Comparison between Laparoscopic and Open Appendicectomy in Baghdad Teaching Hospital

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ABSTRACT

Background: Open appendicectomy and laparoscopic appendicectomy are the most commonly used appendicitis surgical procedures. Each method has been considered a gold standard, and there is no consensus on which is the best.

Objectives: To determine the most effective appendicectomy procedure between the two methods.

Methods: A prospective research design was used in Baghdad Teaching Hospital from August 2018 to August 2022. A sample of 173 patients was selected, whereby fifty-three participants were surveyed for the laparoscopy and 120 for open appendicectomy.

Results: Laparoscopic appendicectomy had less need for analgesia (one dose for laparoscopic appendicectomy and two to three doses for open appendicectomy) and better bowel movements (one to two days for laparoscopic appendicectomy and one to three days for open appendicectomy). It was also associated with less time to diet (93.3% for less than 24 hours in open appendicectomy and 100% for less than 24 hours in laparoscopic appendicectomy). The procedure was linked to lesser hospital stay days (10 to 24 hours for laparoscopic appendicectomy and 1 to 3 days for open appendicectomy, $p<0.001$) and complications (38 cases for open appendicectomy and 4 for laparoscopic appendicectomy, $p<0.0001$).

Conclusion: The study revealed that laparoscopy is the safest and most efficient compared to open appendicectomy. The procedure has shorter operative time, fewer hospital admission days, less need for analgesics, low complication rates, earlier return to normal activities, early food tolerance, and bowel movements.

Keywords: Open appendicectomy, Laparoscopic appendicectomy, Appendicitis, Appendicectomy.

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The appendix has always been considered a vestigial organ. However, the appendix is susceptible to inflammation, common in young adults and children; a condition referred to as appendicitis. In most cases, appendicitis will require one to undergo surgery to eliminate the possibility of its rapture in the abdomen, a process referred to as appendicectomy. This will lead to surgical removal of the appendix. One of the most commonly used surgical procedures is laparoscopic appendicectomy (LA), which has been considered the gold standard since the 2000s and used since the 1980s[1].

Laparoscopic appendicectomy supports a much safer appendicectomy by allowing the surgeons to use three small ports ranging between 5 and 10 mm[1]. The appendix can thus be mobilized as it is easily visualized. The main advantages of laparoscopic appendicectomy are that it has a shorter postoperative recovery time, less postoperative pain, better cosmetic results, shorter stay in the hospital, and reduced polity for wound infection and postoperative morbidity. Nonetheless, laparoscopic appendicectomy is controversial, especially when treating complicated appendicitis[1]. The main reason has been linked to its longer operation time and higher probability of abscess and infection after the procedure.

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On the other hand, open appendicectomy (OA) is also another surgical procedure that is commonly used in managing appendicitis. The procedure has been used for centuries following its first description in 1894[2]. Open appendicectomy remained the gold standard for years until the establishment of laparoscopic appendicectomy in 1983 by Semm[3]. Nonetheless, despite laparoscopic appendicectomy being considered the best and gold standard over open appendicectomy, its efficiency and superiority have always been debated. Despite various studies[1-3] showing that laparoscopic appendicectomy resulted in much better patient outcomes, several retrospective studies[4,5] meta-analyses[6,7] and randomized studies[8] have shown conflicting results between the two appendicectomy procedures. Some studies have shown that laparoscopic appendicectomy has better outcomes, while others have linked it to adverse effects and supported open appendicectomy. Laparoscopic appendicectomy is not considered superior to open appendicectomy when performing acute appendicitis surgery[9]. Therefore, given the conflicting results from past studies, this research sought to determine the safest and most effective appendicectomy procedure based on various clinical outcomes.

Methods

A prospective study was carried out in the Baghdad Teaching hospital of Medical City complex from August 2018 until August 2022. Patients with acute appendicitis who presented to our surgical team were included in this study, including female patients with previous cesarean sections through a Pfannenstiel incision. A total of 173 cases were analyzed that met the inclusion criteria. The exclusion criteria included eliminating patients who had undertaken previous laparotomy incisions and those with general anesthesia contraindications. The clinical data gathered included demographical information, return to normal outcomes, postoperative complications, hospital stay, oral analgesic intake, time until diet, bowel movement postoperative, operative time, surgical findings, co-morbidities, WBC count, and BMI.

Approval was sought from the hospital's Institutional Review Board and the Ethics Committee. Moreover, the participants signed an informed consent form, given the research's observational nature. The study also complied with STROBE criteria[10]. This is a checklist that was developed to help strengthen the standards of reporting in epidemiological-based studies. Laparoscopic appendicectomy was done through three ports, 10 mm optical port (supraumbilical), 10 mm port (right subcostal) for securing the mesoappendix by vessel sealing system (LigaSure COVIDIEN™) (Maryland Jaw Open Sealer/Divider 5 mm - 23 cm) and for extraction of the appendix and the 3rd port was in the left iliac fossa (5 mm) for handling the appendix. Open appendicectomy was done through the standard gridiron incision. Pelvic drain was inserted in complicated cases for both OA and LA.

Frequencies were used in presenting the categorical data. Frequencies were selected to allow a researcher to provide information on several occurrences supported by distinct values. The data is distributed within a given interval or period and presented as a graphical representation, list, or table. The data were entered and stored in the Microsoft Excel application. All variables were coded with a specific code for each variable and prepared for statistical analysis. SPSS (statistical package for social sciences) software for windows version 20, was used in statistical analysis The quantitative variables like age, length of hospitalization, and operative time were measured as mean ± SD. Independent samples t-test was used to compare the length of hospital stay and operating time between two groups. Effect modifiers like age, gender, and ASA class were controlled by stratification. Post-stratification chi-square tests were applied for qualitative variables

and the independent samples t-test for quantitative variables. In all statistical tests and procedures, level of significance P value was set at ≤ 0.05 considered as significant difference or association.

Results

Of the 173 patients with appendicitis, 53 were operated via laparoscopic appendicectomies, and 120 underwent open appendicectomies. The mean age of the studies patients indicated no significant differences. However, the youngest patient who underwent an open appendicectomy was 12 years old, while the oldest one was 50 years. The youngest who laparoscopic appendicectomy was five years old, while the oldest was 54 years. However, the differences in WBC count and gender were statistically significant, (Table 1).

Out of the 53 laparoscopic procedures, eight were performed for complicated acute appendicitis, while 45 were performed for uncomplicated acute appendicitis. In the open appendicectomy group, 38 were performed on complicated acute appendicitis, while 82 were performed on uncomplicated appendicitis, (Table 2).

Bowel movements were observed between one and two days for patients who underwent laparoscopic procedures and one to three days for those who underwent open procedures (p< 0.001). As a result, 112 (93.3%) of the patients who underwent the open procedures were nil by mouth for less than 24 hours before oral intake was resumed compared to 8 (6.7%) who needed more than 24 hours to start their oral intake. In the case of the laparoscopic procedure, 53 (100%) of the patients were kept nil by mouth for 24 hours or less before resuming oral intake (p <0.001). The laparoscopic appendicectomy group required fewer oral and parenteral analgesic doses, with most patients receiving one and a few two, compared to open appendicectomy patients receiving two and a few three doses. The hospital stay days were much higher in the open appendicectomy patients ranging from one to three days compared to 10 hours to one day for laparoscopic procedure patients (p <0.001), (Table 3).

Significant differences in early postoperative complications between open appendicectomy and laparoscopic appendicectomy, whereby 38 cases were recorded for open and four for laparoscopic were evidenced in this study, (Table 4). The differences in wound infection were significant (p<0.001). However, no significant differences were observed between the two groups for vomiting, pelvic abscess, port site infection and pus drainage.

Table 1: Demographical and preoperative clinical data.

		Open appendectomy	Laparoscopic appendectomy	*P*
Gender	Male	82 (66.67%)	26 (49%)	<0.001
	Female	41 (33.33%)	27(51%)	
Mean age		29.47 years	27.01 years	0.57
WBC count (per mm^3)		12,000-17,000	12,000-22,000	
Co-morbidities	Hypertension	21	4	0.244
	DM	17	1	

Table 2: Surgical findings.

	Open appendectomy N (%)	Laparoscopic appendectomy N (%)
Uncomplicated acute appendicitis	82 (68.3)	45 (84.9)
Complicated acute appendicitis	38 (31.7)	8 (15.1)

Table 3: Postoperative and operative clinical data.

		Open appendectomy (n)	Laparoscopic appendectomy (n)	*P*
Return to normal activity (day)	15-19 10-14 5-9 0-4	27 84 9 0	0 2 39 12	0.001
Oral analgesics (dose/day)	0 1 2 3	0 0 70 50	5 48 0 0	0.001
Parenteral analgesics (dose/day)	0 1 2 3	0 0 72 48	0 50 3 0	<0.0001
Time until oral intake (hour)	0-4 5-9 10-14 15-19 20-24 >24	0 0 18 35 59 8	0 34 16 2 1	<0.001
Hospital stay	0-12 hours 13-24 hours 2 days 3 days	0 21 73 26	15 37 1 0	<0.001
Bowel movement (day postop.)	0 1 2 3	0 8 102 10	0 52 1 0	<0.001
Operative time (min.)	0-10 11-20 21-30 31-40 41-50 51-60 61-70 71-80	0 0 30 36 22 16 14 2	13 33 5 1 0 1 0 0	< 0.0001

Table 4: Postoperative complications.

	Open appendectomy	Laparoscopic appendectomy	*P*
Vomiting	0	1	0.339
Wound infection	36	0	<0.001
Pelvic abscess	2	1	0.147
Port site infection	0	1	0.339
Pus drainage	0	1	0.339
None	82	49	

Discussion

Regarding complicated appendicitis, laparoscopy has been regarded as a relative contraindication given that it has increased with much higher postoperative complication risks[3]. Various studies by Mancini GJ, et al and So, et al have found the contrary, challenging some current findings on the issue. The results of this study revealed that the mean age for patients undergoing appendicectomy was

27.01 years for laparoscopic and 29.47 years for an open procedure. These findings are similar to those of Biondi A et al. They found that the mean age for patients undergoing the open procedure was 29.66±15.13 years, while for the laparoscopic procedure was 27.75±14.24 years. However, other studies by Mohamed AA et al found that the mean age for open procedures was 34±13 years and 32±14 years for a laparoscopic procedure. The similarity in the ages of the study and that by Biondi A et al is attributed to the fact that appendicitis is commonly associated with the younger generation, as evidenced by Marzuillo P et al. In the study, patients suffering from this disorder were as young as five years old. Appendicitis was most common in those aged 11 to 20 years. Nonetheless, there were also some patients aged 50 years and above, which can be attributed to increased life expectancies.

On the other hand, laparoscopic procedures had a significantly shorter operative time ($p<0.0001$), with 62.2% (n=33) lasting for 11-20 minutes compared to open procedures, whereby 13.3% (n=16) lasted for over 60 minutes, with the highest time being recorded at 73 minutes. Moreover, the shortest operative time for an open procedure lasted 21 to 30 minutes for 25% (n=30) of the patients. Nonetheless, this study's findings differed from those of Mohamed AA et al who found that the mean open procedure lasted for 64±15 minutes and the laparoscopic procedure lasted for 73±23 minutes. Additionally, laparoscopic procedures stay longer than open procedures at 39.9±9.5 minutes and 38.4±9.0 minutes, respectively[1]. These study findings contradicted the findings of the study. However, they are similar to Tiwari MM et al who found that laparoscopic procedures lasted much shorter than open procedures. The variations in time might arise from the experience and skill levels of the practitioners involved in the different centers where the studies were carried out.

The length of hospital stay is vital since it affects the patient's well-being and influences the economy. The study's findings indicated that 98.1% of the patients who underwent laparoscopic procedures lasted 0-24 hours compared to 17.5% for open procedures. In most open procedures and hospital stays, 60.8% lasted two days compared to 1.9% for laparoscopic procedures. This indicates the differences in hospital stay were significantly higher for the two groups ($p<0.001$). These results were similar to those of Biondi A et al, who found that patients who had undergone the laparoscopic procedure had a shorter stay in the hospital than open procedures. The researchers also found that this was associated with earlier bowel movements that led to early oral intake time and hospital discharge. These findings are similar to this study, which found that 64.9% of patients took 5-9 hours before oral intake time compared to 0% for open procedure patients. Additionally, 98.1% of patients who underwent laparoscopic appendicectomy took only one day to start experiencing bowel movements compared to 6.67% for open appendicectomy.

Likewise, to check the levels of pain by patients as they underwent the procedure, the study measured the number of analgesic doses, in this case, parenteral and oral, as required by each patient. The parenteral and oral analgesics were much lower in patients who underwent the laparoscopic procedure compared to an open procedure. Nearly 90.5% of the participants took one dose of oral analgesics compared to 0% for open appendicectomy, while 94.3% of laparoscopic patients took one dose of parenteral analgesics compared to 0% for an open procedure. The findings of this study were similar to those of Moore DE et al and Biondi A et al and Hart R et al who found the laparoscopic patient groups took lesser dosages and reported less pain. Past studies have found no difference between daily activities performance and return to work for both open and laparoscopic appendicectomy as in Biondi

A et al. However, this study found that 22.6% and 73.5% of patients returned to regular activity within 0 to 4 and 5 to 9 days for laparoscopic procedures compared to 0% and 7.5% for open ($p<0.001$). Most patients who underwent the open procedures (70%) took 10-14 days to return to regular activity and this is similar to Hart R et al, this can be explained by improvement in laparoscopy experience.

Moreover, 31.6% of the participants who underwent open appendicectomy reported complications compared to 7.5% for the laparoscopic procedure, with the wound infection rate being significantly higher in the open procedure at 30% compared to none for laparoscopy ($p<0.001$). These results were similar to Biondi A et al. They found the overall complication rate for open procedures was 24.5% compared to 6.7% for laparoscopy, with wound infections being the highest. Abscess formation was observed in two patients under open and one for laparoscopy, Mancini GJ et al also found that laparoscopic appendicectomy was associated with less intra-abdominal abscess However, our study's findings differ from those of Shaikh AR et al which found that abscess formation is higher in patients undergoing laparoscopy than in open procedures. This was attributed to the inadequate learning curve and mechanical bacterial spread from the ruptured appendix.

In conclusion, the study's findings showed that laparoscopic appendicectomy has more advantages than open appendicectomy. These include; a lower rate of complications after surgery, earlier return to normal activities, early tolerance for food, one does not need much postoperative analgesia, reduced stay in the hospital, earlier resumption of bowel movements, and reduced operative time. Moreover, during the patient consent signing process, there was a much higher satisfaction rate among patients who had undergone a laparoscopic appendicectomy. Nonetheless, despite the procedure being associated with a few postoperative complications, it was still the best, as the incidents were minimal. Therefore, laparoscopy is the most efficient and safest appendicectomy procedure, provided the respective surgeons have the experience and the instruments used are safe.

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