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Comparison of Early Outcomes of Laparoscopic and Open Appendectomy

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Abstract **Original Research Article**

***Introduction*:** There are numerous studies comparing the outcomes of open appendectomy (OA) and laparoscopic appendectomy (LA). However, the debate over which method is superior is still ongoing. This study aims to compare the early outcomes and complications of laparoscopic and open appendectomy to determine the advantages and disadvantages of each method. ***Materials ve Methods*:** In this study, the medical records of patients who underwent surgery for acute appendicitis between January 1, 2020, and January 1, 2025, were retrospectively reviewed. Patients were divided into two groups based on whether they underwent laparoscopic or open appendectomy, and comparisons were made regarding age, gender, and length of hospital stay. Postoperative complications, including pain, atelectasis, surgical site infection, bleeding, stump leakage, and intra-abdominal abscess formation, were identified and compared between the groups. ***Results*:** A total of 179 patients were included in the study, with 64.2% being male and 35.8% female. There was no significant difference between the groups in terms of atelectasis, surgical site infection, or intra-abdominal abscess formation ($p>0.05$). However, postoperative pain and length of hospital stay were significantly shorter in the laparoscopic group ($p<0.05$). ***Conclusion*:** The complication rates following laparoscopic and open appendectomy are similar. However, postoperative pain and hospital stay are shorter in patients undergoing laparoscopic appendectomy. Laparoscopic appendectomy is an effective and reliable method for treating acute appendicitis.

Keywords: Acute appendicitis, Laparoscopic appendectomy, Open appendectomy.

INTRODUCTION

Acute appendicitis is the most common cause of admission to surgical clinics for acute abdominal pain (7-9%). It is most frequently observed between the ages of 10 and 30. The lifetime risk of developing acute appendicitis is 8.6% in men and 6.7% in women [1, 2].

The diagnosis of acute appendicitis is made based on physical examination, laboratory tests, and radiological imaging. Loss of appetite, nausea, vomiting, and abdominal pain that begins around the umbilicus and shifts to the right lower quadrant are the main symptoms. Leukocyte count and CRP levels are typically found to be elevated. Abdominal ultrasound, abdominal computed tomography, and abdominal magnetic resonance imaging are the main radiological methods used for diagnosis [3, 4].

Although conservative methods with antibiotic treatment are applied in suitable patients, the primary treatment method is appendectomy through surgical intervention. Appendectomy can be performed using traditional open, laparoscopic, and robotic surgical techniques [5-7].

This study compares the early outcomes and complications of appendectomy cases performed with open and laparoscopic methods.

MATERIALS VE METHODS

After obtaining permission for the study from the Chief Physician's Office of Hatay Mustafa Kemal University Faculty of Medicine Training and Research Hospital, the files of patients who were operated on with a diagnosis of acute appendicitis between 01.01.2020 and 01.01.2025 were retrospectively reviewed. The patients were divided into two groups: those who underwent laparoscopic appendectomy and those who underwent open appendectomy. The patients' age, gender, body mass index (BMI), Alvarado score, use of drains, and length of hospital stay were determined and compared. Postoperative visual analogue scores of the patients were assessed and compared. Complications that developed within the first month after surgery, such as atelectasis, wound infection, bleeding, stump leakage,

and intra-abdominal abscess, were identified and compared. Pathology results were reviewed and compared.

Surgical Technique

All patients were evaluated by a general surgeon and an anesthesiologist prior to surgery. All procedures were performed under general anesthesia. The surgeries were performed by a general surgeon or by residents under the supervision of a general surgeon. For open appendectomy, a McBurney incision was made in the right lower quadrant of the abdomen. The appendix was located, and the appendicular vessels were ligated and divided. The appendix was then ligated near its base with two absorbable sutures placed 3 mm apart. The proximal 5 mm of these sutures was tied with a third suture, and the tissue between them was excised to complete the appendectomy. For laparoscopic appendectomy, three trocars were inserted: one just proximal to the umbilicus, one in the right upper quadrant, and one in the left lower quadrant. The intra-abdominal pressure was set to 10-12 mmHg with the aid of carbon dioxide insufflation. The appendicular vessels were sealed and divided using energy devices. The appendix was ligated near its base with two absorbable sutures placed 5 mm apart, and a third suture was placed proximally, all done intracorporeally. The tissue between these sutures was excised, completing the appendectomy. The appendix was removed using an endobag through the trocar. Patients were transferred to the postoperative general surgery ward. For analgesia, paracetamol, sodium diclofenac, and narcotic analgesics, if necessary, were administered. The visual analog pain scores (VAS) of the patients were recorded during the first 24 hours postoperatively.

Statistical Analysis

Descriptive statistics were used to analyze the data, including the percentage distribution of categorical variables and the mean and standard deviation of continuous variables. The Pearson chi-square test and the Yates-corrected chi-square test were employed to assess the relationship between categorical variables and the dependent variable, with column percentages used for descriptive statistics. The Shapiro-Wilk test was applied to evaluate the normality of continuous variables in relation to the dependent variable. Since the continuous variables did not follow a normal distribution, the Mann-Whitney U test was used for comparison between two continuous variables, and a p-value of <0.05 was considered statistically significant.

RESULTS

A total of 179 patients were included in the study. Of these, 64.2% were male, and 35.8% were female. Among these patients, 65.4% underwent open appendectomy, while 34.6% underwent laparoscopic appendectomy. The gender, complication occurrence and type, drain placement status, narcotic analgesic requirement, and pathology results according to the type of surgery are shown in Table 1. Of the patients who underwent laparoscopic appendectomy, 51.6% were male, and 48.4% were female (p=0.016). Narcotic analgesic use was required in 35.5% of the laparoscopic group, while 69.2% of the open appendectomy group required narcotic analgesics (p<0.001) (Table 1). The patients' age, BMI, Alvarado score, length of hospital stay, and VAS score according to the surgery type are presented in Table 2. The BMI of the laparoscopic group was 28.1±7.4, while the BMI of the open group was 26.7±2.9 (p=0.027). The Alvarado score of the laparoscopic group was 7.2±1.5, while the open group's score was 7.6±1.5 (p=0.007). The length of hospital stay for the laparoscopic group was 1.6±1.8 days, compared to 1.8±1.9 days in the open group (p=0.046). The average VAS score for the laparoscopic group was 5.8±0.9, while it was 6.4±1.4 for the open group (p<0.001) (Table 2).

Table 1: Gender, Complication Status and Type, Drain Presence, Narcotic Requirement, and Pathology Results According to Surgery Type

		Total*		Type of Surgery				p**
				Laparascopic (N=62)*		Open (N=117)*		
		Number	Percentage	Number	Percentage	Number	Percentage	
Gender	Male	115	64,2	62	51,6	117	70,9	**0,016**[a]
	Female	64	35,8	30	48,4	34	29,1	
Complication	Present	19	10,6	62	9,7	117	11,1	0,957
	Absent	160	89,4	56	90,3	104	88,9	
Complication Type	Absent	160	89,4	56	90,3	104	88,9	0,859
	Surgical Site Infection	9	5,0	2	3,2	7	6,0	
	Bleeding	3	1,7	1	1,6	2	1,7	
	Atelectasis	4	2,2	2	3,2	2	1,7	
	Intraabdominal Abscess	3	1,7	1	1,6	2	1,7	
Drain Use	Present	20	11,2	6	9,7	14	12,0	0,831
	Absent	159	88,8	56	90,3	103	88,0	
Narkotic Analgesic Need	Present	57,5	103	22	35,5	81	69,2	**<0,001**
	Absent	42,5	76	40	64,5	36	30,8	
Pathology Result	Acute Appendicitis	167	93,3	58	93,5	109	93,2	1,000[a]
	Normal or Not Appendicitis	12	6,7	4	6,5	8	6,8	

* Column percentage, ** Pearson Chi-square test, [a] Yates-corrected chi-square test

Table 2: Age, BMI, Alvarado Score, Length of Hospital Stay, and VAS Score According to Surgery Type

	Total		Group				p*
			Laparascopic		Open		
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	
Age (Years)	31,9	9,8	29,4	7,4	33,2	10,7	0,058
BMI	27,1	3,21	28,1	3,6	26,7	2,9	**0,027**
Alvarado Score	7,5	1,1	7,2	1,5	7,6	1,5	**0,007**
Hospital Score (Days)	1,8	1,8	1,6	1,8	1,8	1,9	**0,046**
VAS Score	6,5	1,3	5,8	0,9	6,8	1,4	**<0,001**

*Mann-Whitney U Test, VAS: The Visual Analogue Scale. BMI: Body Mass Index.

DISCUSSION

Acute appendicitis is one of the most common intra-abdominal conditions that requires emergency surgical treatment. The primary treatment is appendectomy. The appendectomy procedure was first described by McBurney in 1894 and has remained the main treatment method for many years. In 1983, Seem performed the first laparoscopic appendectomy. Initially used only to confirm the diagnosis in suspected cases of appendicitis, laparoscopy has become widely used for appendectomy in subsequent years [8-10]. Although no study has definitively shown the superiority of one technique over the other, there are many studies outlining the advantages and disadvantages of these techniques. The main advantages of laparoscopic appendectomy include less postoperative pain, earlier return to work, fewer wound infections, and better cosmetic outcomes, while the disadvantages include higher costs, the need for more technical equipment, longer surgery times, and, in some studies, a higher incidence of intra-abdominal abscesses [10-15].

In our study, the average age of the patients was similar in both groups. However, the laparoscopic appendectomy group had a higher proportion of female patients. One reason for this is the difficulty in fully distinguishing between gynecological pathologies at the diagnostic stage in female patients, which led our team to favor diagnostic laparoscopy. The lower Alvarado score in the laparoscopic group also increased the tendency to prefer laparoscopic surgery. Additionally, the higher BMI was another reason for choosing laparoscopic appendectomy.

Delay in the diagnosis of acute appendicitis leads to appendiceal perforation, which is a significant cause of morbidity and mortality (13-37%). Therefore, it is crucial to establish an accurate diagnosis of acute appendicitis. However, this has led to an increase in the rate of negative appendectomies [16]. In our study, the negative appendectomy rate was higher in the laparoscopic appendectomy cases. This is due to the preference for laparoscopic surgery in cases with a low Alvarado score or when there was diagnostic uncertainty.

In studies comparing the complications of open appendectomy and laparoscopic appendectomy, it has been reported that wound infections are more frequent after open appendectomy, while intra-abdominal abscesses are more common following laparoscopic appendectomy. However, blood loss is notably lower in laparoscopic appendectomy [8, 10]. In our study, there was no significant difference in terms of wound infection, intra-abdominal abscess, and bleeding, which contrasts with the findings in the literature.

One of the main advantages of laparoscopic techniques is reduced postoperative pain. Less pain is considered an important factor for earlier discharge and quicker return to normal life [17, 18]. The findings in our study were consistent with those in the literature. The postoperative VAS scores were lower in the laparoscopic appendectomy group, and these patients had a shorter hospital stay.

CONCLUSION

In this study, the complications of laparoscopic appendectomy were found to be similar to those of open appendectomy. Postoperative pain and hospital stay duration were shorter in the laparoscopic appendectomy group. Considering these findings, we conclude that laparoscopic appendectomy is a reliable method for the treatment of acute appendicitis.

Competing Interests: The authors declare no conflict of interest regarding this study and its publication.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Approval

The current study was obtained permission for the study from the Chief Physician's Office of Hatay Mustafa Kemal University Faculty of Medicine Training and Research Hospital numbered E-14096738-108.02-474417 and dated February 12, 2025.

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