

Research Article

Efficacy of Open vs. Laparoscopic Appendectomies

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Abstract:

Background: Appendicitis is common problem treated surgically by open or laparoscopic appendectomy.

Objectives: To compare short term complications of open versus laparoscopic appendectomy.

Study design: Randomized control trial

Setting: Department of General Surgery, Mardan Medical Complex, MTI, Mardan.

Subjects: Total 110 patients of both gender aged 20 to 40 years undergoing appendectomy were enrolled.

Methodology: This study was done from 12th July 2020 till 11th January 2021 after approval from hospital ethical committee. Total 110 patients were enrolled and divided in open appendectomy and laparoscopic appendectomy and short term complications were noted.

Results: In our study total 110 patients were enrolled and divided in two groups. The mean age of patients was 32.65±4.8 years. There were 25.5% patients in younger age group and 74.5% in elder age group. In our study population there were 26.4% males and 73.6% female patients. The mean body mass index was 30.9±5.5 kg/m². Mean duration of surgery was 1.4±0.4 hours in laparoscopic group and 1.5±0.4 hours in open appendectomy. The most common complication was wound infection in 12.7%, paralytic ileus in 10.9%, intra-abdominal abscess in 9.1% and vomiting in 6.4% patients. Complication rate was significantly increased in open appendectomy, p-value 0.032.

Conclusion: Laparoscopic is safer as compared to open appendectomy.

Keywords: Acute appendicitis, open appendectomy, Laparoscopic appendectomy.

Introduction

Acute appendicitis is a common condition that occurs in all age groups. [1] Acute appendicitis develops in a progressive and irreversible manner, even if the clinical course can be temporarily modified by medications. [2, 3] Reliable and real-time diagnosis of acute appendicitis can be made based on findings of the white blood cell count and enhanced computed tomography. [4] Appendicitis is the most common cause of surgical abdomen in all age groups. Approximately 7–10 % of the general population develops acute appendicitis with the maximal incidence being in the second and third decades of life. Open appendectomy has been the gold standard for treating patients with acute appendicitis for more than a century, but since its first description in the early 1990s laparoscopic appendectomy has advanced to becoming the treatment of choice for acute and chronic appendicitis, with increasing numbers of procedures performed last decade. [5] Efficiency and superiority of laparoscopic approach compared to the open technique is the subject of much debate nowadays. There is evidence that minimal surgical trauma through laparoscopic approach resulted in significant shorter hospital

stay, less postoperative pain, faster return to daily activities in several settings related with gastrointestinal surgery. [6] However, different retrospective studies and randomized trials comparing laparoscopic with open appendectomy have provided conflicting results. [7, 8] Some of these studies have demonstrated better clinical outcomes with the laparoscopic approach, while other studies have shown marginal or no clinical benefits and higher surgical costs.

Sangrasi in his study compared short term complications after laparoscopic and open appendectomy. He found that paralytic ileus was found in 51.9% in open appendectomy and 18.8% in laparoscopic appendectomy, wound infection was 6.3 % and 13.7% in laparoscopic and open appendectomy, vomiting was present in 51.9% patients undergoing open appendectomy and 18.8% after laparoscopic procedure, intra-abdominal abscess developed in 4.2% and 1.9 % in laparoscopic and open appendectomy respectively. [9] While in another study by Biondi concluded that laparoscopic appendectomy was found to have greater complications as compared to open appendectomy. In laparoscopic appendectomy vomiting was found in 44.8%, paralytic ileus in 27.6%, wound infection in

13.8% and intra-abdominal abscess in 13.8% while in open appendectomy complication rate was 22.4%, 14.5 %, 43.4% and 1.3 % respectively [10] The rationale of this study was to determine any possible benefits of the laparoscopic approach in term of reduced short term post-operative outcome. Using this study we can make uniform guidelines for using laparoscopic appendectomy as gold standard procedure. Moreover we can anticipate the short term complications. Earlier recognition will result in rapid recovery and less morbidity.

Materials and Method

110 patients suffering from appendicitis were selected from 12th July 2020 till 11th January 2021. All were having confirmed cases of appendicitis diagnosed by WHO standard criteria[11]. They had symptoms of fever, nausea, vomiting, abdominal distension, stomachache, rebound tenderness on right lower quadrant and tenderness and proved to have seroperitoneum by ultrasonography. The patients were divided into open appendectomy group and laparoscopic appendectomy group. The mean age of patients was 32.65±4.8 years. There were 25.5% patients in younger age group and 74.5% in elder age group. In our study population there were 26.4% males and 73.6% female patients. The mean body mass index was 30.9±5.5 kg/m². Mean duration of surgery was 1.4±0.4 hours in laparoscopic group and 1.5±0.4 hours in open appendectomy.

Inclusion criteria:

1. Patients of acute appendectomy as per operational definition
2. Patients of both gender.
3. Patients aged between 20 to 40 years

Exclusion criteria:

1. Patients with history of previous abdominal surgery (determined on history and medical record)
2. Pregnant women (Positive UPT)

Data Collection Procedure:

After approval from hospital ethical committee patients of acute appendicitis full filling the inclusion and exclusion criteria were enrolled from surgical emergency. Written informed consent was taken. Demographic data including age, gender and BMI was noted. Patients were divided by blocked randomization in two groups. Both groups underwent appendectomy by single surgical team. Group A underwent laparoscopic appendectomy while patients in Group B underwent open appendectomy. All specimens were sent to hospital pathology department for histopathology. Patients were followed up after 12, 24 and 48 hours to look for paralytic ileus, wound infections, vomiting and intra abdominal abscess. Patients were discharged once they were able to take regular diet, afebrile, and had good pain control. All data was noted on specially designed proforma. Patients were treated as per hospital protocols. Confidentiality of data was ensured.

Laparoscopic Appendectomy

Laparoscopic appendectomy was performed under general anesthesia. All the patients were intubated. Preoperative antibiotics were administered to cover gram-negative and anaerobic bacteria. Foley catheter was helpful in decompressing the bladder, thereby maximizing the viewing field and improving working space.

A 2-cm supraumbilical curvilinear incision directly above the umbilicus was made. The incision was made to peritoneal cavity through the subcutaneous tissue, beyond the Scarpa fascia, down to the linea alba using electrocautery and S retractors. Metzenbaum scissors was used to cut 2-cm longitudinal incisions for entry into the peritoneal cavity. CO₂ insufflation was made and then 5 mm canula sheath and laparoscope were inserted. The two other incisions were made at the position of equilateral triangle formed by left inguinal region and umbilicus under laparoscope; and 3 mm or 5 mm canula sheath was inserted. Peritoneal fluid was absorbed. The tip of the appendix was grasped and placed in the proper position, an ultrasonic device was used to divide the mesoappendix toward the base of the appendix. Endoscopic clips were used for controlling the appendiceal vessels. The appendix was taken out through cannula sheath. Peritoneal cavity was washed and the incisions were washed with povidine-iodine solution. The incisions were closed with 0 polyglactin UR stitch and drainage tube was placed in the pelvic cavity.

Open Appendectomy

The open appendectomies were performed under general anesthesia and the patients were intubated in supine position. The incision was made at mcburney point with a No. 10 blade, a Bovie electrocautery was used to incise through both the superficial (Camper) and the deep (Scarpa) fascia. The external oblique aponeurosis was exposed, incision were made in the direction of fibers, and the external oblique muscle was split bluntly with alternating Kelly clamps and Roux retractors. This blunt muscle spreading, along with appropriate retraction allowed visualization of the transversalis fascia and the peritoneum. An incision was performed on peritoneum in a craniocaudal direction with Metzenbaum scissors, thereby gaining access to the peritoneal cavity. Once the cavity was opened, any fluid encountered was sent for Gram stain and culture. The mesoappendix, containing the appendiceal artery, was then ligated and separated from the appendix. The appendix was incised and removed. Each abdominal layer was stitched separately in reverse direction.

Results

In our study total 110 patients were enrolled and divided in two groups. The mean age of patients was 32.65±4.8 years.

Table 1

Table 1: Age of sampled population

Age in years			
Groups	Mean	N	Std. Deviation
Group A (Laparoscopic appendectomy)	31.11	55	5.353
Group B (Open appendectomy)	34.20	55	3.633
Total	32.65	110	4.811

There were 25.5% patients in younger age group and 74.5% in elder age group. **Table 2**

Table 2: Age groups in sampled population

	Group	A	Age group		Total
			Count	%	
Group	Laparoscopic appendectomy)	Count	19	34.5%	55
			36	65.5%	
Group	B (Open appendectomy)	Count	9	16.4%	55
			46	83.6%	
Total		Count	28	25.5%	110
			82	74.5%	

In our study population there were 26.4% males and 73.6% female patients. **Table 3**

Table 3: Gender distribution in sampled population

	Group	A	Gender of subjects		Total
			Male	Female	
Group	Laparoscopic appendectomy)	Count	12	21.8%	55
			43	78.2%	
Group	B (Open appendectomy)	Count	17	30.9%	55
			38	69.1%	
Total		Count	29	26.4%	110
			81	73.6%	

The mean body mass index was 30.9±5.5 kg/m2. **Table 4**

Table 4: Mean BMI value of sampled population

kg/m2			
Group	Mean	N	Std. Deviation
Group A (Laparoscopic appendectomy)	31.1436	55	6.36291
Group B (Open appendectomy)	30.6655	55	4.74069
Total	30.9045	110	5.59010

Mean duration of surgery was 1.4±0.4 hours in laparoscopic group and 1.5±0.4 hours in open appendectomy. **Table 5**

Table 5: Mean duration of surgery in both groups

Duration of surgery(Hours)			
Group	Mean	N	Std. Deviation
Group A (Laparoscopic appendectomy)	1.4800	55	.43902
Group B (Open appendectomy)	1.5982	55	.37342
Total	1.5391	110	.40999

The most common complication was wound infection in 12.7%, paralytic ileus in 10.9%, intra-abdominal abscess in 9.1% and vomiting in 6.4% patients. **Table 6**

Table 6: Frequency of post-operative complications

		Frequency	Percent
Post-operative complications	No complication	67	60.9
	Wound infection	14	12.7
	Paralytic ileus	12	10.9
	Intra-abdominal abscess	10	9.1
	Vomiting	7	6.4
	Total	110	100.0

Complication rate was significantly increased in open appendectomy, p-value 0.032. **Table 7**

Table 7: Comparison of complications among both groups

		Group		Total	p-value
		Group A (Laparoscopic appendectomy)	Group B (Open appendectomy)		
No complication	Count	41	26	67	0.01
	%	74.5%	47.3%	60.9%	
Wound infection	Count	3	11	14	0.031
	%	5.5%	20.0%	12.7%	
Paralytic ileus	Count	4	8	12	0.21
	%	7.3%	14.5%	10.9%	
Intra-abdominal abscess	Count	5	5	10	0.9
	%	9.1%	9.1%	9.1%	
Vomiting	Count	2	5	7	0.6
	%	3.6%	9.1%	6.4%	

Data stratification was done for age and p- value was significant i.e. 0.03. **Table 8**

Table 8: Data stratification for complications rates among groups and age groups.

Age group				Group		Total	p-value
				Group A	Group B		
20-30 years	Post-operative complications	No complication	Count	15	4	19	0.03
			%	78.9%	44.4%	67.9%	
		Wound infection	Count	3	3	6	0.31
			%	15.8%	33.3%	21.4%	
		Intra-abdominal abscess	Count	1	1	2	0.34
			%	5.3%	11.1%	7.1%	
	Vomiting	Count	0	1	1	0.99	
	%	0.0%	11.1%	3.6%			
Total		Count	19	9	28	0.226	
		%	100.0%	100.0%	100.0%		
31-40 years	Post-operative complications	No complication	Count	26	22	48	0.04
			%	72.2%	47.8%	58.5%	
		Wound infection	Count	0	8	8	0.99
			%	0.0%	17.4%	9.8%	
		Paralytic ileus	Count	4	8	12	0.34
			%	11.1%	17.4%	14.6%	
	Intra-abdominal abscess	Count	4	4	8	0.29	
		%	11.1%	8.7%	9.8%		
	Vomiting	Count	2	4	6	0.87	
		%	5.6%	8.7%	7.3%		
Total		Count	36	46	82	0.05	
		%	100.0%	100.0%	100.0%		

Data stratification was done for gender and p- value was significant i.e. 0.03. **Table 9**

Table 9: Data stratification for complications rates among groups and gender.

Gender of subjects				Group		Total	p-value
				Group A	Group B		
Male	Post-operative complications	No complication	Count	9	8	17	0.04
			%	75.0%	47.1%	58.6%	
		Wound infection	Count	2	4	6	0.54
			%	16.7%	23.5%	20.7%	
		Paralytic ileus	Count	0	3	3	0.00
			%	0.0%	17.6%	10.3%	
	Intra-abdominal abscess	Count	1	1	2	0.54	
	%	8.3%	5.9%	6.9%			
Vomiting	Count	0	1	1	0.99		
	%	0.0%	5.9%	3.4%			
Total		Count	12	17	29	0.408	
		%	100.0%	100.0%	100.0%		
Female	Post-operative complications	No complication	Count	32	18	50	0.03
			%	74.4%	47.4%	61.7%	
		Wound infection	Count	1	7	8	0.07
			%	2.3%	18.4%	9.9%	
		Paralytic ileus	Count	4	5	9	0.09
			%	9.3%	13.2%	11.1%	
	Intra-abdominal abscess	Count	4	4	8	0.31	
		%	9.3%	10.5%	9.9%		
Vomiting	Count	2	4	6	0.041		
	%	4.7%	10.5%	7.4%			
Total		Count	43	38	81	0.06	
		%	100.0%	100.0%	100.0%		

Data stratification was done for BMI and p- value was significant i.e. 0.03. **Table 10**

Table 10: Data stratification for complications rates among groups and BMI.

BMI group				Group		Total	p-value
				Group A	Group B		
Less than 30kg/m2	Post-operative complications	No complication	Count	15	12	27	0.81
			%	60.0%	60.0%	60.0%	
		Wound infection	Count	3	2	5	0.091
			%	12.0%	10.0%	11.1%	
		Paralytic ileus	Count	4	5	9	0.32
			%	16.0%	25.0%	20.0%	
	Intra-abdominal abscess	Count	1	0	1	0.99	
	%	4.0%	0.0%	2.2%			
Vomiting	Count	2	1	3	0.47		
	%	8.0%	5.0%	6.7%			
Total		Count	25	20	45	0.83	
		%	100.0%	100.0%	100.0%		
More than 30kg/m2	Post-operative complications	No complication	Count	26	14	40	0.021
			%	86.7%	40.0%	61.5%	
		Wound infection	Count	0	9	9	0.99
			%	0.0%	25.7%	13.8%	
		Paralytic ileus	Count	0	3	3	0.99
			%	0.0%	8.6%	4.6%	
	Intra-abdominal abscess	Count	4	5	9	0.76	
		%	13.3%	14.3%	13.8%		
Vomiting	Count	0	4	4	0.99		
	%	0.0%	11.4%	6.2%			
Total		Count	30	35	65	0.001	
		%	100.0%	100.0%	100.0%		

Discussion

Globally, the most common reason for acute abdomen is appendicitis. Appendicitis is caused by an obstruction of the hollow segment of the appendix. This is mostly due to a calcified "stone" of feces. Inflammation of lymphoid tissue from a viral infection, parasites, gallstone, or tumor may also result in the obstruction. This blockage results in augmented pressures in the appendix, reduced blood flow to the appendix, and bacterial expansion within the appendix that causes inflammation. McBurney formerly described the open approach to appendectomy. It has turned out to be the standard treatment of choice for acute appendicitis, remained chiefly unaffected for 100 years due to its approving effectiveness and safety. With the arrival of laparoscopy appendectomy has progressively more been performed by means of a minimal invasive approach. The aim of this study was to compare complications rates of open appendectomy versus laparoscopic appendectomy. In our study total 110 patients were enrolled and divided in two groups. The mean age of patients was 32.65±4.8 years. There were 25.5% patients in younger age group and 74.5% in elder age group. In our study population there were 26.4% males and 73.6% female patients. The mean body mass index was 30.9±5.5 kg/m2. Mean duration of surgery was 1.4±0.4 hours in laparoscopic group and 1.5±0.4 hours in open appendectomy. The most common complication was wound infection in 12.7%, paralytic ileus in 10.9%, intra-abdominal abscess in 9.1% and vomiting in 6.4% patients. Complication rate was significantly increased in open appendectomy, p-value 0.032. Data stratification was done for age, gender and BMI. Our results were inconsistent with other studies. In one local study [12] The mean age of patients was 33.8 ± 7.5 years. After laparoscopic appendectomy 19.4% developed complications, 8.6% develop paralytic ileus and 5.3% develop wound infection. In another study [13] total number of complications was less in the Laparoscopic appendectomy group with a significantly lower incidence of wound infection (1.4 % versus 10.6 %, P <0.001). In international study [14] the overall incidence of complications was greater in the Open Appendectomy group, compared with that of the Laparoscopic Appendectomy group. Multivariable analysis revealed a significantly reduced rate of postoperative complications in the LA group, compared with that of the OA group (16.7% versus 27%; odds ratio 0.376; 95% CI 0.153–0.923; p = 0.0327). In open group paralytic ileus was found in 29.6%, intra-abdominal abscess in 22.2% and wound infection in 25.9%. In laparoscopic appendectomy group paralytic ileus was found in 46.6%, intra-abdominal abscess in 6.6% and wound infection in 13.2%. In recent meta-analysis [15] it was found that wound infection rate was 48% to 70% lower in Laparoscopic group as compared to open appendectomy but conversely intra-abdominal infections rate was 1.34 to 2.20 higher in Laparoscopic group. In another study [16] similar results were seen. Surgical site infections occurred exclusively after OA (38 vs. 0 patients). Intra-abdominal abscess formation occurred statistically significantly more often after LA (2 vs. 10 patients; p = 0.002). There were no statistical

significances concerning the occurrence of postoperative ileus ($p = 0.261$) or appendiceal stump insufficiencies ($p = 0.076$).

Conclusion

Laparoscopic appendectomy is safer and clinically advantageous technique. In most of the suspected cases of appendicitis, whenever possible, laparoscopy should be considered as procedure of choice

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