



A comparative research study on open appendectomy versus laparoscopic appendectomy

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ABSTRACT

Appendectomy is an eventual treatment for appendicitis, which can be performed through either traditional open appendectomy or by laparoscopic technique. Majority of researches found Laparoscopic appendectomies are ideal for simple appendicitis, but most of the advantages are of inadequate clinical relevance, even though intra-abdominal abscesses are a concern in some cases of complicated appendicitis. The main objective was to evaluate and compare the length of hospital stay, in-hospital complications, operation time, and usage of antibiotics between laparoscopic (LA) and open appendectomy (OA). A retrospective analysis was done with the data of 411 patients older than 12 years from the Department of Surgery at Rajiv Gandhi Institute of Medical Sciences (RIMS) Hospital between February 2011 and February 2016. Clinical and laboratory information was obtained by reviewing patients' medical records, including age, gender, WBC, RBS, operating time, duration of hospital stay, complications as well as usage of antibiotics. Out of 411 cases reviewed 196 underwent LA procedure and 215 were done with OA. The mean operating time was significantly longer in LA (80.41 ± 28.09 Vs 55.56 ± 16.72 ; $P < 0.0001$; 95% CI = 20.42 to 29.29). The antibiotic usage was found to be more in OA group. Out of 61 complications observed in all the study population, 42 (69%) were experienced by OA group. Study proves that laparoscopic appendectomy is a safe and effective procedure, in contrast, to open appendectomy and surgeons had a stronger preference for the LA due to its numerous advantages.

Keywords: Appendectomy; Open Appendectomy; Laparoscopic Appendectomy.

INTRODUCTION

Appendicitis is commonly an emergency abdominal snag and leads to surgery. In 1983, Semm introduced the use of laparoscopic techniques, by the first large study of laparoscopic appendectomies reported by Pier *et al.* in 1991 (Semm K, 1983; Pier A, Gotz F, Bacher C, 1991). This technique lets surgeon to keep away from the traditional muscle-splitting incision at the McBurney point, which was the regular treatment for over a century.

Although initially an infamous procedure, Evidence supports the use of a laparoscopic appendectomy for the treatment of appendicitis (Lintula H, Kokki H, Vanamo K, 2001; Aziz MI, van der Burg BL, Hamming JF, 2006). Laparoscopic appendectomies are ideal for sim-

ple appendicitis, but most of the advantages are of inadequate clinical relevance (Sauerland S, Jaschinski T, Neugebauer EA, 2010). Intra-abdominal abscesses are a concern when performing laparoscopic appendectomies within cases of complicated appendicitis. A meta-analysis study was conducted on children with appendicitis exposed that intra-abdominal abscess formation was more frequent following laparoscopic surgery, although this was not statistically considerable (Aziz MI, van der Burg BL, Hamming JF, 2006).

Even though the differences among the two approaches have been small, most studies illustrate that the laparoscopic operation is longer, shorter hospitalization and possibly with a speedier return to work. Complication rates were equivalent, except that wound infections were to some extent lower after laparoscopic appendectomy. Wound infections occur about half as often with the laparoscopic approach except deep pelvic abscesses were two times as frequent. (Eypasch E, Sauerland S, Lofering R, Neugebauer EAM, 2002; Sauerland S, Lofering R, Neugebauer EAM, 2006)

Studies have exposed shorter stays, higher rates of routine discharge and lower mortality and morbidity

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rates among the laparoscopic group. In particular, mortality rates for laparoscopic appendectomy were 1/5 of open appendectomy rates among patients older than 65. In former population studies, complication rates were as good as between the two approaches, except high wound infection rate for the open procedure and a higher intra-abdominal abscess rate for the laparoscopic procedure. (Masoomi H, Mills S, Dolich MO, Ketana N, Carmichael JC, et al., 2011)

One study using a Nationwide Inpatient Sample database in the U.S. exposed that laparoscopic appendectomies were associated with low morbidity and mortality, shorter hospital stays, and a decrease in hospital charges in adults with perforated appendicitis (Swank HA, Eshuis EJ, van Berge Henegouwen MI, Bemelman WA, 2011).

The main objective of the current retrospective study was to evaluate the length of hospital stay, in-hospital complications, operation time, and usage of antibiotics between laparoscopic (LA) and open appendectomy (OA).

MATERIALS AND METHODS

Data of 411 patients older than 12 years from the Department of Surgery at Rajiv Gandhi Institute of Medical Sciences (RIMS) Hospital between February 2011 and February 2016 were included. The study has been approved by Institutional Ethics and Research Committee of RIMS, Kadapa. The indications for either LA or OA are based on the attending surgeon's estimation and the patient's condition. The following data were collected for analysis i.e. patient's background; laboratory data; and pre-operative complaints; findings of CT were evaluated retrospectively. Patients received appendectomy mostly because of common symptoms of appendicitis such as abdominal pain, fever, anorexia, nausea, and vomiting. In addition, it was also a normal indication for an appendectomy that acute appendicitis was diagnosed highly by abdominal computed tomography (CT).

Clinical and laboratory information was obtained by reviewing patients' medical records, including age, gender, white blood count (WBC), random blood sugar (RBS), operating time, duration of hospital stay, complications as well as usage of antibiotics. A standard self-designed data collection form was implemented in collecting the required information from the subjects.

However, when reviewing the charts, conversion from LA to OA was found in four patients due to severe inflammatory adhesions. Cases of conversion from LA to OA were included in the OA group. Thus, these patients were divided by the procedure for appendectomy into two groups; OA and LA, 215 patients underwent LA and 196 were OA.

The operating time was from concluding anesthesia to the last suture placing, obtained in the operation notes. The hospital stay was the duration between the

date of surgery and the date of discharge. The criteria for discharge of patient included no fever, eating well, and no tenderness over the abdomen in physical examination.

Complications included wound infections, intra-abdominal abscess, paralytic ileus, as well as 30-day readmission for evaluation of complaints of nausea/vomiting, pain, diarrhea or fever.

The Standard muscle-splitting approach in the right iliac fossa procedure for OA was followed by the surgeons in that the appendix was removed and the stump was ligated. LA was performed by three-trocar technique (Karl Storz, Germany), the mesoappendix was controlled with laparoscopic bipolar cautery (Karl Storz, Germany), and the appendix base was tied with a single endoloop (Covidien, USA). The appendix was removed through the left iliac fossa port or the umbilical port.

Statistical analysis was performed by Student's t-test using the SPSS for comparison between LA and OA groups. Data was expressed as a mean \pm standard deviation. P value of less than 0.05 was considered significant.

RESULTS AND DISCUSSION

Patients

Out of 411 cases reviewed 196 underwent LA procedure and 215 were done with OA. Among 215 cases 213 were planned under OA but 2 cases were converted from LA to OA due to not meeting the inclusion criteria for the LA procedure. A total of 300 males were undergone appendectomy, and 111 females. We observed that the occurrence of appendicitis was more in males compared to females (Kai-Biao Lin et. al 2015) in contrast to other studies (Addiss DG et al., 1980, DAVID G. ADDISS et al., 1990; Naveen K et al., 2013). High incidence of appendicitis was observed in the adult age group in both OA and LA groups (Kai-Biao Lin et. al., 2015); and (Pieper R et al., 1982) reported a slight increase in the very old patients. Commonly, most of the hospital admissions were with coolies who do the strenuous activities in their daily life. There was no statistical difference in WBC count and RBS count between LA and OA groups. (All $P > 0.05$; Table - 1)

Operating time

We have recorded the time taken to complete surgical procedure in two group of patients and we found that the mean operating time of the LA was considerably longer than OA group (Swank HA et al., 2011; Ingraham AM et al., 2010; Ching-Chung Tsai et al., 2012) with extreme significant difference (80.41 ± 28.09 Vs 55.56 ± 16.72 ; $P < 0.0001$; 95% CI = 20.42 to 29.29). (Table - 1)

Table 1: Comparison of parameters between open and laparoscopic appendectomy groups

Parameters	LA (n = 196)	OA (n = 215)	P
Mean Age \pm SD (years)	47.26 \pm 11.13	25.86 \pm 6.01	***
Gender, No. (male/ female)	151/45	149/66	
Mean WBC \pm SD (1000/mm ³)	15.2 \pm 5.5	14.1 \pm 4.1	NS
Mean RBC \pm SD (%)	111.35 \pm 13.04	111.81 \pm 12.60	NS
Mean Operating time \pm SD (minutes)	80.41 \pm 28.09	55.56 \pm 16.72	***
Mean Hospital stay \pm SD (days)	5.66 \pm 1.78	7.98 \pm 2.55	***
No., complications (%)	19 (9.69)	42 (19.53)	
Number of antibiotics per prescription	2.37 \pm 0.73	3.13 \pm 1.16	***
Duration of antibiotic therapy	5.25 \pm 2.33	5.60 \pm 3.15	NS

*** - Extremely Significant; NS - Not Significant

Table 2: Use of antibiotics between open and laparoscopic appendectomy groups

Antibiotic	LA (n = 196)	OA (n= 215)	Total
Amoxicillin	107	172	279
Cefixime	159	206	365
Ceftriaxone	167	181	348
Gentamycin	32	53	85
Total	465	612	1077

Table 3: Complications between open and laparoscopic appendectomy groups

Complications	LA (n = 196)	OA (n = 215)
Wound Infections	5 (2.55%)	21 (9.76%)
Abscess	4 (2.04%)	15 (6.97%)
Paralytic ileus	10 (5.10%)	6 (2.79%)
Total	19 (9.69%)	42 (19.53%)

Hospital stay

Patients who underwent OA procedure were received inpatient services much longer time than LA group patients with an extremely significant difference (5.66 \pm 1.78 Vs 7.98 \pm 2.55; 95% CI = -2.75 to -1.89) (Table - 1). As OA procedure involves higher incidence of complications and lesser wound healing time. (Ching-Chung Tsai *et al.*, 2012; Ulrich Guller, MD, MHS *et al.*, 2004; Steven L. Lee, MD *et al.*, 2011)

Use of antibiotics

Antibiotic usage is quite common in any surgical procedures both as a surgical prophylactic and treatment/curative, in this study we have noticed and compared the number of antibiotics per prescription and duration of antibiotic therapy for both the groups. The usage was found to be more in OA group than LA (Total number of antibiotics: 612 Vs 465; Duration (in days): 5.60 Vs 5.25), cephalosporin antibiotic usage was found to be more when compare with other antibiotics. There was an extremely significant difference regarding the use of antibiotics between LA and OA groups. (Table – 1, 2)

Complications

A total of 61 complications (wound infections, abscess, and paralytic ileus) were recorded in the patient medical records, out which OA group patients had devel-

oped more complications than LA. Many studies reported the same, as in OA procedure a big incision will be made to the lower abdominal part which attracts infectious agents much more than three-trocar technique (LA). (Table - 3)

CONCLUSION

This retrospective patient chart review proves that laparoscopic appendectomy is a safe and effective procedure in contrast to open appendectomy. It reduces the length of post-operative hospital stay. The surgeons in this study had a stronger preference for the laparoscopic technique due to its numerous advantages. They also believe that LA has the advantage of identifying the position of the appendix with greater precision due to the better visualization of the abdominal contents. Therefore, LA may be considered a better alternative technique to OA in the management of appendicitis.

CONFLICTS OF INTERESTS

All authors have none to declare

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