ORIGINAL ARTICLE

Comparison of Open and Laparoscopic Appendicectomy in Rural Teaching Hospital

Narsinha Kulkarni[1], Abhijit Rayate[1], Kartik Gupta[1] and Nikhil Barhate[1]
[1]Department of Surgery, Maharashtra Institute of Medical Sciences and Research (Medical College), Latur –413512, Maharashtra, India.

Abstract:
Background: Appendicitis is a common surgical emergency with a lifetime risk of appendectomy being 9.6 to 9.8 %. Open and laparoscopic approaches are being advocated with similar benefits. *Aim and Objective:* Our study aims to compare the outcomes in open and laparoscopic appendectomies in a teaching hospital in rural Maharashtra. *Material and Methods:* This is an observational study of 114 consecutive patients who underwent appendectomy from August 2017 to July 2020 in the department of surgery at a rural medical college and teaching institute. Sixty-eight patients of open appendectomy (43 acute cases and 25 chronic cases) and 46 of laparoscopic appendectomy (20 acute cases and 26 chronic cases) were included in the study. We investigated operative time, length of hospital stays, postoperative pain, intravenous analgesia complication rate and cost between the two groups. *Results:* We observed longer operative time (51.26 ± 11.67 vs 33.69 ± 10.27 minutes for open, $P < 0.0001$) and shorter postoperative stay (LA vs OA: 3.67 ± 0.92 vs 5.71 ± 1.49 days respectively $P < 0.0001$) for the laparoscopic surgery(LA) group as compared to open appendectomy(OA). Postoperative intravenous analgesic use was less in the laparoscopy group (2.38 days vs 4.10 days, $P < 0.0001$). The cost difference was not statistically significant. There was no significant perioperative morbidity in either group. *Conclusion:* Laparoscopic appendicectomy is associated with lesser use of postoperative analgesics, fewer complications, shorter hospital stay, early return to routine work. Laparoscopic appendicectomy was found to have longer duration of surgery.

Keywords: Appendicitis, Appendectomy, Appendicectomy, Laparoscopic appendectomy, Open Appendectomy

Introduction:

Acute Appendicitis is one of the common surgical emergencies. It accounts for about 3.8% of patients presenting with acute abdominal pain in the emergency department [1]. This incidence was found to vary between different ages groups (4.54 in <65 years and 1.47 in > 65 years of age) [1]. Lee et al. had observed that the lifetime risk of appendicitis is 16.33% for males and 16.34% for females and that the lifetime risk of appendectomy is 9.89% for males and 9.61% for females[2]. Di Saverio et al. had observed variability in incidences, presentation, severity of the disease, radiological workup, and surgical management related to the gross national income of the country [3].

Benefits of minimal access/invasive surgery cannot be over-emphasized. Minimal surgical trauma in LA leads to significantly lesser post-operative pain, short duration of stay, and faster return to daily activities and hence preferred over open appendectomy (OA) [3-7]. In their updated review, Jaschinski et al. had reported reduced pain intensity on day one [0.75 cm on a 10 cm Visual analogue scale (VAS)] shorter hospital stay (one day) and earlier return to normal activity (5days) after LA in adults (low quality of evidence). Wound infections were less likely but the incidences of intra-abdominal abscesses were higher following LA (moderate quality of evidence). In children, they found no differences in the pain intensity (on day one) and incidences of intra-abdominal abscesses or time until return to normal activity [6].

Despite this fact, LA is still struggling to prove its superiority over OA in many scenarios which showed equivocal or marginally more benefits and similar or higher cost than an open approach [6,8–12]. Many times, the surgical approach needs to be determined taking into consideration the disease condition, socio-

economic status of the patient, experience of the surgeon and infrastructure at the hospital. We had conducted this study in a rural medical college to compare the benefits of laparoscopic appendectomy over the open approach in terms of operating time, postoperative pain, analgesia and complications and cost.

Material and Methods:

We had conducted this analytical observational study in the Department of Surgery at a rural tertiary care institute from August 2017 to July 2020. We had designed the study according to STROBE criteria [13]. The study was approved by the institutional ethics committee. We included patients above 10 years of age who underwent appendectomy (open and laparoscopy) for acute or chronic appendicitis. We excluded following scenarios: complicated appendicitis (mass/ abscess), appendicitis in pregnancy, cases requiring a laparotomy incision, cases requiring conversion to open, and cases with severe and uncontrolled medical comorbidities.

After due consent, we recorded all the details of 114 patients in Microsoft Excel. For statistical analysis, we used MedCalc for Windows, version 19.4 (MedCalc Software, Ostend, Belgium).Operative time was defined as the time duration from skin incision to wound closure. We didn't consider anesthesia induction time and reversal time as these may vary and cause bias. We purposefully defined the length of stay (LOS) as the duration between the first post-operative day to the day of discharge.

All the patients had a standard antibiotic plan of one dose of third-generation cephalosporin preoperatively followed by three doses in the post-operative period. A criterion for discharge was adequate mobilization by the patient, tolerance to soft diet and passage of flatus. The study was conducted in a charitable teaching hospital which does not charge for the indoor stay, doctor charges, investigation charges or operative charges. Hence, we had considered only the medical and disposable expenses for calculating the cost of the procedure.

Results:

Of the total 114 patients, 68 patients underwent open appendectomy (OA) and 46 patients underwent laparoscopic appendectomy (LA). Table no. 1 shows the demographic and clinical data of these patients. Majority of the cases belonged to the age group of 21-30 years; 38.23% in OA and 32.60% in LA. There were 63 cases of acute appendicitis (43 in OA and 20 in LA) and 51 cases of chronic appendicitis (25 in OA and 26 in LA). Mean total leucocyte count was 10355 ±2330 in OA group and 9809± 2082 in the LA group. Postgraduate trainee/residents had performed 38 OA cases and 19 LA cases under supervision.

Catgut endoloop was used (86.95%) and intracorporeal vicryl suture in 6 cases (13.05%) in LA group for stump management Table no. 2 and 3 compare both the groups with respect to the operative time, Visual Analogue Score on the first post-operative day, total days of intravenous analgesic use, post-operative stay and cost of the procedure.

Some of the cases in the LA group were more apprehensive peri-operatively & were not comfortable to be discharged earlier. There was superficial wound infection in 3 patients in the OA group (4.41%) and one patient (2.17%) of LA group. All of them were managed non-surgically. There were no cases of wound dehiscence, intra-abdominal abscess, septicemia, readmissions or mortality.

Table No. 1: Patient demographics and clinical data

Character	OA	LA
Gender: Male Female	36 32	22 24
Clinically Acute cases Chronic/Interval cases	43 25	20 26
Mean age ±SD (P= 0.1933)	25.78 ± 10.63	28.61 ± 12.29
Total Leucocyte count ±SD (P = 0.2027)	10355 ± 2330	9809 ± 2082
Operating surgeon: Consultant Postgraduate trainee	30 38	27 19

(OA: open appendectomy group, LA: laparoscopic appendectomy group, SD: standard deviation)

Table No. 2: Operative time of surgery in both groups

Operative time (minutes)	OA	LA
< 30	31	2
31 – 40	22	8
41 – 50	12	16
> 50	3	20
Mean ±SD	33.69 ± 10.27	51.26 ± 11.67
Median	32.5	50

(OA: open appendectomy group, LA: laparoscopic appendectomy group SD: standard deviation)

Table No. 3: Visual Analogue Score (VAS) on first post-operative day (POD1), total days of intravenous analgesic use, post-operative stay and cost of the procedure

Observed variable	OA (Mean ± S.D.)	LA (Mean ± S.D.)	P value
VAS score POD1	6.03 ± 1.81	2.87 ± 1.67	<0.0001
IV analgesic use (days)	4.10 ± 0.78	2.38 ± 0.53	<0.0001
Post-operative stay (days)	5.71 ± 1.49	3.67 ± 0.92	<0.0001
Cost (Indian rupees)	4809.26 ± 661.13	4713.04 ± 267.17	0.3531

(OA: open appendectomy group, LA: laparoscopic appendectomy group SD: standard deviation)

Discussion:

Along with the advances in biomedical technology and improvements in perioperative safety, the changes in perspective have led to the acceptance of minimal access surgeries by many surgeons, old and new alike.

Mean age, gender ratios, and leucocyte counts from our study were comparable with previous studies [14-20].

The application of laparoscopic equipment and the ergonomics on the abdominal wall increases the complexity of the surgery and requires improved surgical skill [7]. Generally, all laparoscopic procedures are more time consuming for reasons like inherent nature of slow maneuver of instruments, careful slow insufflations and routine diagnostic laparoscopy at beginning of any laparoscopic procedure [21].

The mean operative time was 33.69 ± 10.27 minutes in OA group and 51.26 ± 11.67 minutes in LA group. The difference was statistically significant (P<0.0001) and was compared to other studies (table no. 4) [10,15,17,18,20,22–24]. Some of the previous studies had not observed significant differences in the operative time between the two approaches [12,14,25].

Ekstein et al. had observed that patients undergoing laparoscopy may experience more pain in the early postoperative hours. But by 24 hours, they are more comfortable and require less analgesia than laparotomy patients [26]. In the current study, the laparoscopic procedure was associated with less pain (VAS score) on post-op day 1 (P<0.0001)which was comparable to study by Pradhan et al. [24] Ciftci et al. did not observe any statistical difference in VAS score in both the groups 24 hours postoperatively [14]. Our findings of less usage of parenteral analgesics in the LA group was comparable with previous studies [17,18,23].

The incidence of postoperative wound infection in the LA group was not statistically significant (P=0.525). The observations were compared to previous studies [6,14–16,18,21,23–25,27].

Table no. 3 shows that the postoperative hospital stay was significantly lower for the LA group (P<0.0001).

Our observations were comparable to previous studies (table no. 4) [10,15,17–20,22–25]. Ciftciet al. had not observed a significant difference in length of stay [14]. On reviewing the literature, some studies had counted total hospital stay (admission to discharge) due to different health sector policies and schemes. This may not be feasible always as some patients may require preoperative optimization for comorbidities. Jaschinksi et al. had commented in their review that despite variations in data and use of the absolute length of hospital stay, the stay was shorter by 0.96 days in the LA group[6]. In our study we have observed that though the operative time was longer in LA group, it

had not affected the postoperative recovery; rather the patients in LA group had shorter postoperative hospital stay.

The study did not observe any statistical difference in the cost of procedure of OA group 4809.26 ± 661.25 rupees and LA group 4713.04 ± 267.17rupees; median OA 4700 vs LA 4650 rupees. Previous studies have also not found significant difference in costs [10,12,23,24]

Literature is full of conflicting cost analyses over this issue. Cost analysis is complicated for reasons such as different billing protocols across different tiers of hospitals and cities, Government health schemes, teaching institutions. Irrespective of the cost difference, almost everyone agrees that LA provides more clinical comfort, shorter stay and early resumption of work which naturally equals to a smaller loss of workdays and economic benefits for all patients.

Our study had some limitations. Our hospital caters to a rural population. Despite early mobilisation and minor degrees of pain, we observed that some patients had delayed the oral feeds and stayed for a longer duration postoperatively. Some reasons might be age-old beliefs like longer the hospital stay improves the outcome, apprehension about the procedure and logistics issues of travelling by public transport on rural roads to distant villages.

Table No.4: Comparison of our findings with other studies

	N (cases)		Operative time (minutes)		Stay (Days)	
Study	OA	LA	OA	LA	OA	LA
Biondi et al.[10]	310	283	31.36±11.43	54.9±14.7	2.7±2.5	1.4±0.6
Kathare et al.[17]	25	25	53.8±19.96	71.2±25.67	7.7±2.3	2.8±0.91
Kryspin et al.[15]	199	91	62.9±22.6	67.8±19.8	4.7	3.3
Naraintran et al.[20]	50	50	48.2±12.4	68.5±20.3	4±2.94	2.8±0.9
Sharma et al.[18]	30	30	55±23.96	85.67±27.66	8.87±4.24	12.33±23.39
Sunilkumaret al.[22]	50	50	42.80±7.01	54.30±13.02	5.88±2.29	3.62±0.9
Utpal et al.[23]	179	100	25	30	5	3
Pradhan et al.[24]	106	110	37.99±9.8	42.82±10.8	3.19±2.16	2.75±0.7
Our study	68	46	33.69±10.27	51.26±11.67	5.71±1.49	3.67±0.92

(OA: open appendectomy group, LA: laparoscopic appendectomy)

Conclusion:

From our study, we conclude that laparoscopic appendicectomy is associated with less need for postoperative analgesics, fewer complications, shorter hospital stay and early return to normal work. These advantages outweigh longer operative time in LA.

We recommend that with the extensive application of minimal access surgery, skills training, and advances in bio-medical technology, operative time will no longer be the focal point of discussion.

Conflict of Interest - Nil

Sources of Support - Nil

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Address for correspondence:*Dr. Abhijit S. Rayate, Associate Professor of Surgery, Maharashtra Institute of Medical Sciences & Research (Medical College), Latur–413512, Maharashtra, India. Email:asrayate@yahoo.com, Mobile: +91 9209295967.*

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