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Comparative Study Between Open Surgical Technique Versus Laparoscopic Appendectomy In Complicated Appendicitis

General Surgery

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ABSTRACT

Background: The benefits of diagnostic and therapy in a single procedure with minimal morbidity are combined in the laparoscopic appendectomy (LA). Furthermore, the entire abdomen may be visualized to exclude any additional pathology that may be present. Patients are likely to experience less postsurgical pain, get discharged from the hospital, and come back to normal activities and employment sooner than those who have undergone open appendectomy (OA).
Aim of the work: To compare between Laparoscopic and open appendectomy in complicated appendicitis.
Patients and methods: This study was a prospective study involving 40 patients who were suspected of having complicated acute appendicitis in the emergency room of Al-Azhar University Hospitals. Patients had been randomly assigned to one of two groups: Group A, which comprised 20 patients who had laparoscopic appendectomy, and Group B, which comprised 20 patients who had open appendectomy.
Results: There was a statistically significant reduction in hospital stay and post-surgical complications in group A compared to group B, but an increase in operative time in group A compared to group B ($p<0.001$).
Conclusion: Laparoscopic appendectomy is a safe and viable operation for treating complicated appendicitis, and it could be the first option without an increase in postsurgical complications. Despite the surgeons' increased experience, the lengthier surgery time remains an issue for laparoscopic surgery.
Keywords: *Complicated appendicitis; appendectomy; Laparoscopic appendectomy; Open appendectomy.*

INTRODUCTION

Acute appendicitis is still one of the most prevalent emergency diseases, accounting for 9% of all occurrences during a lifetime. The rate of complex appendicitis has remained steady at 25% of all instances during the previous few decades, possibly owing to greater usage of CT imaging. [1]

With the emergence of laparoscopic surgery and the increased use of laparoscopy over the last 3 decades, complicated appendicitis (CA), described as gangrenous or perforated appendicitis with or without peritonitis, was increasingly handled laparoscopically, with up to 67 % of CA instances conducted laparoscopically in the United States in 2011.[2]

However, in the past, some worries have been expressed about a possible greater prevalence of intra-abdominal abscesses (IAA) in the laparoscopic group compared to the open group. A prior systematic review (SR) and meta-analysis (MA) on IAA found no difference between the two groups, implying that the laparoscopic method had certain advantages.[3]

Since Semm's first study of laparoscopic appendectomy (LA) in 1983, a significant variety of research comparing laparoscopic vs. open appendectomy (OA) has been done. When compared to OA, LA has a distinct advantage in terms of peritoneal cavity access and visualisation via small incisions. As a result, LA is superior at managing complex appendicitis.[4]

When compared to uncomplicated appendicitis, OA for complex appendicitis necessitates a wider abdominal incision and a lengthier operating duration, putting patients under additional surgical stress. Furthermore, the wound is exposed to polluted fluid, thereby increasing the risk of wound infections. As a result, it stands to reason that LA may have benefits over OA in individuals with complex appendicitis, as LA is linked to a reduced wound surface zone exposed to contamination and may allow for direct visualization during peritoneal lavage.[5]

Because of several advantages linked with minimally invasive surgery, like reduced rates of surgical site infection (SSI), lowered occurrence of postsurgical ileus, shortened lengths of hospital stays (LOS), and the ability to sooner come back to regular activities, LA has become increasingly popular over OA in the last 20 years. Many meta-analyses have concluded that LA is the preferred technique for individuals

having simple, uncomplicated AA. CA, on the other hand, is linked to worse results, like a higher risk of postsurgical SSI and the formation of IAA, which leads to more readmissions and a longer time to return to regular activities. Many investigations have also shown that LA is linked to a significantly greater rate of IAA. Hence, OA has been designated the gold standard for CA sufferers.[6]

The aim of this research was to compare laparoscopic versus open appendectomy in patients with complicated appendicitis.

PATIENTS AND METHODS

This study was a prospective study involving 40 patients who were suspected of having complicated acute appendicitis in the emergency room of Al-Azhar University Hospitals.

Patients had been randomly assigned to one of two groups: Group A, which comprised 20 patients who had laparoscopic appendectomy, and Group B, which comprised 20 patients who had open appendectomy.

Inclusion criteria: History of present illness 3 days or more, fever ≥ 38°C, marked localized guarding and tenderness in Rt iliac fossa, total leukocytic account more than 15000, and signs of complications in investigations such as in U/S or CT scan like appendicular diameter 1cm or more and peri-appendicular collection.

Exclusion Criteria: Chronic medical or psychiatric diseases, hemodynamic instability, coagulation disorders, cirrhosis, and/or ascites, prior laparotomy, pregnancy, history of drug abuse, contraindication to laparoscopy, and patients with any symptoms of acute infection (pain, fever or vaginal discharge).

All patients were subjected to:

Informed consent was obtained from each participant.

Preoperative Management:

Taking a complete history.

Clinical examination: Abdominal examination.

Laboratory examinations and imaging:

CBC with total and differential WBCs.

Prothrombin time.

Fasting blood sugar.

Liver and renal function tests.

Urine analysis.

Ultrasonography.

Plain chest X-ray in cases of suspected pneumonia.

Control of the general condition like DM and hypertension.

prophylactic Antibiotics.

Operative management.

Study protocol had been submitted for approval by Institutional Review Board, Al-Azhar University. Each individual who took part in the study gave verbal informed consent. At every level of the research, confidentiality and personal privacy have been respected.

Statistical analysis:

The gathered data has been coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc., Chicago, IL, USA). The Shapiro-Walk test has been performed to determine if the data has a normal distribution. Frequency and relative percentage have been employed to represent qualitative data. To determine the difference between two or more sets of qualitative variables, use the Chi-square test ($\chi 2$). The quantitative results have been presented as mean ± SD (standard deviation). To compare two independent groups of normally distributed variables, the independent samples t-test has been employed (parametric data). Significant has been regarded as a P value of less than 0.05.

RESULTS

There were no statistically significant differences (p-value > 0.05) among the groups studied in terms of laboratory Investigations and U/S findings (Table 1).

	Group A (n = 20)		Group B (n = 20)		Test of sig.	P-value
	No.	%	No.	%		
Gender					$\chi 2$ =	0.752
Male	10	50.0%	11	55.0%	0.100	
Female	10	50.0%	9	45.0%		
Age (years)					t =	0.277
(Min. – Max.)	(16 –57)		(15–55)		-1.104	
Mean ± SD.	35.10 ± 12.485		30.80 ± 12.155			

Table (1): Comparison of demographic data between groups (A) and (B)

The age in group A ranged from 16 to 57 years and the mean ± SD was 35.10 ± 12.48 years, while in group B the age ranged from 15 to 55 years and the mean ± SD was 30.80 ± 12.15 years. Age differences between the two groups were not statistically significant (p>0.05). The gender was distributed in group A 10(50%) males, 10(50%) females and in group B 11(55%) males, 9(45%) females with no statistically significant difference (p>0.05) (Table 1).

Intraoperative findings	Groups				Total		X^2	P-value
	Group A (n = 20)		Group B (n = 20)					
	N	%	N	%	N	%		
Gangrenous appendix	8	40.0%	7	35.0%	15	37.5%	0.432	0.934
Appendicular abscess	4	20.0%	5	25.0%	9	22.5%		
Appendicular mass	3	15.0%	4	20.0%	7	17.5%		
Perforative appendicitis	5	25.0%	4	20.0%	9	22.5%		
Total	20	100.0%	20	100.0%	40	100.0%		

Table (2): Comparison between group (A) and group (B) as regards Intraoperative findings

The intraoperative findings where 8(40%) cases had acute Gangrenous appendix in group A in comparison to 7(35%) cases in group B, 4(20%) cases with appendicular abscess in group A in comparison to 5 (25%) of cases in group B, and 3(15%) cases with appendicular mass in group A in comparison to 4(20%) cases in group B, 5(25%) cases in group A with perforative appendicitis in comparison to 4(20%) cases in group B (Table 2).

	Group A (No. = 20)			Group B (No. = 20)			t	P-value
Operative time (min)								
Min – Max	55	-	97	40	-	76	6.721	0.000**
Mean ± SD	80.35	±	13.011	55.80	±	9.876		
Hospital stay (days)								
Min – Max	1	-	7	2	-	8	-2.775	0.009*
Mean ± SD	2.65	±	1.814	4.25	±	1.832		
Time to return to normal life(days)								
Min – Max	3	-	10	5	-	16	-3.233	0.003*
Mean ± SD	4.95	±	2.235	8.10	±	3.740		
Pain score after operation (VAS) (6hr)								
Min – Max	1	-	6	2	-	7	-4.205	0.000**
Mean ± SD	2.65	±	1.424	4.50	±	1.357		

Table (3): Comparison of groups (A) and (B) in terms of operative time, hospital stays, time to get back to normal life and pain score after operation

The operative time in group A was statistically significantly longer than in group B ($p<0.001$). Group B had a statistically significant longer hospital stay than group A ($p<0.001$). The time to return to normal life was statistically significantly longer in group B than in group A ($p<0.05$). The pain score in group B increased statistically significantly more than in group A ($p<0.001$) (Table 3).

Post-operative complications	Groups				Total		X^2	P-value
	Group A (n = 20)		Group B (n = 20)					
	N	%	N	%	N	%		
No	16	80.0%	8	40.0%	24	60.0%	8.485	0.037*
Incisional surgical site infections (I)	4	20.0%	7	35.0%	11	27.5%		
organ/space surgical site infections (II)	0	0.0%	3	15.0%	3	7.5%		
Readmission	0	0.0%	2	10.0%	2	5%		
Total	20	100.0%	20	100.0%	40	100.0%		

Table (4): Comparison of post-operative complications between groups (A) and (B):

In terms of postoperative complications, there were statistically significant differences between the two groups ($p<0.05$) (Table 4).

Patient satisfaction level with the scar and cosmetic outcome	Groups				Total		X^2	P-value
	Group A (n = 20)		Group B (n = 20)					
	N	%	N	%	N	%		
Satisfied	16	80.0%	8	40.0%	24	60.0%	9.067	0.011*
Partially satisfied	3	15.0%	3	15.0%	6	15.0%		
Unsatisfied	1	5.0%	9	45.0%	10	25.0%		
Total	20	100.0%	20	100.0%	40	100.0%		

Table (5): Comparison between group (A) and group (B) as regards Patient satisfaction level with the scar and cosmetic outcome

Patients in group A were more satisfied with the scar and cosmetic outcome than those in group B, which was statistically significant (p<0.05) (Table 5).

DISCUSSION

Regarding the demographic data of the studied groups, the present results revealed that the average age (range) of group A was 35.10 ± 12.48 (16-57) years with 50% male, while in group B was 30.80 ± 12.15 (15-55) years with 55% males. Age and sex differences between the two groups were not statistically significant (p>0.05).

In the study by Niranjan and Kumar [7], they performed a prospective comparative study of LA versus OA. They enrolled 55 (68.75%) OA patients and 35 (43.75%) LA patients who were men, 25 (31.25%) OA patients, and 45 (56.25%) LA patients who were females. The patients in two groups had an average age of 24.8 ± 8.77 years and 23.5 ± 7.61 years, respectively.

Takami et al.[8] studied 179 patients to compare laparoscopic vs. open appendectomy for complicated appendicitis treatment. In 89 patients (49.7%), OA was used, and in 90 patients, LA was used. The OA group consisted of 56 men and 33 women, while the LA group consisted of 62 men and 28 women. The OA group was 50.17±22.77 years old, while the LA group was 50.13±25.84 years old. Clinical features as well as other factors like age, gender, BMI, WBC count, comorbidities, and CRP level did not differ significantly across the groups studied.

Regarding intraoperative findings of the studied cases, there where 8(40%) cases had acute Gangrenous appendix in group A in comparison to 7(35%) cases in group B, 4(20%) cases with appendicular abscess in group A in comparison to 5 (25%) of cases in group B, and 3(15%) cases with appendicular mass in group A in comparison to 4(20%) cases in group B, 5(25%) cases in group A with perforative appendicitis in comparison to 4(20%) cases in group B.

In agreement with our findings, in the study by Hanspal et al. [9], they enrolled 53 cases in open appendicectomy and 59 cases in laparoscopic appendicectomy. The groups were comparable in age, gender, and comorbidities, and there were no statistically significant differences between the studied groups regarding intraoperative results.

Also, there was an agreement by Xiao et al. [10] with our results; they enrolled 38 LAs and 22 OAs. In terms of age, gender, and comorbidities, intraoperative findings, there are no statistically significant differences between the studied groups.

Regarding the operative time of the studied groups, in group A the mean operative time was 80.35 ± 13.011(55-97) minutes, while in group B was 55.80 ± 9.876 (40-76) minutes. The operative time in group A was statistically significantly longer than in group B (p<0.001).

Our results were supported by the findings by Niranjan and Kumar [7] as they reported that OA takes less time (45.3 ±10.63) than LA (65.6 ± 20.69). In the OA group, the operative time increased statistically significantly.

Also, in agreement with our results the study by Takami et al. [8] revealed that the LA group had longer average operative times than the OA group (102.56 ± 44.4 versus 85.4 ± 43.11 min; p = 0.009). In the OA group, the operative time was statistically significantly longer.

Regarding hospital stay, in group A the average hospital stay was 1.25±0.769 (1-3) days, while in group B was 2.20±1.508 (1-5) days. The hospital stay in group B was statistically significantly longer than in group A (p<0.001).

Our results were supported by the findings by Niranjan and Kumar [7] as they reported that LA significantly reduced the length of hospital stay. (P<0.05).

Our results were further supported by Kumar and Rao [11] as the concluded that the LA significantly reduced the length of hospital stay (P<0.05).

Also, there were agreement between our results and the study by Shirazi et al. [12] they reported that the hospital stay in Group A was 4.1±0.8 days, but in Group B it was 1.5±0.06 days (P = 0.001). In the open group, oral liquids were begun after 10.4±2.3 hours following the operation; that was significantly longer (P = 0.001).

Furthermore, in children there was accordance by Seqsaqa et al. [13] with our results as they revealed that the time required to begin oral intake was significantly shorter with LA than with OA, 1.9 versus 2.73 days (p = 0.025*). The average hospital

stay was significantly shorter with LA compared to OA, at 4.23 versus 5.13 (p = 0.044*).

Regarding pain score six hours after operation on visual analogue score in group A ranged from 1 to 6 and the mean ± SD was 2.65 ± 1.424, while in group B ranged from 2 to 7 and the mean ± SD was 4.50 ± 1.357. The pain score in group B increased statistically significantly more than in group A (p<0.001). In agreement with our results the study by Niranjan and Kumar [7] revealed that average pain score in the open group was 2.7 ±0.25 compared to 1.5 ±0.39 in the laparoscopic group, with a statistically significant p value of less than 0.05.

Regarding postsurgical complications, our results showed that there where 16(80%) cases had no complications in group A in comparison to 8(40%) cases in group B, 4(20%) cases had Incisional surgical site infections(Ⅰ)in group A in comparison 7(35%) cases in group B and 3(15%) with organ/space surgical site infections (Ⅱ), and 2(10%) needed readmission in group B. In terms of postsurgical complications, there were statistically significant differences between the two groups (p<0.05).

In agreement with our results, the study by Niranjan and Kumar [7] revealed that in terms of postsurgical complications, there were statistically significant differences between the two groups (p<0.05).

Our findings were supported by Singh et al. [3] as thy revealed that OA group was associated with more complications like wound infection, postoperative ileus when compared with LA group. Whereas other complications like intraabdominal abscess, urinary tract infection and diarrhea were comparable. Wound infection was seen in 17.5% of patients in the OA group as compared to 2.5% in the LA group; prolonged ileus has been observed in 22% of patients with open appendectomy and 10% of patients with laparoscopic appendectomy.

Our results were further supported by Kumar and Rao [11] as they reported that the laparoscopic group had fewer postsurgical complications such as vomiting and ileus. In the laparoscopic group, the prevalence of postsurgical wound infection is significantly lower.

Finally, regarding patient satisfaction level with the scar and cosmetic outcome, our results revealed that 16(80%) cases were satisfied in group A in comparison to 8(40%) cases in group B, 3(15%) cases were partially satisfied in group A in comparison to 3(15%) of cases in group B, and 1(5%) case was unsatisfied in group A in comparison to 9(45%) cases in group B. There was statistically significant increase in patient satisfaction level with the scar and cosmetic outcome in group A than group B (p<0.05).

Our findings were supported by Resutra and Gupta [14] as they reported that 160 (80%) of the patients in Group A were completely satisfied with the scar and aesthetic result, 30 (15%) were moderately satisfied, and 10 (5%) were dissatisfied owing to the bad scar. In Group B, 40 patients (20%) were completely satisfied with the aesthetic result, 50 patients (25%) were moderately satisfied, and 110 patients (55%) were dissatisfied. The average cosmesis satisfaction score in Group A was 8.16 ± 0.37, compared to 7.36 ± 0.58 in Group B, with a statistically significant difference between the two groups. (p<0.05).

This result was further supported by Hanspal et al. [9] as they concluded that they discovered a strong preference for laparoscopy among patients (during consent collection) and a high level of satisfaction following surgery.

CONCLUSION

In terms of pain score, intra-operative and post-operative complications, laparoscopic appendicectomy was superior to open appendicectomy. Post-operative recovery was satisfactory in terms of hospital stay length, time to start oral fluids, time interval before analgesics were needed, and getting back to regular work. The only disadvantage of laparoscopic appendicectomy was the time required for surgery .

In chosen patients having acute or recurring appendicitis, laparoscopic appendicectomy is superior to open appendicectomy. The laparoscopic technique for appendectomy is an effective and safe operational technique that has clinically significant advantages over the open approach.

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