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## Comparison between open and laparoscopic appendectomy: A systematic review

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### Abstract

**Introduction:** Open appendectomy (OA) has been the treatment of choice for acute appendicitis since its introduction by Mc-burney in 1884. Laparoscopic appendectomy (LA) though widely practiced, has not gained universal approval. LA was first described in 1983. Some early studies showed equivocal results about benefit of LA. Recent studies showed overall benefit in favour of LA. So, we decided to do this study with a view to evaluate the therapeutic benefit of LA by comparing with conventional OA.

**Materials and methods:** We collected data of 100 appendectomies done in Chamarajanagara institute of medical sciences & hospital from a period of 15 months. Out of them 50 had conventional OA and 50 had LA. We compared the mean operation time, time of first oral feeding, narcotic analgesic requirement, and duration of post-operative hospital stay.

**Results:** We found that mean operation time was  $33\pm 5.8$  minute and  $37\pm 7.5$  minute in LA and OA respectively. Duration of post-operative hospital stay was 1.2 days shorter in Laparoscopic group. LA required 1.1 shots of less analgesic than OA. Oral feeding was resumed 21 hours earlier following LA compared to OA. Laparoscopic appendectomy was safely performed in paediatric patient without any adverse effect. We also found that, in female patient, concurrent ovarian cysts, tubal pregnancy and endometriosis can be diagnosed and managed laparoscopically in the same sitting.

**Conclusion:** Our study found that laparoscopic appendectomy is an effective and safe procedure irrespective of age and sex of the patient. LA has added advantage of early return of bowel movement, less post-op hospital stay and less requirement of narcotic analgesic.

**Keywords:** Acute appendicitis; laparoscopic appendectomy; open appendectomy; laparoscopic vs open appendectomy

### Introduction

Acute appendicitis is a common cause of acute abdominal pain with a life-time incidence between 7–9%. As a direct result, appendectomy is one of the most frequently performed surgical procedures. The open approach to appendectomy was originally described by McBurney. It has become the standard treatment of choice for acute appendicitis, remaining mainly unchanged for 100 years due to its favorable efficacy and safety. Since the advent of laparoscopy, appendectomy has increasingly been performed using a minimally invasive approach, following the first report by Semm in 1983. Although laparoscopic appendectomy (LA) has gained much popularity among some surgeons, others remain skeptical with regard to replacing the relatively straightforward open appendectomy (OA). Criticism of LA includes increased operative cost, primarily due to the use of disposable laparoscopic instruments, increased operation time, and concerns about a higher incidence of intra-abdominal abscesses, particularly after perforated appendicitis. Proponents of LA, however, claim that the advantages of the procedure include improved wound healing, reduced postoperative pain and, ultimately, earlier discharge from hospital, all translating to an earlier return to normal activity. Therefore, the use of LA remains controversial, in contrast to the wide acceptance of laparoscopic cholecystectomy since its innovation.

Meta-analysis is a useful statistical tool that can be used to evaluate the existing literature in both quantitative and qualitative ways by comparing and integrating the results of different studies, taking into account variations in characteristics that can influence the overall estimate of the outcome of interest. Previous meta-analyses have demonstrated a reduced incidence of surgical site infection and length of hospital stay following LA in adults. Some studies, however, have suggested that LA is associated with higher rates of intra-abdominal abscess formation,

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Longer operative times, and higher surgical costs when compared to OA. LA, however, is currently not universally accepted as the standard of care for the treatment of acute appendicitis in children and differences in the patient population mean that direct extrapolation of adult data to children is invalid. Although much research has been done to compare results from LA and OA in children, conclusions have been difficult to draw because of small study size, the presence of only a handful of randomized trials, and possible heterogeneity in patient characteristics, surgical practice, and severity of appendicitis between these studies. At present, there is no consensus between pediatric surgeons as to the benefits of LA over OA.

In order to guide future management decisions, we decided to conduct a meta-analysis of randomized controlled trials (RCTs) comparing LA and OA in adult and pediatric patients.

## Materials and Methods

### Inclusion Criteria

Patients with appendicitis were included in the study performed at Chamarajanagara institute of medical sciences & hospital, for a period of 15 months. The diagnosis of appendicitis was made on the following criteria: History of right lower quadrant pain or periumbilical pain migrating to the right lower quadrant with nausea and/or vomiting, fever of more than 38°C and/or leukocytosis above 10,000 cells per mL, right lower quadrant guarding, and tenderness on physical examination. All patients included were 16 years of age or older.

### Exclusion Criteria

Patients were excluded if the diagnosis of appendicitis was not clinically established and if they had a history of symptoms for more than 5 days and/or a palpable mass in the right lower quadrant, suggesting an appendiceal abscess treated with antibiotics and possible percutaneous drainage. Patients with the following conditions were also excluded: history of cirrhosis and coagulation disorders, generalized peritonitis, shock on admission, absolute contraindication to laparoscopic surgery (large ventral hernia, history of laparotomies for small bowel obstruction, ascites with abdominal distension), contraindication to general anesthesia (severe cardiac and/or pulmonary disease), inability to give informed consent due to mental disability, and pregnancy.

## Results and Discussion

7 (7%) of our patients were children. We used the same trocar positions in children as in adults. We inserted camera trocar slightly above the umbilicus in very small children. The CO<sub>2</sub> pressure was kept at 11 or 12 mm of Hg in children. We did not encounter any difficulty while operating on children, except crowding of instruments. There are many studies done on lap appendectomy on children. No difference in mortality or major complication rate was observed between LA and OA among children. 10 of our patients were above 60 years. No special problem was encountered during operating in these patients. But we did not attempt LA on patients with COPD and heart failure, as increased intra-abdominal pressure may compromise cardiovascular hemodynamics. We rarely found very obese patient in Chamarajanagara Institute of Medical Sciences and Hospital. OA in obese patient is particularly difficult through McBurney's incision and often requires larger incision. LA in obese patient has extra advantage in this regard. As concomitant pelvic pathology can be diagnosed and managed very effectively during laparoscopy, we have managed cases of ruptured ectopic pregnancy and ovarian

Cysts during this period in women of reproductive age group. Any patient of reproductive age having suspected appendicitis should have laparoscopic appendectomy as any concomitant pelvic pathology can be dealt with in the same laparoscopic session. We also removed gall bladders for USG proved gall stones during laparoscopic appendectomies. In these cases we used conventional 4 ports as in laparoscopic cholecystectomies and did not insert any extra port for removal of appendices. Complications following LA are less than in OA. Although some studies show higher intra-abdominal abscess formation in LA, others report no significant difference between LA and OA. During the early period of our study we were inserting double ligature at the base of the appendix to secure the stump. Later on we started practicing single loop to secure appendix base as there was no difference in post-operative mortality and morbidity between the use of single loop and double loop in LA. As a result operation time was reduced by few minutes. When we came across to perforated appendix and pus collection, we used suction only to clean the pus from the peritoneal cavity. We did not use irrigation at all. A prospective randomized trial was published in the literature, which concluded that there is no significant difference in outcome between suction and irrigation combined and suction alone during LA in case of perforated appendicitis<sup>18</sup>. In this study the incidence of residual abscess was found to be same in both group with perforated appendicitis. Duration of hospital stay was also not different. Here we like to mention that we tend to discharge patient slightly later in this rural based medical college hospital. Our patients come from distant places. As a result they cannot come to the hospital at odd hours of the day in case any post-op emergency arises at home. Adhesion formation is now one of the common complications following intra-abdominal operation. A study has shown that rate of adhesion is about 80% in OA compared to 10% in LA three months after the surgery. Regarding the indication of LA we may include females of reproductive age group, doubtful diagnosis of appendicitis, recurrent appendicitis, high working class, and obese patient, cirrhosis of liver, sickle cell disease and immuno-compromised patient. General Anaesthesia and pneumoperitoneum required for laparoscopic procedure poses risks to certain group of patients with cardio-respiratory compromise. So LA is not recommended for patients with COPD or cardiac disease. LA should also be avoided in previous lower abdominal surgery, generalized peritonitis and stump appendicitis. Laparoscopic appendectomy in pregnancy is associated with a low rate of intra-operative complications in all trimesters. However, LA in pregnancy is associated with a significantly higher rate of fetal loss compared to open appendectomy. Open appendectomy would appear to be the safer option for pregnant women for whom surgical intervention is indicated.

## Conclusion

Laparoscopic appendectomy is an effective and safe option and the procedure of choice for most patients regardless of age, sex and BMI. It requires less operative time, has minimal complications and less hospital stays and has the advantage of managing concomitant pathologies. The laparoscopic approach is a safe and efficient operative procedure in appendectomy and it provides clinically beneficial advantages over open method (including shorter hospital stay, decreased need for postoperative analgesia, early food tolerance, earlier return to work, lower rate of wound infection) against only marginally higher hospital costs.

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