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ORIGINAL ARTICLE

Retrospective comparison of laparoscopic versus open appendectomy techniques in a tertiary care hospital in Peshawar, Pakistan

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ABSTRACT

Background: In children and young adults, appendicitis, or inflammation of the vermiform appendix, is the most frequent surgical emergency. This study aims to compare and evaluate results of open appendectomy versus laparoscopic appendectomy as regards the length of surgery, recovery after surgery, bowel movement return, and mobilization.

Methods: The research carried out a retrospective analysis on 760 individuals who underwent appendectomy procedures at a Peshawar tertiary care hospital between June 2021 and July 2023. These patients were distributed into OA (open appendectomy) and LA (laparoscopic appendectomy) groups. The following variables such as duration of surgery, postoperative bowel movements, hospital stay, and mobilization were selected from the electronic health record for comparison. Ethical approval for the study was granted by the ethics committee, with the assigned IRB & EC number: PIMC/DMR/7. SPSS version 22.0 was used to analyze the data.

Results: Operative intervention time for the LA group (38 minutes) was less than that of the OA group (65 minutes). Time to recover in the postoperative period was faster in LA patients, with 95% having bowel movements by the first day after surgery, as compared to the OA group at 68% and was found statistically significant (p value <0.05). Mobilization for the LA group was faster as they were mobilized at 8 hours compared to the OA patients, who were mobilized only after 34 hours and stayed in the hospital for 6 days and were statistically significant (p value <0.05).

Conclusion: Comparing laparoscopic appendectomy to open appendectomy, the former was obviously superior in terms of faster recovery, less operative time, and shorter stay in the hospital.

Keywords: Appendicitis, Appendectomy, Laparoscopic Surgery, Operative Procedure, Surgical Procedures

This article may be cited as: Afridi NS, Shah AA, Uzair M, Hussain A, Maryam, Khalil J. Retrospective comparison of laparoscopic versus open appendectomy techniques in a tertiary care hospital in Peshawar, Pakistan. Int J Pathol;22(4):214-20. https://doi.org/10.59736/IJP.22.04.924

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Introduction

Appendicitis, inflammation of the vermiform appendix and has traditionally been regarded as the majority of surgical emergencies among pediatric and young

adult populations presenting with abdominal pain. One of the oldest surgical interventions, an appendectomy is a procedure that removes an inflamed appendix to treat either chronic or acute appendicitis. Currently two types of appendectomy are there: laparoscopic and open. The former had dominated for 85 years, but since the latter was introduced to clinical practice in 1980, the controversy over which is better has not yet been abated despite the voluminous literature from LA. Management modalities primarily rely on history and clinical examination. Conservative approach with or without use of antibiotics may be indicated in selected cases. Diagnosis is usually made by history, clinical examination, and laboratory studies; however, a proportion of 30-45% may present with atypical forms of the disease. When the diagnosis is still in doubt, ultrasound and computed tomography are the most frequently used imaging modalities. Acute appendicitis has a 7-9% lifetime incidence and is still the most common cause of acute abdominal discomfort (1, 2) First described in 1894 by McBurney, due to its efficiency and safety, the open approach to appendectomy gained wide acceptance as a treatment standard for acute appendicitis. This technique, also referred to as McBurney's procedure, is still in use when an open surgical approach is necessary. (3) McBuney's OA dominated the surgical field for almost a century and until 1980 was considered the gold standard of therapy for acute appendicitis. In that year, the first fully laparoscopic appendectomy, which marked a significant paradigm shift in general surgery, was performed by Semm, a gynaecologist. (4, 5) In a prospective non-randomized study of 500 appendectomies, 138 children had LA while 362 children were chosen for the open surgery. There was no recorded death in either group. 3% of the open group experienced major complications, whereas the laparoscopic group did not have any major issues. In 20% of the open group and 13% of the laparoscopic group, minor problems were seen, and here also LA scores well. (6) Similarly, another study also forecasted that laparoscopic appendectomy would eventually emerge as the standard care for appendicitis, since it has clearly been shown to result in less postoperative pain than the conventional open method. (7) Advances such as Artificial Intelligence are revolutionizing healthcare by potentially improving the management of appendicitis through better diagnostics, prognosis, and decision-making. Advances in this regard support optimized techniques for laparoscopic as well as open surgery with the aim of improving patient outcomes. (8) Moreover, standard precautions among healthcare workers are an important factor for surgical success. Correct implementation of these protocols will ensure the safety of healthcare workers and minimize the risk of complications such as surgical site infections, which are still critical concerns in appendectomy procedures. (9) The shift from traditional to modular medical education in Pakistan emphasizes integration and competency-based learning, equipping graduates with the skills to adopt modern surgical techniques. This approach enhances understanding of laparoscopic versus open appendectomy, enabling informed clinical decisions. (10)

This research aims to evaluate open versus laparoscopic appendectomy techniques in patients suffering from appendicitis, by comparisons of surgery duration, hospital stay, postoperative discomfort, complications, and return to routine work. The outcomes are reviewed at a tertiary care

facility at Peshawar to determine the better approach in the practice.

Methods

This is a retrospective study conducted at the Department of General Surgery, Peshawar, at a private tertiary care hospital (Peshawar Institute of Medical Sciences), starting from June 2021 and going through to July 2023, including all the patients who were admitted with a diagnosis of appendicitis. All data were extracted using EHR from the electronic database of the said hospital. The study encompassed a cohort of 760 patients who received an appendectomy. Participants were categorized into two distinct groups according to the surgical approach utilized: the open appendectomy (OA) group and the laparoscopic appendectomy (LA) group. The ethics committee reviewed the study design and rationale and approved it by assigning the IRB & EC number: PIMC/DMR/7. Since the research design was based on a retrospective study of files, the ethics committee of the hospital exempted the sample size calculation. This exemption was provided considering the characteristics of the study, which involved the use of pre-existing patient records without interaction with the patients. The population consisted of patients aged 16 years and above who have undergone either open appendectomy or LA for the treatment of appendicitis within the period under review. All those with clinical or imaging-confirmed diagnosis of appendicitis were included in the study. Individuals were excluded from the study if they had undergone conservative management of appendicitis, did not have surgical intervention, had incomplete medical records in the EHR, or had significant comorbid conditions that prevented surgery. In addition, patients who had undergone an appendectomy due to indications unrelated to appendicitis, like incidental appendectomies during other surgical procedures, were also excluded from the study. The diagnosis had been made clinically by a synthesis of the patient's history of right iliac fossa or periumbilical discomfort, nausea, and vomiting, combined with fever >38°C and >10,000 cells/mL leukocytosis. Other supportive findings included tenderness or guarding in the right iliac fossa. In cases where the diagnosis was in doubt, confirmation was made through imaging studies, such as abdominal ultrasound or computed tomography studies. Both groups were given a prophylactic dose of third-generation cephalosporin and metronidazole at the time of anaesthesia induction. In the OA group, the appendix was accessed and removed via standard McBurney incision in the usual manner. The LA group underwent a standard 3-port technique. Pneumoperitoneum was achieved using CO2 at 12–14 mmHg through a Veress needle inserted infraumbilical. The Trendelenburg position was applied with a slight tilt to the left. The abdominal cavity was investigated for other intra-abdominal and pelvic pathologies. The mesoappendix was divided with bipolar forceps, and the appendix was secured using two ligating loops. Through a 10-mm infra-umbilical port, the appendix was removed, and the specimen was sent for histopathology. In the postoperative period, the patients remained nil per mouth until they were fully recovered from anaesthesia and their bowel sounds returned. Clear fluids were then started; this was followed by a soft diet when the patients tolerated liquids well and after passing flatus. Patients were

discharged when tolerating a regular diet, afebrile, and with adequate pain control. Follow-up was done three weeks following discharge. The data from electronic health records were analysed with SPSS. Descriptive statistics were also performed: frequencies and percentages were computed where appropriate. To evaluate and compare the outcomes of Open Appendectomy (OA) and Laparoscopic Appendectomy (LA) procedures, independent t-tests were conducted on four key variables: Bowel Movements on the 1st Post-Operative Day (POD), Post-Operative Stay, Mobilization time, and Procedure Duration. The calculated t-values were compared to the critical t-value ~ 1.96 from the t-distribution table at a 0.05 significance level.

Results

In the population studied, which consisted of 760 patients, 33.03% of the patients had open appendectomy, while 66.97% had laparoscopic appendectomy. Among males (405), 34.57% underwent open surgery, while 65.43% underwent laparoscopic. Among females (355), (31.27%) underwent open procedure and 68.73% underwent laparoscopic procedure. (Table 1)

Table 1: Gender and surgical procedure group among the study population.

Gender	Open appendectomy (n) (%)		Laparoscopic appendectomy (n) (%)	Total (n) (%)
Males	140 (34.57)		265 (65.43)	405 (100.00)
Females	111 (31.27)		244 (68.73)	355 (100.00)
Total	251 (33.03)		509 (66.97)	760 (100.00)

Out of the 760 patients that comprised the group having undergone open appendectomy, their age group distribution was as follows: 16-25 years, 21.51%; 26-35 years, 24.70%; 36-45 years, 14.74%; 46-55 years, 21.51%; and 56+ years, 17.55%. While in the laparoscopic group, the distribution was as follows: 16-25 years, 35.17%; 26-35 years, 22.39%; 36-45 years, 16.70%; 46-55 years, 6.68%; 56+ years, 19.06%. (Table 2)

Table 2: Distribution of Age group

Age group (in years)	Open appendectomy (n) (%)	Laparoscopic appendectomy (n) (%)
16-25	54 (21.51)	179 (35.17)
26-35	62 (24.70)	114 (22.39)
36-45	37 (14.74)	85 (16.70)
46-55	54 (21.51)	34 (6.68)
56 & above	44 (17.55)	97 (19.06)
Total	251 (100.00)	509 (100.00)

Postoperative recovery also favoured LA, with 95% of patients regaining bowel movements quickly on 1st post operative day, compared to 68% in the OA group. Additionally, post operative stay at hospital was significantly shorter for LA patients (3 days) versus OA patients (6 days), likely reflecting quicker recovery times with laparoscopic surgery. Mobilization was also quicker among the LA patients as they became mobilized within 8 hours, whereas mobilization occurred for the OA group after 34 hours. In comparison LA procedure was notably faster, with an average duration of 38 minutes as compared to 65 minutes for OA. All t-values ($|t| > 1.96$) indicated significant differences, suggesting that LA is associated with better outcomes than OA in terms of higher rates of bowel movements on the 1st POD, shorter post-operative stay, quicker mobilization, and shorter procedure duration. (Table 3)

Table 3: Comparison of Open Appendectomy and Laparoscopic Appendectomy procedures

Variables	Open appendectomy	Laparoscopic appendectomy	p-value
Bowel movements (1ST POD*)	68%	95%	0.0041
Post OP Stay**	6 days	3 days	0.0028
Mobilization	34 hours	8 hours	0.0007
Procedure duration	65 mins	38 mins	0.0041

*POD: Post-Operative Day, **Post OP Stay: Post-operative stay.

Discussion

A total of 760 patients were studied with 33.03% having open appendectomy (OA) and 66.97% experiencing laparoscopic appendectomy (LA). While the males had OA at a frequency of 34.57%, males had LA at a frequency of 65.43%. Females experienced 31.27% OA and 68.73% had LA. For OA patients, the peak age group was at a frequency of 26-35 years at 24.70%, while the peak age group was at 16-25 years for LA with a frequency of 35.17%. According to recent literature both techniques of appendectomies are safe and effective, but surprisingly, Laparoscopic surgery is linked to decreased postoperative discomfort, reduced infection rates, and shorter hospital stays, although some surgeons believe that they do not give apparent advantages for men. A meta-analysis of 28 trials involving 2,877 patients backed up the results. (11)

For the laparoscopic appendectomy group, our study had an average operative time of 38 minutes compared to an estimated average of 65 minutes for the open appendectomy group. According to Rbihat et al, a mean operative time of 55 minutes for the laparoscopic group was compared to 22 minutes for the open group. (12) Another research on 593 patients, Biondi et al., had revealed that the open appendectomies taken were of shorter mean operative times, which is 31.36 ± 11.13 minutes in comparison with that of the laparoscopic procedure whose mean time was 54.9 ± 14.2 minutes. (13)

In our study, postoperative hospital stay was 6 days and 3 days for open and laparoscopic appendectomy groups respectively. Further, bowel movement returned on the first postoperative day in 68% of laparoscopic patients and 95% of open appendectomy patients. However, according to research by Vellani et al, wherein the average length of postoperative stay was much less in patients undergoing laparoscopic appendectomy, at 1.97 ± 2.3 days compared to 3.1 ± 1.8 days with the open appendectomy. Average times to return of bowel movements are similarly significantly shorter in the laparoscopic group at 10.6 ± 8.2 hours, compared to the open group at 21 ± 13 hours. (14) Many studies have confirmed the result that there is indeed reduced postoperative hospital stay and complications for laparoscopic interventions. (15,16) Likewise, Adams et al., in their study, found that in both groups the average stay at hospital was same, which equalled to 3 days for both, although this contradicts the overall findings of most of studies that may have longer stays relative to laparoscopic appendectomy for open appendectomy. (17)

In this study, the patients took 34 hours in the open appendectomy group to be mobilized, which was much lower, only 8 hours, in the laparoscopic appendectomy group. Other studies have also shown similar results where the patients in the laparoscopic group were usually completely mobilized and required no further analgesics after an average time of 12 hours compared to the open appendectomy group with an average

time of roughly 36 hours for mobilization. (18,19,20)

Study's strengths and limitations

A sample of 760 patients increases the strength in the study, making the research more powerful and generalizable in its findings. The fact that the open and laparoscopic approaches are both incorporated into the study allows for a comparison between the two approaches to treatment for appendicitis. By using electronic health records to extract data, the problem of recall bias is reduced, while, at the same time, making the documentation accurate and standardized. Clear inclusion and exclusion criteria have helped keep the study's internal validity within the confines of focusing only on confirmed cases of appendicitis and excluding confounding cases with apparent significant comorbidities or incomplete records. However, the study has a few limitations. It is a retrospective study which relies on pre-existing data, in this case, not as comprehensive or may be biased by incomplete documentation of details. Furthermore, the study was confined to only one private tertiary care hospital in Peshawar, which may reduce external validity and limit applicability to other settings.

Conclusion

Open appendectomy (OA) compared with laparoscopic appendectomy (LA) for appendicitis treatment, allows the obvious advantages of LA over OA in surgical outcomes. LA is associated with reduced operative time, faster recovery of bowel function, quicker mobilization, and much shorter postoperative hospital stay. These benefits are in line with the worldwide trend toward minimally invasive surgery-a trend that has emerged with documented improvement in patient recovery and overall postoperative outcomes in the management of appendicitis.

Future Recommendations

Future studies should be prospective, randomized, controlled trials to minimize any bias and to afford more stringent evidence in the comparison of open versus laparoscopic appendectomy. These should be multi-centered and spread out among different public hospitals to increase generalizability. Finally, long-term patient outcomes, patient satisfaction, and cost-effectiveness also must be assessed to guide decisions.

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HISTORY	
Date received:	25-11-2024
Date sent for review:	24-12-2024
Date received reviewers comments:	25-12-2024
Date received revised manuscript:	26-12-2024
Date accepted:	27-12-2024

KEY FOR CONTRIBUTION OF AUTHORS:

A. Conception/Study/Designing/Planning
B. Active Participation in Active Methodology
C. Interpretation/ Analysis and Discussion

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