Acta Biomedica Scientia
e - ISSN - 2348 - 2168
Print ISSN - 2348 - 215X
www.mcmed.us/journal/abs
Research Article
Pediatrics

COMPARATIVE EVALUATION OF STEPWISE VERSUS CONVENTIONAL THREE-PORT LAPAROSCOPIC APPENDICECTOMY IN PEDIATRIC APPENDICITIS

Dr Abhiram Kumar C[1]*, Dr Saginala Ravichandra [2], Dr.M.Pallavi[3]

[1*]Assistant Professor, Department of Paediatrics, Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research, Melmaruvathur, Tamil Nadu, India.
[2]Katuri Medical College, Chinnakondrupadu, Guntur, Andhra Pradesh, India.
[3]Assistant Professor, Department of Paediatrics, Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram, Andhra Pradesh, India.

ABSTRACT

Acute appendicitis is the most common cause of emergency intra-abdominal surgery in children. While the conventional laparoscopic appendicectomy typically involves three ports, modified techniques such as the stepwise approach aim to reduce invasiveness, improve cosmetic outcomes, and lower costs. Objective: This study compared clinical outcomes and complication rates between the stepwise laparoscopic appendicectomy technique and the conventional three-port method in pediatric patients. Methods: A prospective observational study was conducted including children diagnosed or suspected with appendicitis who underwent laparoscopic appendicectomy performed by 12 specialists. Patients were assigned to either a stepwise port placement technique, where ports were added based on intraoperative findings, or the standard three-port method. Demographic data, operative details, complication rates, and postoperative outcomes were collected and analyzed using descriptive statistics, Student's t-test, and analysis of variance. Results: Among 700 patients (Stepwise, N=250; Standard, N=450), complication rates were comparable between groups (5.4% vs. 10.1%, $p > 0.05$). The mean operative time was shorter in the stepwise group (50.5 vs. 64.5 minutes), though not statistically significant. The number of ports used per patient was significantly lower in the stepwise group (1.38 vs. 2.95, $p = 0.04$), indicating a less invasive procedure. No significant differences were observed in perforation rates, negative appendicectomy rates, or length of hospital stay. Conclusions: Compared to the usual three-port approach, the stepwise laparoscopic appendicectomy is both safer and just as effective in children, with far fewer ports needed. Laparoscopy can lead to little surgical trauma, improved how the area appears after surgery and sometimes even reduces costs. More extensive randomized trials are necessary to confirm these findings and monitor long-term results that matter to patients.

Keywords:-Laparoscopic appendicectomy, Stepwise technique, Pediatric appendicitis, Minimally invasive surgery, Surgical outcomes.

Access this article online		
Home page **www.mcmed.us/journal/abs**		**Quick Response code**
Received:25.08.19	**Revised**:12.09.19	**Accepted**:15.10.19

INTRODUCTION

The majority of children who have emergency surgeries for abdominal problems have acute appendicitis [1]. Before 1983, surgeons commonly chose open appendicectomy, but now most people receive laparoscopic appendicectomy, thanks to Kurt Semm [2]. In 1991, Valla and her colleagues published the first

Corresponding Author: **Dr Abhiram Kumar C**

account of the procedure in children [3] and it is now widely used in these centers. While doing a laparoscopic appendicectomy usually requires three ports, various techniques have been suggested to achieve better results, better cosmetic outcomes and a lower cost [4].

MATERIALS AND METHODS

The study included children with appendicitis or those suspected to have it, who underwent laparoscopic surgery after they experienced abdominal pain and continued right lower quadrant areas of sensitivity. Any person with major swelling in the abdomen, reasons against blowing air into the abdomen or who requires surgery through an open incision was not included in the study. After giving general anesthesia, a breathing tube was inserted in the patient's throat, then intravenous antibiotics were given. A total of 12 laparoscopic appendectomy specialists participated in the study. Using the Hasson method, we made an umbilical opening and positioned the ports according to where the appendix was. The group using the stepwise technique operated the telescope and built more ports where the appendix looked firm and could be included. In the traditional way, three ports were put in place before a pathology assessment was done. The appendectomy was performed using triangulation methods and after operating, local anesthetic was injected, appendix specimens were analyzed and patients began moving early. Upon receiving antibiotics after their operation, patients were discharged when they met the discharge requirements. After four weeks, the patients were followed up. All information was analyzed with descriptive analysis, Student's t-test and analysis of variance.

RESULTS

The complication rates and clinical outcomes between the Stepwise Standard and Standard surgical techniques were compared in this study.

Complications

As shown in Table 1, among patients undergoing the Stepwise Standard procedure (N=10), the incidence of port site infection was reported in 3 cases, while in the Standard group (N=26), 4 cases were observed. Post-operative intra-abdominal collections occurred in 4 patients in the Stepwise group compared to 8 in the Standard group. Adhesive bowel obstruction was noted in 1 patient in the Stepwise group and 3 patients in the Standard group. Prolonged post-operative ileus affected 2 patients in the Stepwise group versus 4 in the Standard group. Intrabdominal abscess was observed in 1 patient in the Stepwise group and 3 in the Standard group. Notably, the category of "Other" complications was absent in the Stepwise group but recorded 6 cases in the Standard group. Overall, complication frequencies were numerically lower or comparable in the Stepwise group relative to the Standard group, suggesting a favorable safety profile.

Demographics and Clinical Outcomes

Table 2 details the comparison of baseline characteristics and perioperative outcomes between the Stepwise group (N=250) and the Standard group (N=450). The mean age of patients in the Stepwise group was 15.20 years compared to 24.10 years in the Standard group, with this difference not reaching statistical significance ($p > 0.05$). The male-to-female ratio was similar between groups (3.05 vs. 2.55, p = ns), indicating comparable gender distribution.

The perforation rates were almost identical, with 27.4% in the Stepwise group and 28.0% in the Standard group (p = ns). Negative appendicectomy rates showed a trend toward being higher in the Stepwise group (9.5%) compared to the Standard group (4.5%), though this difference was not statistically significant.

Operative time was shorter in the Stepwise group, averaging 50.50 minutes versus 64.50 minutes in the Standard group. Despite this numerical difference, the operating time did not reach statistical significance, potentially due to variability in surgical complexity or surgeon experience.

The overall complication rate was lower in the Stepwise group (5.4%) compared to the Standard group (10.1%), although this did not reach statistical significance. Length of hospital stay was virtually the same between groups, with means of 2.98 days and 2.95 days respectively.

A significant finding was the number of ports used per patient, which was markedly lower in the Stepwise group at 1.38 compared to 2.95 in the Standard group ($p = 0.04$). This reduction in port usage suggests that the Stepwise technique may be less invasive, potentially reducing surgical trauma and associated morbidity.

In summary, the Stepwise Standard procedure demonstrated similar clinical safety and efficacy compared to the Standard technique across a range of outcomes, including complication rates, perforation, and hospital stay. The significantly reduced number of ports used in the Stepwise group highlights a possible advantage in surgical technique, favoring minimal invasiveness without compromising patient safety or operative efficiency.

Table 1: Complications

Complications	Stepwise Standard N=10	Standard N=26
Port site infection	3	4
Post-operative intra-abdominal collection	4	8
Adhesive bowel obstruction	1	3
Prolonged post-operative ileus	2	4
Intrabdominal abscess	1	3
Other	0	6

Figure 1: Surgical Complications: Stepwise (N=10) vs. Standard (N=26)

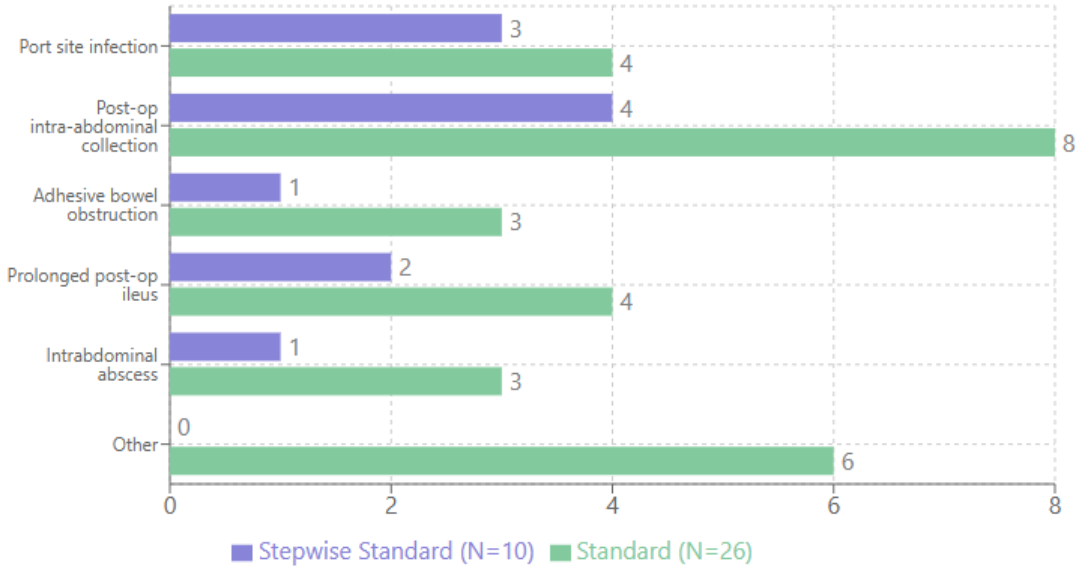


Figure 2: Complication Rates (% of cases)

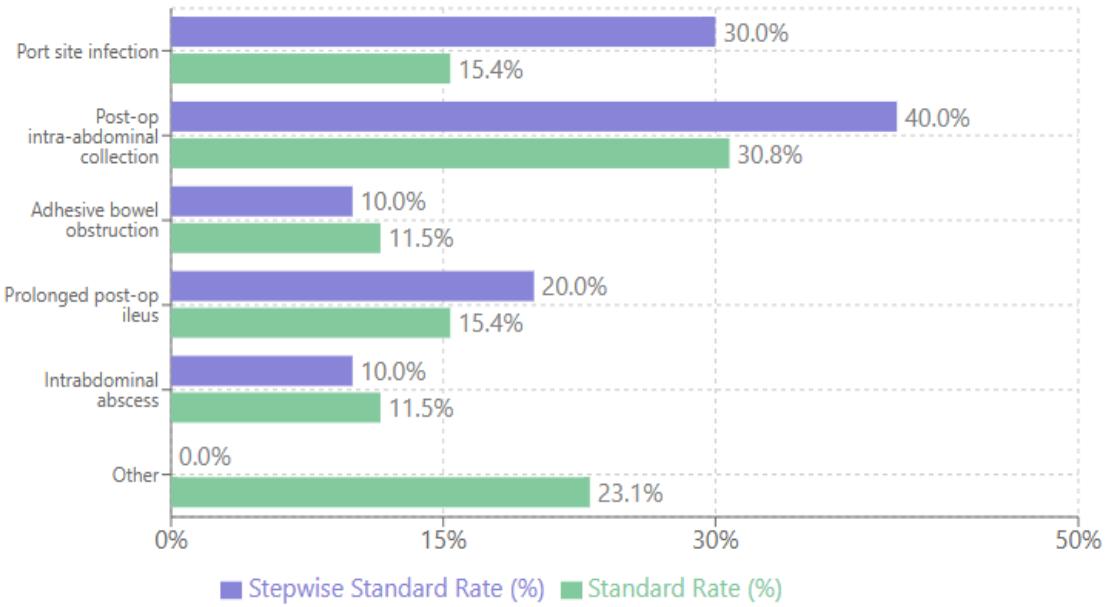


Figure 3: Number of Ports per Patient

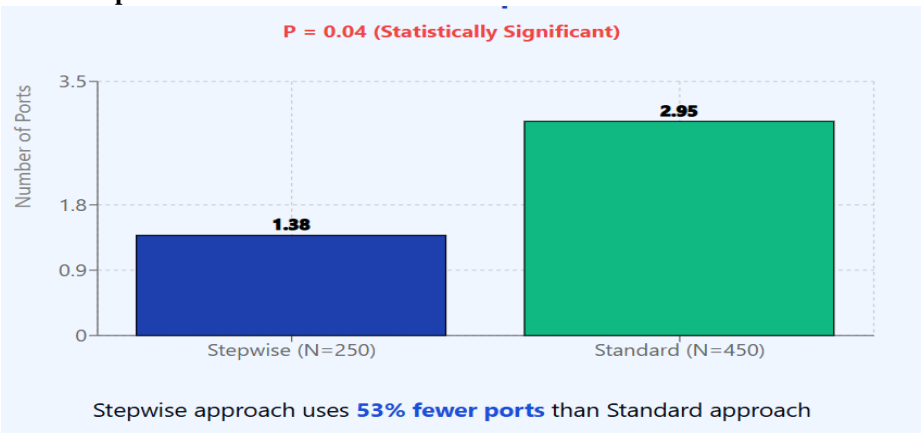
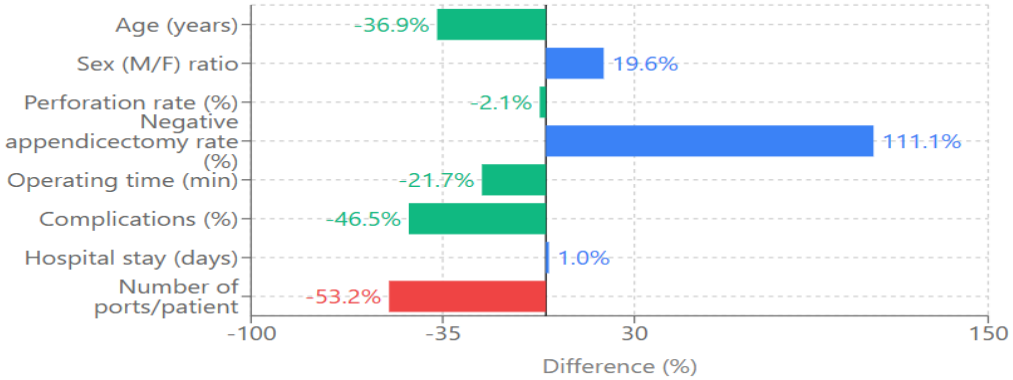


Figure 4: Percentage Difference (Stepwise vs Standard)



DISCUSSION

The surgical approach presented in this study is a modified laparoscopic appendicectomy. The use of several ports depends on the difficulty of the surgical procedure. From our research, the outcomes for a conventional three-port appendicectomy were just as good as those for a stepwise appendicectomy. Except for the ports used, the two groups did not differ statistically. People who have appendicitis are properly and safely treated using a stepwise procedure. It was decided if an additional port was needed, based on how difficult the surgeon thought the procedure would be. Although appendix removal through just one or two ports should cause less damage to the surrounding tissues, further research on a larger group is necessary to confirm this [5]. In addition, using this approach can cut the number of ports by over 50%. Because appendicectomy is done so frequently, it helps the nation save substantial costs [6]. It starts with a need for operations cost investment. Using what we found from our initial experience, we came up with an algorithm. It is possible to reach the umbilical port with an appendix using the one-port technique. The tip of the appendix is taken and gently pulled toward the gallbladder to measure its movement. Usually, most of the appendix can come out through the umbilical hole if it is reachable. The same technique as an open procedure is followed for appendicectomy. A second area can be made for inserting the port if blockages in the abdomen keep the appendix from moving. Usually [7], the port is put in the left iliac fossa, below and to the side of the anterior superior iliac spine. The appendix may be taken out via the umbilical port site and the usual laparoscopic way or it can be removed within the abdomen using the same site. For serious appendicitis where exposure, separation of tissues and washing the belly are likely to be challenging, another port (second five-millimeter disposable) may be added. The laparoscopic technique is followed for performing the appendicectomy as usual [8]. Our pilot study was not set up using a randomised method. The patients chosen were selected at the surgeons' discretion based on how much experience they had. We agree that issues like this do not prevent bias from happening. The study included only a few people. More research should be performed to understand both returning to normal life and the use of pain medications after the operation. Most find the stepwise technique simpler than a three-port technique and need less training to administer [9].

CONCLUSION

The findings proved that performing appendicectomy laparoscopically in stages is equal to the usual three-port method in children with appendicitis. Comparable clinical outcomes were found when looking at rates of complications, holes caused in the bowel, the number of days people spent in the hospital and safety. Importantly, these results were obtained using the stepwise technique which means fewer ports were needed for each patient, showing the procedure was less invasive. Less access to the abdomen because of laparoscopy means that surrounding tissue is better protected, surgical scars can be smaller and more patients can benefit from lower medical costs because appendectomy is so common.Results suggest that surgeons may use intraoperative examinations and difficulty of the case to determine individualized placement of ports, without harming care quality. The flexible method may help perform laparoscopic appendectomy more quickly and involve less from the surgical team, meaning it could be offered in places with few resources or surgeons.It is important to remember, though, that the study's findings may be biased since its sample was limited, its design was not randomized and there was no standard for how cases were chosen. They can result in bias that makes it difficult to apply some research results to a larger group. We need additional high-quality studies with many patients to see whether the stepwise technique is truly safe, useful and cost-effective. Future research should also consider pain after the procedure, the quantity of pain medicine necessary, patient happiness and the resulting function and appearance in the long term.In short, this procedure promises to be minimally invasive, designed for each patient and just as safe and effective as traditional open surgery, with greater chances for a speedy recovery and fewer medical expenses. The use of this procedure, after more evidence is available, may greatly improve surgery for appendicitis patients everywhere.

REFERENCES

1. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. (1990). The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol*, 132, 910–925.
2. Semm K. (1983). Endoscopic appendectomy. *Endoscopy*, 15, 59–64.
3. Valla JS, Limonne B, Valla V, Montupet P, Daoud N, Grinda A. (1991). Laparoscopic appendectomy in children: report of 465 cases. *Surg LaparoscEndosc*, 1, 166–172.
4. Roberts KE. (2009). True single port appendectomy: first experience with the "puppeteer technique". *Surg Endosc*, 23, 1825–1830.
5. Hong TH, Kim HL, Lee YS, Kim JJ, Lee KH, You YK. (2009). Transumbilical single port laparoscopic appendectomy (TUSPLA): scarless intracorporeal appendectomy. *J Laparoendosc Adv Surg Tech A*, 19, 75–78.
6. Nguyen NT, Reavis KM, Hinojosa MW, Smith BR, Stamos MJ. (2009). A single port technique for laparoscopic extended stapled appendectomy. *Surg Innov*, 16, 78–81.
7. Merchant AM, Cook MW, White BC, Davis SS, Sweeney JF, Lin E. (2009). TransumbilicalGelport access technique for performing single incision laparoscopic surgery (SILS). *J Gastrointest Surg*, 13, 159–162.
8. Schier F. (1998). Laparoscopic appendectomy with 1.7 mm instruments. *Pediatr Surg Int*, 14, 142–143.
9. Stanfill AB, Matilsky DK, Kalvakuri K, Pearl RH, Wallace LJ, Vegunta RK. (2010). Transumbilical laparoscopically assisted appendectomy: an alternative minimally invasive technique in paediatric patients. *J Laparoendosc Adv Surg Tech A*, 20, 873–876.

Cite this article:
Dr. Abhiram Kumar C. (2019).Evaluation Of Stepwise Versus Conventional Three-Port Laparoscopic Appendicectomy in Pediatric Appendicitis. *Acta Biomedica Scientia*,6(3), 354-358.

Attribution-Non Commercial-No Derivatives 4.0 International