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Original Research Article

A prospective randomized comparison of primary outcome between laparoscopic appendectomy and open appendectomy

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ABSTRACT

Background: Open appendectomy is one of the most common surgeries done in an emergency operation theatre even after three decades of introduction of laparoscopic surgeries. The previous studies done on laparoscopic appendectomy produced conflicting recommendations, and the adequacy of sample sizes is generally unknown. We compared primary outcomes after laparoscopic and open appendectomy in a sample of predetermined statistical power.
Methods: A pre-study power analysis suggested that 200 randomized patients would yield 80% power to show a mean decrease of 1.3 days hospitalization. One hundred ninety-eight patients with a preoperative diagnosis of acute appendicitis were randomized prospectively to laparoscopic or open appendectomy. The primary outcomes measured were duration of operative time, postoperative pain and analgesia, length of hospital stay and cosmetic advantages.
Results: It was found that mean operation time was 33±5.8 minute and 37± 7.5 minute in OA and LA 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. Laparoscpic 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.
Conclusions: Present 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 stays and less requirement of narcotic analgesic.

Keywords: Acute appendicitis, Laparoscopic appendectomy, Laparoscopic versus open appendectomy, Open appendectomy

INTRODUCTION

Open appendectomy has been a safe and effective operation for acute appendicitis for more than a century. According to the literature, approximately 7% of the population develop appendicitis in their life time, with peak incidence between the ages of 10 and 30 years, thus making appendectomy the most frequently performed abdominal operation. Recently, several authors proposed that the new technique of laparoscopic appendectomy should be the preferred treatment for acute appendicitis. However, unlike laparoscopic cholecystectomy, laparoscopic appendectomy (LA) has not yet gained popularity.[2]

Laparoscopic cholecystectomy is now considered a standard method of performing cholecystectomy and has mostly replaced the old method throughout the world, while appendectomy has yet to achieve such popularity.[3] Since its introduction by Mcburney in 1884, appendectomy has been a treatment of choice for acute appendicitis.[4] For more than a century, open

appendectomy remained the gold standard of treatment of acute appendicitis and for interval appendectomy.

In 1981, Semm, a German gynecologist performed the first laparoscopic appendectomy.[5-6] Despite its use even before laparoscopic cholecystectomy, LA has not yet emerged as gold standard appendectomy. LA has potential advantages of shorter hospital stay, less use of analgesia, early mobilization, early return of bowel function, acceptable complication rate along with the recent enthusiasm of minimally invasive surgery. These definite advantages have led some authors to advocate this approach as the procedure of choice for uncomplicated appendicitis.[7-8]

METHODS

We conducted prospective study of consecutive patients with appendectomy in Sree Siddhartha Medical College Hospital between July 2014 and november 2016. Sree Siddhartha Medical College is a teaching hospital, which mostly caters rural population of the surrounding districts. All the operations were performed in the five surgical units of the hospital.

Pre-operative diagnosis was made using history, clinical examination coupled with laboratory findings and imaging studies. In open group, only appendix removed via McBurney's incision was included in the study. Patients in whom midline incisions were given were excluded from the study. Operating time was calculated from the time of first incision up to the placement of last stitch on the closing wound. Post-operative hospital stay, in days, was defined as the time the patient left the operation theater up to the time of discharge from the hospital. Number of shots of injectable analgesics given to the patients postoperatively was recorded. Time of resumption of oral food, in hours, was calculated from the time of surgery. Data were analyzed using standard statistical method. Descriptive statistical including means, medians, standard deviation, percentages were used to describe study population on all variables. For categorical variables x2 test and Fisher exact test were used to make comparison.

Procedure description

For the laparoscopic approach, a 10-mm trocar was placed at the umbilicus and 2 additional 5mm and a 10-mm trocar were inserted in the lower abdomen and right hypochondrium respectively (Figure 1). The meso-appendix was transected after applying titanium hemoclip. The bases of the appendix were ligated with an endoloop constructed with a Roeder's knot on a No-1 vicryl thread (Figure 2). Usually a single endoloop was used. The specimens were removed via the umbilical port. In case of peritoneal collection only suction was used. No irrigation was used. In open approach, we used traditional grid-iron incision over the Mc-Burney's point. The appendix bases were transfixed with a no. 1/0 vicryl suture. Appendix base was not invaginated. All patients received preoperative and post-operative antibiotic. A combination of 2nd or 3rd generation cephalosporin and metronidazole were used. In presence of severe systemic sign an aminoglycoside, usually Amikacin was added. All patients were discharged on resumption of solid food and complete remission of fever.

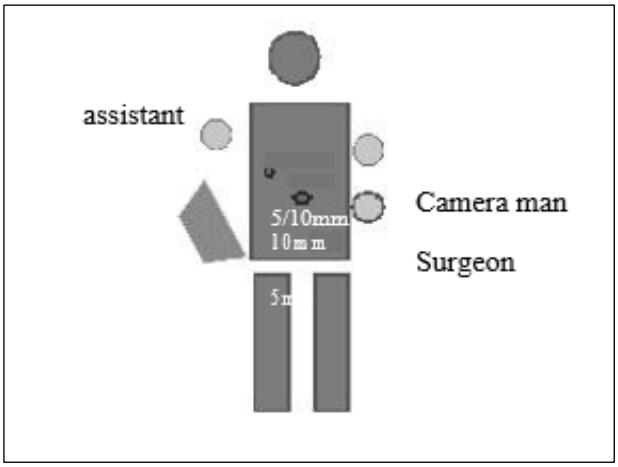

Figure 1: Ergonomics.

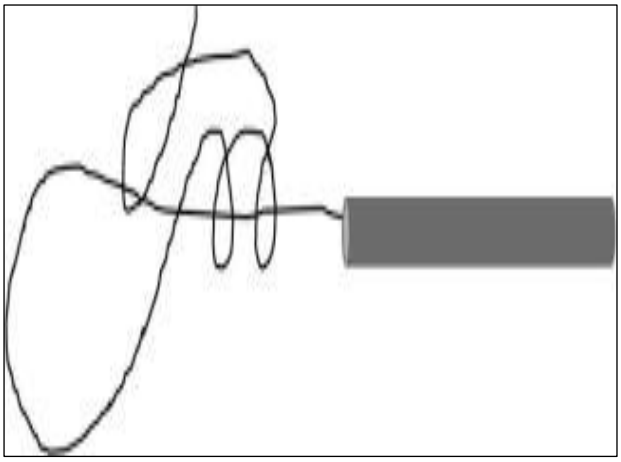

Figure 2: Roeder's knot.

RESULTS

A total of 198 appendectomy were performed, of which 99 were open and 99 were laparoscopic. Ages of the patients ranged from 2 to 72 years. In the laparoscopic group 39 (39%) were adult male, 56 (56%) were adult female, 4 (5%) were children. Operating time in LA was 37±7.5 minutes and in OA was 33±5.8 minute (OR - 0.79, CI - 95%). Conversion rate for LA was 3.4% (3 cases). Average number of shots of narcotic analgesics required for OA was 3.1 while for LA was 2 (OR - 0.30, CI 95%). Oral feeding was resumed after average 59 hours after surgery in OA and average 38 hours after LA (OR - 0.41, CI 95%). Mean difference were 21 hours in favor of LA. The post-operative hospital stay was 4.4 days in OA and 3.2 in LA (OR - 0.47, CI 95%). LA

group required 1.2 days less post OP hospital stay than OA (Table 1). Some concomitant pathology was managed during LA including 10 cholecystectomies, 4 tubal pregnancy and 6 ovarian cystectomies (Table 2). There was no death in either group.

Table 1: Outcome comparison between LA and OA.

Outcome	LA	OA	Mean Difference	Odds ratio
Operating time (minute)	37±7.5	33±6	4	0.79
				CI 95%
Number of analgesic doses (narcotic)	2	3.1	-1.1	0.30
				CI 95%
Resumption of oral food (hours)	38	59	-21	0.41
				CI 95%
Hospital stay (days)	3.2	4.4	-1.2	0.47
				CI 95%

Table 2: Con-commitment pathology managed during LA.

Concomitant pathology	Number
Lap cholecystectomy	10
Excision of tubal pregnancy	4
Lap ovarian cystectomy	6

DISCUSSION

4 (5%) of 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_2 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.[9]

Two 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.[10]

We rarely found very obese patient in this rural based medical college 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.[11]

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.[12-16]

During the early period of the present 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.[17] 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.[18] 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.[19]

Regarding the indication of LA we may include females of reproductive age group, doubtful diagnosis of appendicitis, recurrent appendicitis, high working class, 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 appendicectomy 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 appendicectomy. Open appendicectomy would appear to be the safer option for pregnant women for whom surgical intervention is indicated.[20]

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.

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