the operating time for Laparoscopic procedure can be still further reduced.

Post-operative hospital stay in our study for Lap versus Open appendectomy was 5.57days and 7.6 days respectively. Most of the open cases required more hospitalization as the wound infection rate were high.Aziz et al [14] have reported much reduced hospital stay for Lap. Appendectomy. Mohammed G. Khiralkal in his study reported hospital stay of 2.75 versus 4.38 days [15]. However Ikeda et al [16] and Miyano et al [17] have shown longer duration of stay in both groups ranging from 6.5 to 14 days in Lap and 7.8 to 16 days in open surgery.

Incidence of wound infection was less in Lap in comparison with open procedure. Many authors also have reported the same findings. Bartin et al [18], Far ss etal[19] Yagmuru et al [20] have also shown much less complication with Lap. Appendectomy.

The pain score was comparatively less for the lap appendectomy group and patient comfort were much noted .The advantage of laparoscopic procedures were the early return to normal activities. In our study we could observe the normal activity return time for lap appendectomy was 8.95 days while it was much higher at 12.39 days for open appendectomy group.

## CONCLUSION:

Laparoscopic Appendectomy is a safe and effective procedure and has considerable advantage over Open Appendectomy in children. There is considerable reduction in post-operative pain and much reduced incidents of major post-operative complications. Laparoscopy procedures can be safely employed for paediatrics appendicitis with less hospital stay and early return to normal activities,

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