iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** XI **Month of publication:** November 2022

DOI: https://doi.org/10.22214/ijraset.2022.47324

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue XI Nov 2022- Available at www.ijraset.com

Comparative Analysis of Clinical Outcomes of Open Appendectomy and Laparoscopic Appendectomy

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Abstract: ***We know that the Open appendectomy (OA) is standardized among surgeons and, OA is typically completed using a small right lower quadrant incision and postoperative recovery is usually uneventful. It is the second most common general surgical procedure performed in India and the most common intra-abdominal surgical emergency, with a lifetime risk of 6%. Study aimed to compare the clinical outcomes between laparoscopic and open appendectomy. Material and methods: The present study was conducted in the Department of General Surgery of our medical college. For the study, we retrospectively viewed the medical records of patients aged 60 years or more with acute appendicitis who underwent Laparoscopic appendectomy (LA) and were compared to patients who underwent open appendectomy (OA). A total of 70 patients (35 each for LA and OA) were selected. The analysis of preoperative, intra-operative, and postoperative parameters was done and was compared.***
Keywords: Laparoscopic Appendectomy, Open Appendectomy, Acute Appendicitis.

I. INTRODUCTION

Open appendectomy (OA) is standardized among surgeons and, unlike cholecystectomy, OA is typically completed using a small right lower quadrant incision and postoperative recovery is usually uneventful.1, 2 It is the second most common general surgical procedure performed after laparoscopic cholecystectomy, and the most common intraabdominal surgical emergency, with a lifetime risk of 6%. The overall mortality of OA is around 0.3%; and morbidity, about 11%.4. The introduction of laparoscopic appendectomy (LA) was therefore greeted with initial reluctance, skepticism, or outright rejection by many surgeons.3,4 Surgeons were discouraged by the disadvantages of the laparoscopic approach, including longer duration of operation, increased cost to the patient, and reports of complications.5 Nearly 3 decades later, large series of randomized controlled trials have shown significant evidence in favor of LA in many centers across the world. Despite published studies showing several advantages, the validity of this procedure in developing countries has not been confirmed.6 Hence the present study was planned to compare the clinical outcomes between laparoscopic and open appendectomy.

II. MATERIAL AND METHODS

The present study was conducted in the Department of General Surgery of MES medical college Perinthalmanna, kerala. Period of study was from October 2013 to March 2014. The ethical clearance for the protocol of study was obtained from the ethical committee of the institute. For the study, we retrospectively viewed the medical records of patients aged 60 years or more with acute appendicitis who underwent Laparoscopic appendectomy (LA) and were compared to patients who underwent open appendectomy (OA). A total of 70 patients (35 each for LA and OA) were selected. In all the patients, history of pain in the abdomen along with tenderness was noticed at the right lower quadrant. The analysis of preoperative, intra-operative, and postoperative parameters was done and was compared. The study was designed as a prospective randomized clinical trial and was initiated after approval by the institutional review board. The inclusion criterion was preoperative diagnosis of acute appendicitis. All of the patients underwent combined clinical, radiological, and biochemical evaluations for acute appendicitis. The diagnosis was determined and the final decision for surgical treatment was made by the attending surgeon. All of the patients were given detailed information about the study and provided signed informed consent forms. The patients were divided into two randomized groups: Group 1 underwent laparoscopic appendectomy, whereas Group 2 underwent OA. Randomization was performed using a lottery method. A resident, who had no knowledge of the preoperative data and would not be involved in the operations, was chosen to select lottery cards. Exclusion criteria were as follows: unwillingness to participate; inability to provide informed consent (mental disabilities); age younger than 15 years; pregnancy; severe sepsis or septic shock on admission; contraindication for laparoscopy; ASA III or IV; conversion to open procedure; and complicated appendicitis.

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All of the operations were performed under general anesthesia. Prophylactic antibiotherapy with a single shot of cefazolin (1 g, intravenous) was administered on a routine basis during the induction of anesthesia. All of the operations were performed by residents who were at least within their second year under supervision of the chief resident or the attending surgeon. In the laparoscopic approach, a temporary Foley catheter and an orogastric tube were inserted after the induction of general anesthesia to prevent visceral injury; both were withdrawn prior to recovery from anesthesia. The patient was positioned in a 30° Trendelenburg position and a 15° left tilt. A Verres needle was used to create pneumoperitoneum in all patients except those who had undergone previous abdominal surgery; Hasson technique was used on the latter patients instead. A 10-mm optic trocar was inserted through an infraumbilical incision, and a 30° scope was utilized in all cases. Under direct vision, a 10-mm and a 5-mm trocar were introduced in the left lower quadrant and suprapubic region, respectively. The dissection of the mesoappendix was performed using a 5-mm or a 10-mm vessel sealing device (The LigaSureTM Vessel Sealing System, Valleylab, Boulder, CO, USA). The dissection was kept as close to the appendix as possible to reduce the bulk of the specimen so as to avoid specimen delivery problems. The appendiceal base was secured using intracorporeal knotting with 2/0 silk. Either one or two knots were used based on the experience of the operating surgeon. The standard knot type used was a square knot with two turns in the first throw and one turn in the last two throws. A metal endoclip was applied to the specimen's side to prevent contamination. Following the appendectomy, the specimen was extracted from the trocar in the left lower quadrant and placed in a specimen bag. A "suction only" policy was preferred over irrigation unless there was localized pus accumulation in the pelvis. Drainage was avoided in all cases. In the open procedure, a Rockey-Davis or McBurney incision was used for the laparotomy. The anterolateral abdominal muscles were split, and the peritoneum was incised. The mesoappendix was ligated with 2/0 silk and divided. The base of the appendix was ligated with 2/0 silk. A hemostat was applied to the distal side of the specimen, and the appendix was transected. The incision was closed in an anatomic fashion. Again, a "suction only" policy was preferred over irrigation unless there was localized pus accumulation in the pelvis. Drainage was similarly avoided in all cases. All of the patients, except those who experienced nausea or vomiting, were allowed to start oral intake at the 4th postoperative hour. Tramadol (100 mg as needed, intravenous) was administered for the management of postoperative pain and was replaced by peroral naproxen sodium (550 mg twice a day) after the initiation of oral intake.

The patients were followed for 30 days after surgery. All of the findings among those admitted for dressing changes and stitch removal and those readmitted for postoperative complications were recorded. A visual analog pain scale was used to compare postoperative pain at the 4th postoperative hour and at the time of discharge. All of the patients were asked to complete to a quality of life questionnaire, specifically, the Nottingham Health Profile, at the 15th postoperative day. The Nottingham Health Profile is a validated tool that consists of 38 health-related questions which represent six dimensions of subjective health: physical mobility, pain, sleep, energy, emotional reactions, and social isolation.[10-12] The primary outcome measure was postoperative complications, including readmissions, rehospitalizations, and reoperations. The secondary outcome measures were length of hospital stay, visual analog pain scores, and quality of life scores. Statistical analysis was performed using NCSS 2007 Software (NCSS, Kaysville, UT, USA). Descriptive data were expressed as mean values and standard deviations. Student's t-test and Fisher's exact test were used to evaluate proportional data and qualitative data, respectively, for intergroup differences. A p value less than 0.05 was considered statistically significant.

III. RESULTS

One hundred and twenty-one patients were assessed for eligibility for the study. Twenty-two patients were excluded, and three patients were lost to followup. Therefore, a total of 96 patients were randomly divided into two groups: 50 patients in Group 1, and 46 patients in Group 2. The mean ages of the patients in Groups 1 and 2 were 27.4±18.5 years (range: 16-54 years) and 28.2±21.2 years (range: 15-71 years), respectively. The female-to-male ratios in Groups 1 and 2 were 0.9 (23/27) and 0.09 (4/44), respectively. The results and the comparison of outcome measures are presented in Table 1. The mean hospital stay lengths were similar for both groups (p=0.618). In Group 1, an iatrogenic ideal injury occurred in one patient. The injury was overlooked during the procedure, and the patient underwent reoperation on the second post-operative day, prior to discharge, due to signs of peritonitis. During diagnostic laparoscopy, a 1 cm perforation was found on the antimesenteric side of the terminal ileum. The perforated ileal segment was exteriorized because of the presence of diffuse peritonitis. The patient was discharged on the eighth day without any further complications and was scheduled for stoma closure. In Group 1, massive bleeding occurred after the insertion of the suprapubic trocar in one patient. The bleeding could not be controlled by direct compression, so the incision was enlarged, and the bleeding vessel was exposed and ligated. Four patients, one in Group 1 and three in Group 2, who developed wound infections were managed using regular wound care in the outpatient setting.

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Two patients, one in Group 1 and one in Group 2, with intraabdominal abscess were immediately rehospitalized. In both cases, parenteral anti-biotherapy with piperacilline-tazobactam (13.5 g/day, intravenous) was started, and a percutaneous drainage catheter was inserted under sonographic guidance by an interventional radiologist.

Three patients in group one presented with paralytic ileus. Of the three, one patient was managed via enema application in the outpatient setting. However, the other two were re-hospitalized and received conservative treatment, including nasogastric decompression and bowel rest. Both patients were discharged on the second day. There were no mortalities in either of the groups.

Table 1. Results of Outcome Measures

	Group I (n = 50)			Group II (n = 46)			p
	%	n	Mean±SD	%	n	Mean±SD	0.618
Postoperative complications Wound infection	2.1	1	-	6	3	-	0.999
Intraabdominal abscess	2.1	1	-	2	1	-	-
Bleeding	-	-	-	-	-	-	-
Paralytic ileus	6.5	3	-	-	-	-	0.106
Purulent peritonitis	2.1	1	-	-	-	-	0.479
Length of hospital stay (hours)	-	12-192	20.3±14.3	-	8-120	21.12±18.56	0.618
Readmission	13	6	-	8	4	-	0.513
Rehospitalization	6.5	3	-	6	3	-	0.999
Reoperation	2.1	1	-	-	-	-	0.479
Visual analog pain score Postoperative 4th hour	-	9-9	8.78±1.27	-	9-9	9±0.54	0.537
At discharge	-	4-5	4.74±0.8	-	5-5	4.86±0.81	0.327
Quality of life score	-	8-9	8.64±0.94	-	8-9	8.64±0.94	0.888

IV. DISCUSSION

Previous studies have consistently found that the overall rate of postoperative complications, including intraabdominal abscess formation, wound infection, and paralytic ileus, is higher in complicated appendicitis, irrespective of the method used for appendectomy.[13] Thus, the major determinant of postoperative complications seems to be related to advanced disease rather than the method of appendectomy in complicated appendicitis. Therefore, the present study focused on cases with uncomplicated appendicitis. Early studies comparing LA and OA reported higher rates of postoperative septic complications in LA.[7-9] However, numerous recent studies comparing LA and OA have reported contradictory results,[8,9] although most of the studies included a heterogeneous group of acute appendicitis cases, including all types of complicated appendicitis. Unfortunately, currently available data comparing LA and OA in uncomplicated appendicitis are limited and originate from either studies specifically focused on uncomplicated appendicitis patients or subgroup analyses from studies of patients with all types of appendicitis. Therefore, only a few studies could be used for comparison of results in the present study.[14-17] The rates of postoperative complications in both groups were similar and were comparable to those of the previous studies. Although shorter length of hospital stay is a well known advantage of minimally invasive surgery, in the present study, no hospital stay length advantage was associated with either uncomplicated appendicitis group. Moreover, regardless of the appendectomy technique, early discharge within the first 24 hours after appendectomy for uncomplicated appendicitis does not seem to lead to a significant increase in the rate of postoperative complications when compared to the results of similar studies.[7,9] We found that postoperative pain and quality of life in both groups were similar.

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This conflicts with two other important advantages of minimally invasive surgery, namely, less postoperative pain and faster return to daily activities. However, it also conflicts with previous studies comparing LA and OA in terms of quality of life in both the short-term and the long-term in which better quality of life has been associated with LA.[18-20] Preference for the laparoscopic approach over the open approach in uncomplicated appendicitis is still justified because of the important role of laparoscopic appendectomy in surgical training and patient preference for minimally invasive surgery In conclusion, the laparoscopic approach to appendectomy in patients with uncomplicated appendicitis does not offer a significant advantage over the open approach, in terms of length of hospital stay, postoperative pain scores, or quality of life, which are considered the major advantages of minimally invasive surgery. However, it should also be noted that concerns about increased postoperative septic complications with the laparoscopic approach in uncomplicated appendicitis seem to be unfounded.

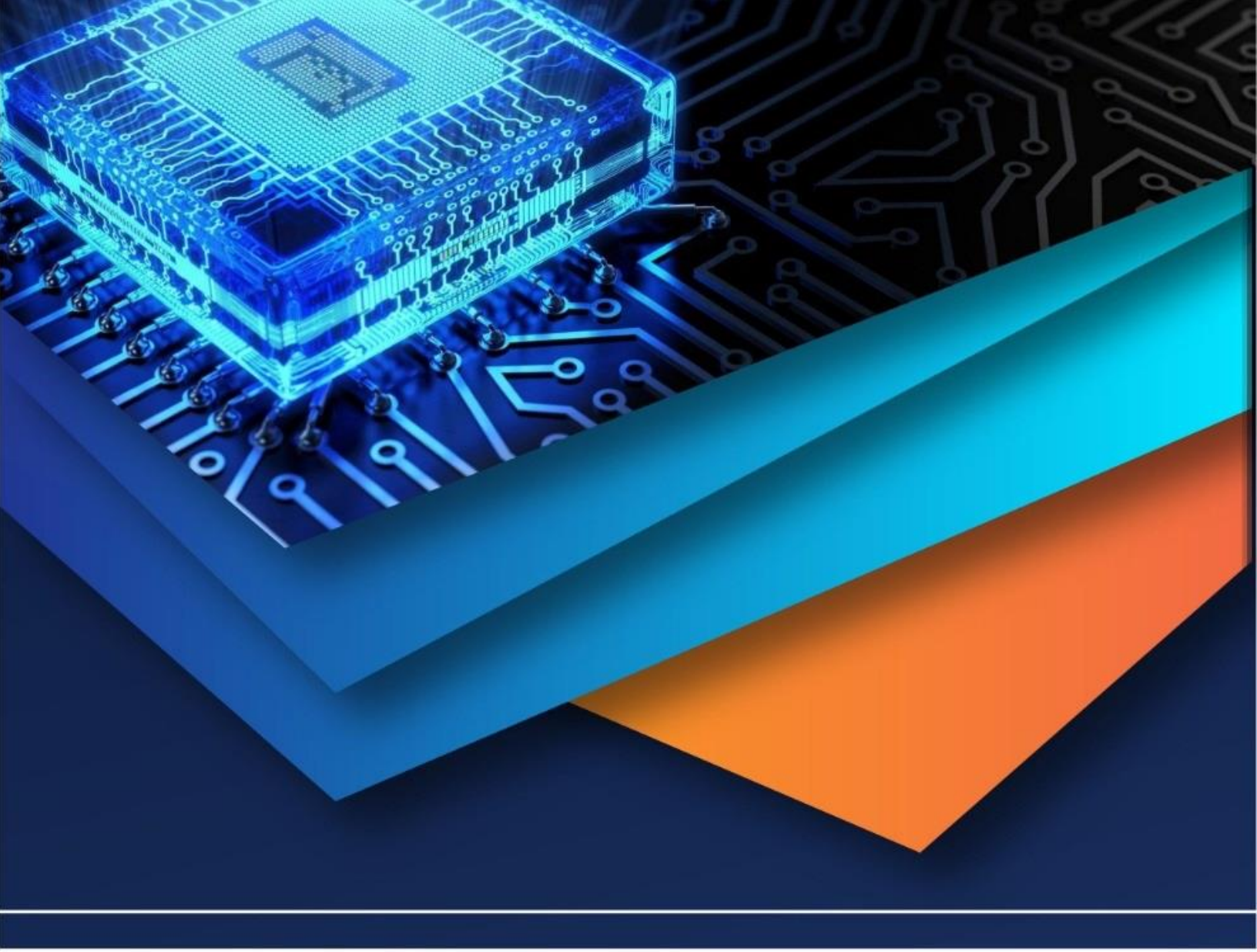
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