



## Original Article

# A Comparative Study of Laparoscopic versus open Appendectomy in a District Hospital Setup

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## Abstract

**Introduction:** *Laparoscopic appendectomy and open appendectomy are the two methods of choice for appendectomy, the acceptance of laparoscopy over laparotomy still remaining a dogma. The specific aim was to compare the outcomes of both the methods in a district hospital setup.*

**Methods:** *A non-randomized interventional study was performed in a district hospital for a period of 1 year and follow up period of 3 months in the post op period at regular intervals after 1 week, 4 weeks and 12 weeks post-op.*

**Statistical Analysis Used:** *The data was entered into a Microsoft Excel spreadsheet and then analyzed using the SPSS 20.0.1 and Graph Pad Prism version 5.*

**Results:** *Lesser hospital stay, intra and post-op analgesia, post-op pain, smaller scars and earlier ambulation, post-op feed and recovery in case of laparoscopic appendectomy as compared to open appendectomy.*

**Conclusion:** *Superiority of laparoscopic appendectomy over open appendectomy and can undoubtedly be the surgery of choice for both acute and recurrent acute appendicitis in a district level setup in India with better training, manpower and cost effectiveness.*

**Keywords:** *Laparoscopy, appendectomy, open, district hospital.*

## Introduction

Appendicitis, which is the inflammation of the appendix, is one of the most common conditions requiring surgical intervention. Since time immemorial the technique of choice for appendicitis has been Open Appendectomy as described by Charles McBurney<sup>[1]</sup> in the year 1894 using Gridiron incision. It was only until 1983 that the concept of using Laparoscopy for the treatment of appendicitis was brought into light by a German gynaecologist Semm<sup>[10]</sup>. This technique has gained popularity in the recent years and has become one of the most widely used procedures using the laparoscope globally. Other minimally invasive approaches to appendectomy have also been reported like SILS and the transvaginal route (NOTES).

Laparoscopic appendectomy though now being used in different medical setups in India faces a lot of challenges like shortage of manpower, equipments and other facilities. This is a study to compare the outcome of Open Appendectomy and Laparoscopic Appendectomy in a district hospital setup catering mostly to the rural population.

## Materials & Methods

For statistical analysis the data was entered into a Microsoft Excel spreadsheet and then analyzed using the SPSS 20.0.1 and Graph Pad Prism version 5. The data was summarized as mean and standard deviation for numerical variables that are not normally distributed. Student's independent sample's t-test was applied to compare normally distributed numerical variables between groups; unpaired proportions were compared by Chi-square or Fischer's test, as appropriate.

**Study Design:** It is a non-randomized interventional hospital-based study. The necessary ethical clearance was obtained from the Regional Ethical Clearance Committee before enlisting subjects for the trial.

**Study Duration:** Study duration was for 1 year. After a patient underwent surgery, he/she was followed up for a period of 3 months in the post op period at regular intervals after 1 week, 4 weeks and 12 weeks.

**Study Population:** All patients with acute appendicitis or recurrent acute appendicitis fulfilling the inclusion criteria.

**Inclusion Criteria:** All patients who presented with acute appendicitis requiring surgical intervention not fulfilling the exclusion criteria.

## Parameters Studied

Considering Laparoscopic appendectomy and Open appendectomy as two different groups, comparison of laparoscopic appendectomy with open appendectomy the following parameters:

- Distribution of age in the two groups.
- Distribution of sex in the two groups.
- Distribution of residence (geographic location) in the two groups.
- Mean incision length in the two groups.
- Mean duration of surgery in the two groups.
- Distribution of intra op complications in the two groups.
- Distribution of mean post op analgesia doses in the two groups.
- Return to normal regular activities in the two groups.
- Distribution of mean hospital stay in the two groups.
- Distribution of complications in the two groups.
- Distribution of men patient acceptance likert scale.
- Follow up distribution in the two groups.

## Results

Entity for comparison		Laparoscopic appendectomy (59)	Open appendectomy (60)	Statistical significance
Mean Age		27.32 ±8.08	25.86 ±9.80	Not significant
Sex	Male	12	11	Not significant
	Female	47	49	
Socio-economic status	BPL	18	20	Not significant
	APL	41	40	
Diagnosis	RAA	41	37	Not significant
	AA	18	23	
Mean incision length (in cm)		2.50 ± 0.00	5.85 ±1.20	Significant (p<0.0001)
Mean duration of surgery (in minutes)		29.47 ±3.93	25.41 ±4.62	Significant (p<0.0001)
Intra op complications		0	1(bleeding2.95 ±1.06)	Not Significant
Mean parenteral analgesics (doses)		2.00 ±0.00	2.95 ±1.06	Significant (p<0.0001)
Mean oral analgesics (doses)		4.23 ±0.75	5.00 ±1.13	Significant (p<0.0001)
Mean time to starting oral feeds (in hours)		14.84 ±3.58	23.70 ±3.56	Significant (p<0.0001)
Mean time to ambulation(in hours)		12.15 ±1.79	23.10 ±4.25	Significant (p<0.0001)
Mean post-op pain after 24hrs VAS		3.16 ±1.16	5.53 ±1.03	Significant (p<0.0001)
Mean hospital stay (in days)		2.10 ±0.35	4.25 ±1.29	Significant(p<0.0001)
Complications (SSI)		1	4	Not significant
Mean patient acceptance likert scale		4.67 ±0.60	2.98 ±0.79	Significant (p<0.0001)

## Discussion

Appendicitis is one of the most common clinical conditions requiring surgical intervention in day-to-day practice, which is indicated for both acute appendicitis and recurrent acute appendicitis. Appendectomy can be performed using several surgical techniques like laparotomy (open), laparoscopy, SILS (single incision laparoscopic surgery), transvaginal route. Of these open appendectomy and laparoscopic appendectomy, are the more commonly being used techniques worldwide. Although, almost 30 years have elapsed since the introduction of laparoscopic appendectomy, there is no consensus on its advantages and disadvantages compared to the conventional technique<sup>[9-11-12]</sup>. Laparoscopy, which is now being used as a technique for even the most complicated procedures and surgeries, is not preferred over open appendectomy in a district hospital setup due to logistic reasons. Bearing this in mind, we designed the present study to determine the possible benefits of the laparoscopic approach.

In our study the difference in the mean age group of patients undergoing laparoscopic appendectomy and open appendectomy was not statistically significant ( $p=0.3794$ ). Although there was a female predominance amongst patients with acute appendicitis in our study, the difference between the sexes in both the groups was not statistically significant ( $p=0.7817$ ). Also there was no statistically significant result ( $p=0.7410$ ) for the association between the socio-economic status of the patients undergoing laparoscopic and open appendectomy. The association of the diagnosis as Acute Appendicitis and Recurrent Acute Appendicitis also did not hold any statistical significance according to our study ( $p=0.3691$ ), suggestive of no selection bias in the age group. Our study is the first to compare the mean length of the incision in laparoscopic appendectomy with that in open appendectomy. The mean incision length for laparoscopic appendectomy was  $2.50 \pm 0.00$  cm while it was  $5.85 \pm 1.20$  cm for open appendectomy, which was statistically significant ( $p<0.0001$ ).

In our study we found that the mean duration of surgery in laparoscopic appendectomy was  $29.47 \pm 3.93$  minutes while took  $25.41 \pm 4.62$  minutes to complete an open appendectomy which was statistically significant ( $p < 0.0001$ ) and shows that lap appendectomy was more time taking as compared to open appendectomy which is in contrast to Peiser JG and Greenberg D<sup>[2]</sup> who in their study named 'Laparoscopic versus open appendectomy: results of a retrospective study' mentions the opposite though their data was not statistically significant ( $p = 0.075$ ) and Sheraz R., Vishal Venkat-Raman, Alison Ho, Alan Karthikesalingam, James Kinross, Jessica Evans and Ian Bloom<sup>[8]</sup> who in their study 'Laparoscopic versus open appendectomy in obese patients' mentions no significant difference in the length of operation time. But our finding matches with Sauerland S, Jaschinski T and Neugebauer EA<sup>[5]</sup> who in their study 'Laparoscopic vs Open surgery for suspected appendicitis' acknowledge that the duration of surgery was 10minutes longer in laparoscopic appendectomy.

We found only 1 case of intra-op complication out of the 119 cases under study. The complication was in the form of bleeding which occurred in a patient that underwent open appendectomy. The association between intra-op complications in the two groups was statistically insignificant ( $p = 0.3193$ ).

The study also revealed that the difference in the mean parenteral analgesics doses in the two groups was statistically significant ( $p < 0.0001$ ) and showed mean parenteral dose of  $2.00 \pm 0.00$  after lap appendectomy and  $2.95 \pm 1.06$  after open appendectomy and mean oral dose of  $4.23 \pm 0.75$  and  $5.00 \pm 1.13$  in laparoscopic and open appendectomy respectively, suggesting that lesser dose of both parenteral and oral analgesics was required after laparoscopic appendectomy which was similar to the findings of L.R. Padankatti, R. Kirthy Pramod, A.Gupta and P.Ramachandran<sup>[4]</sup> in their study 'Laparoscopic versus open appendectomy for complicated appendicitis: a prospective study'.

Our study also highlights the statistical significance ( $p < 0.0001$ ) that was obtained in the comparison of mean time to start post-op oral feeds, which showed that orals feeds could be started  $14.84 \pm 3.58$  hours post-op after lap appendectomy while it was  $23.70 \pm 3.56$  hours for open appendectomy suggesting that oral feeds could be started earlier in a patient undergoing lap appendectomy as compared to open appendectomy. Such was also the conclusion of the L.R. Padankatti et al<sup>[4]</sup> in their study 'Laparoscopic versus Open appendectomy for complicated appendicitis: a prospective study'.

Laparoscopic appendectomy was associated with earlier mobilization in patients as compared to open appendectomy which was reflected by the mean time to ambulation being  $12.15 \pm 1.79$  hours after lap surgery while it was  $23.10 \pm 4.25$  hours post open appendectomy ( $p < 0.0001$ ). Similar findings were also shown in the study by Sauerland S et al<sup>[5]</sup> in their study 'Laparoscopic versus open surgery for suspected appendicitis' where they mention return to normal activities, work and sports occurred earlier after laparoscopic appendectomy.

The mean Post-op pain after 24hr VAS in case of lap appendectomy was  $3.16 \pm 1.16$  as compared to  $5.53 \pm 1.03$  for open appendectomy suggesting lesser post operative pain after laparoscopic appendectomy. This result is similar to the one published by Sauerland S et al<sup>[5]</sup> in their study 'Laparoscopic versus open surgery for suspected appendicitis' which said that pain on day1 after surgery was reduced after laparoscopic appendectomy by 8mm (CI 5 to 11mm) on a 100mm visual analogue scale.

The mean hospital stay for patients who underwent laparoscopic surgery was  $2.10 \pm 0.35$  days while for open appendectomy it was  $4.25 \pm 1.29$  days, ( $p < 0.0001$ ) clearly suggesting that hospital stay was significantly decreased if patients underwent laparoscopic appendectomy. This result matches that of many other studies like the one by Guller U et al<sup>[3]</sup> in their study 'Laparoscopic versus open appendectomy:

outcomes comparisons based on a large administrative database', where they state higher routine discharges rates for lap appendectomy (OR=3.22 [2.47,4.46],  $p<0.0001$ ) and a study by Ward NT, Ramamoorthy SL, Chang DC, Parson JK<sup>[13]</sup> which showed the lap appendectomy was associated with a decreased length of stay (4.44 days vs 7.86 days,  $p<0.001$ ). Similarly, Rodney J. Mason et al<sup>[7]</sup> in their study 'Laparoscopic vs open appendectomy in Obese patients: Outcomes using the American College of Surgeons National Quality Improvement Program Database' published that in the matched cohort, the length of stay was 1.2 days shorter for obese patients undergoing laparoscopic appendectomy compared with open appendectomy (mean difference 1.2 days; 95% CI, 0.98-1.42).

The mean patient acceptance likert scale in two groups was statistically significant.

### Conclusion

Charles McBurney<sup>[1]</sup> in his paper 'The incision made in the abdominal wall in cases of appendicitis, with a description of a new operating method', 1894 clearly states "it is not an easy operation, and should not be attempted by those who are unfamiliar with operations upon the appendix, and I again call attention to the fact that in performing it two extra assistants will be occupied part of the time with retractors". That which was not an easy operation in 1894 is clearly one of the most performed surgeries now a days because of the development in technology and spread of knowledge. Laparoscopic appendectomy, which came into existence in 1983<sup>[10]</sup>, is in the same place at which open appendectomy was once when it was described. Today, even the most complicated appendicular perforations can be performed laparoscopically, there is still dogma about its acceptance due to various reasons. However, laparoscopic appendectomy, a relatively easy procedure, has not gained wide acceptance among surgeons, and the conventional technique remains the procedure of choice in many centers.<sup>[9]</sup>

But the results of our study along with many others clearly suggest the superiority of laparoscopic appendectomy over open appendectomy in areas like usage of analgesics, post-op pain, and recovery to normal activities, hospital stay, intra and post-op complications. With laparoscopy the post-op scars are smaller and more cosmetic. Laparoscopy also comes with an added benefit of better visualization of the appendix and other intra-abdominal organs during the course of surgery. It is also associated with earlier ambulation<sup>[5]</sup> and earlier post-op intake of food per oral<sup>[4]</sup>. Laparoscopic appendectomy is also associated with a lesser hospital stay<sup>[4-7-8-13]</sup> as compared to open appendectomy. Moreover, lesser post-op pain<sup>[5]</sup> and lesser use of analgesics<sup>[4]</sup> make it more acceptable to the patients over open appendectomy. It is time that surgeons should consider laparoscopy as the mode of appendectomy over laparotomy. Although it might be a lengthier operation<sup>[5]</sup> requiring high class of surgical technique and experience, our study suggests that the patient's acceptance of laparoscopic appendectomy over open appendectomy is better. With better equipments, training, manpower and cost effectiveness<sup>[2]</sup> it can undoubtedly be the surgery of choice for both acute and recurrent acute appendicitis in a district level setup in India.

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