

Open Versus Laparoscopic Appendectomy In Children: A Comparison Of Outcomes

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Abstract

BACKGROUND/PURPOSE: Laparoscopic treatment of pediatric appendicitis remains controversial especially in cases of complications including perforated and gangrenous appendicitis and their attendant overall postoperative outcomes. This study evaluates the comparison of various outcomes in open (OA) and laparoscopic appendectomy (LA).

METHODS: A retrospective chart reviewed was performed on 382 consecutive patients who underwent either pediatric laparoscopic or open appendectomy for diagnosis of acute appendicitis between January 2005 and December 2009. Data was reviewed for age, sex, weight, type and length of operating time, operative findings, complications, and length of stay and histology reports.

RESULTS: A total of 382 cases of pediatric appendectomy were reviewed, 276 (72%) were performed as OA and 106 (28%) by LA. There were only six conversions (LA+OA) which were excluded from this analysis representing a conversion rate of 5.66%. The mean age for the open appendectomy group was 9.71 ± 2.91 versus 11.24 ± 2.11 for the laparoscopic group ($P < 0.001$). Body weight was between 21 and 50kg in 204 patients (74%) in the OA group and in 72 (68%) in the LA group ($P < 0.01$). The mean operating time was 38.0 ± 11.6 minutes for the OA group as against 45.7 ± 14.3 minutes in the LA group ($P < 0.0018$). During surgery, 30 patients (10.9%) in the OA group and 10 (9.4%) in the LA group were found to have perforated appendicitis, while a gangrenous appendix was found in 24 patients (8.7%) of the OA group and in 3 (2.8%) of the LA group, resulting in a total of complicated appendicitis of 19.6% in the OA group and of 12.2% in the LA group. There were 26 postoperative complications; 23 (8.3%) in the OA group and 3 (2.8%) in the LA group ($P < 0.25$). OA patients were hospitalized 3.49 ± 2.43 days on the average, while LA patients were hospitalized 2.71 ± 1.71 days ($P < 0.012$). Histology was negative for 28 (10.1%) of the OA patients and for 16 (15%) of the LA patients ($P < 0.25$), yielding a 25% negative appendectomy rate in total.

CONCLUSION: These findings show that laparoscopic appendectomy is a safe and effective alternative in the management of pediatric appendicitis. This technique allows a complete visualization of the abdominal cavity enabling diagnosis and treatment of other abdominal pathologies. Less postoperative complications and shorter hospital stay were evident in this study, and early discharge did not appear to be influenced by age, gender or weight.

INTRODUCTION

The laparoscopic treatment of pediatric appendicitis remains controversial particularly in complicated cases like gangrenous and complicated appendicitis. Laparoscopic appendectomy (LA) was first performed by Semm in 1983 and has since become popular¹. Whereas between 4% and 20% of all appendectomies are already done laparoscopically in adults, only a few specialised centers routinely perform this procedure in children². This lack of unanimity continues, despite numerous studies reporting the safety, benefits and efficacy of LA in children³. Criticisms of laparoscopic appendectomy include increased operative cost,

mainly due to the use of disposable laparoscopic instruments⁴, increased operative time and concerns about a higher incidence of intra-abdominal abscesses especially after perforated appendicitis⁵, while proponents of laparoscopic appendectomy mention improved wound healing and reduced postoperative pain and also support the idea of laparoscopically evaluating the peritoneal cavity prior to committing to appendectomy especially in difficult cases [4], with ultimately earlier discharge from hospital⁶ translating to earlier return to activity⁶.

Although studies in adults show no benefit of LA to OA

with most of the reports focussing on longer operative time and increased expenses with laparoscopic appendectomy⁷, in some retrospective studies in children, they were found to have less emesis, reduced incision pain, fewer wound infections and fewer complications with laparoscopic appendectomy though it is more expensive⁸. The surgical management of complicated paediatric appendicitis (gangrenous or perforated) has been more controversial, and the role of laparoscopy in its treatment has not yet been established⁹. The primary aim of this single-centre, retrospective review was to evaluate comparisons of outcomes in open and laparoscopic appendectomy in children.

METHODOLOGY

A retrospective chart review was performed on 382 consecutive patients who underwent either pediatric laparoscopic or open appendectomy for diagnosis of acute appendicitis between January 2005 and December 2009 in Midwestern Regional Hospital, Limerick, Ireland. Hospital in-patient enquiry (HIPE) was used to identify the total number of these pediatric surgical patients who were aged from 0 to 14 years. This tertiary care facility is one of the busiest acute surgery units in Ireland that provides acute surgical services among others.

Demographic data collected included age, gender and weight. Clinical data included operative findings; histology, postoperative complications, operative time and length of stay either for laparoscopic or open appendectomy. Based on these outcomes, comparisons were made. Inclusion criteria were children aged from 0 to 14 years who had either open or laparoscopic appendectomy while the exclusion criteria were children above 14 years and those that had laparoscopic appendectomy converted to open. Chi-square and t-test were used to compare groups and the threshold for statistical significance was set at a two-tailed p-value of <0.05.

RESULTS

Of the 382 cases of pediatric appendectomy reviewed, 276 (72%) were performed as OA and 106 (28%) by LA. There were only three conversions (LA+OA) which were excluded from this analysis, representing a conversion rate of 2.8%. All the three cases were for perforated appendicular disease. Age ranged from 0 to 14 years and the male-to-female ratio was 1.3:1, the mean age for the open appendectomy group was 9.71

DISCUSSION

Laparoscopic appendectomy has offered huge benefits to children in the recent past: the first report of LA in children was by Ure et al.¹⁰, who presented a small prospective series of about 43 patients concluding that it was a safe procedure. Subsequently there were three European studies confirming the feasibility of laparoscopic appendectomy in children on a routine basis. El Ghoneimi¹¹ compiled a series of 1,379 LAs without any control and Valla et al.¹² similarly published 465 laparoscopic cases without control group. Also Valet et al.¹³ presented a comparison of 200 LA versus 203 OA (total 403 cases) with regards to complicated appendicitis. They all noted numerous benefits including better exposure of the abdominal cavity, efficient peritoneal lavage, improved cosmesis, decreased rate of misdiagnosis, shorter hospital stay, better pain control and early return to normal activities^{10,11,12}.

Our results show that LA can be safely integrated into the daily practice of surgery in children with minimal complication rates in comparison to the open technique and with a conversion rate of 2.8% which compares favourably with what is reported in the literature¹³. As for postoperative complications, there was more wound infection in the OA group than in the LA group, possibly because in OA the appendix is delivered directly through the wound risking wound infections, whereas in LA it is delivered via a bag or into the laparoscopic port. There was only one case of postoperative intraabdominal abscess (which is one of the most common concerns of anti-LA surgeons) in the LA group. Most importantly, there were four cases of small bowel obstruction that required surgical intervention (due to bands and adhesions) from OA as against none after LA. In general, the complication rate for OA is far higher than for LA.

Length of operating time has always been a major worry in LA; Valet et al.⁸ reported an average length of operating time of 40 minutes in comparison to 45 minutes in this study. As surgeons become more familiar with laparoscopic surgery techniques, differences in length of operating time will become insignificant¹⁴.

The majority of papers published showed that the length of stay in the hospital was significantly shorter when patients were treated by LA, which substantiates the hypothesis that laparoscopy allows for faster return of normal organ functions and also reduces hospital cost. Analysis of pathologic findings shows a higher rate of negative

appendectomies in the OA group.

CONCLUSION

These findings show that laparoscopic appendectomy is a safe and effective alternative in the management of pediatric appendicitis. This technique allows for a complete visualization of the abdominal cavity enabling diagnosis and treatment of other abdominal pathologies. Less postoperative complications and shorter hospital stay were evident in this study, and early discharge did not appear to be influenced by age, gender or weight. We agree with other authors that with better training, improved surgical techniques and refinement of equipment, laparoscopic appendectomy will become the procedure of choice

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