Comparison Between Early Appendicectomy and Delayed Appendicectomy in Treating Acute Appendicitis

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Abstract

Background: Acute appendicitis is the most common emergency condition that faces the surgeon worldwide. The overall lifetime risk of having acute appendicitis is estimated to be 6–7 %, with a peak incidence between 10 and 30 years. Early and sometimes immediate appendicectomy is standard, fearing the risk of pathological progression into perforation, gangrenous appendicitis, and abscess formation. However, recently, this practice has been challenged by authors giving a suggestion that appendicectomies can be delayed in some cases and still devoid of adverse postoperative outcomes.

Objective: This study aimed at comparing the two groups regarding the following postoperative outcomes: WBC count on a postoperative day one, time last to a soft liquid diet, rate of complication, length of in-hospital stay, and the need for admission within 30 days of doing the surgery.

Patients and Methods: This is a prospective randomized study of 341 patients (196 male and 145 female) who underwent appendicectomy over a period of eleven months (May 2019-March 2020) in Baquba Teaching Hospital in Diyala Governorate. The patients categorized into two groups for making the comparison (all underwent appendectomy): group A: 181 patients (male 108, female 73) include those who are operated on within 8 hours of arrival to the hospital and group B: 160 patients (male 81, female 79) include those who are operated on after 8 hours of arrival to the hospital. The patients in the two groups were compared regarding the following postoperative outcomes as WBC count at day one postoperatively, time duration to a liquid diet, rate of complication, length of in-hospital stay, and finally, the need for readmission during the first 30 days of doing the surgery.

Results: Regarding the mean white blood cell count at the first postoperative day, it was lower for group B. than that for group A (p-value 0.0018). With regard to the timing of starting having liquid diet, there was no significant difference, and the patients in the two groups started oral liquid diet within the first 24 hours (p-value 0.0715). There was no significant difference between the two groups regarding the immediate and early postoperative complication rate; 0.02% in group A and 0.37% for group B (p-value 0.4022), the length of postoperative hospital stay was the same for the two groups, ranging between 2 days and less than one day (p value 0.0826). There was no significant difference between the two groups regarding the need for readmission within 30 days, 0.016% in group A and 0.025% in group B (p-value 0.9984).

Conclusion: This study concluded that delayed appendicectomy was safe and feasible for patients with uncomplicated appendicitis. Despite that the clinical outcomes of delayed

appendicectomy were not better than those with early appendicectomy. Also Delayed appendicectomy can improve the quality of care provided by the residents, surgeons, anesthetists and theater staff, enhance patient's quality of care, and it allows an increased efficient utilization of medical resources and theaters for other life-threatening emergency cases.

Keywords: Appendicectomy, Appendicitis, delayed appendicectomy

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Introduction

Acute appendicitis is the most common emergency condition that faces the surgeon worldwide. About 7% of the population will develop acute appendicitis in their lifetime, with the peak incidence occurring between the ages of 10 and 30 years[1].

Thus, the procedure appendicectomy is the most frequently performed surgery worldwide and it forms a significant burden on nowadays health providers. In spite of being very common, the insufficient number of clinical researches yielded an uncertainty regarding the best practice, which ultimately affects the outcome[2,3]. It is well established that soon the diagnosis of acute appendicitis is made, the treatment is emergency appendicectomy at the time of diagnosis. This is considered a standard care of the treatment of acute appendicitis during the current century[4]. A delay in surgery believed to raise postoperative morbidity due to progression into complicated appendicitis as perforation or appendicular abscess [5]. Recently, however, the concept of immediate appendicectomy challenged by many authors that suggest that acute appendicitis can be managed non-operatively, or that delaying the operation did not reveal an increase in morbidity. On contrast, there are other authors that support emergency appendicectomy as delay in the surgery will increase the complication rate and overall in-hospital length of stay [6,7].

Recent studies suggested that giving antibiotics can be initiated and appendectomy can be performed as a semi-elective strategy. It is clear that appendicectomy in the daytime reduces the use of nursing staff, anesthesia, and theater staff through the night hours and it even avoids medical mistakes resulting from surgical overload. A brief period of in-hospital monitoring of fewer than six hours in suspected appendicitis do not increase the rate of perforation and may enhance the accuracy of diagnosis[8,9].

For that, there is still a controversy regarding the operation timing for acute appendicitis and whether canceling midnight appendectomy is safe or not. This study aims to make a comparison regarding the outcomes between emergency appendicectomy and delayed one, and also to

assess the feasibility of delayed appendectomy[10].

Patients and Methods

This is a prospective randomized study of 341 patients (196 male and 145 female) who underwent appendicectomy over a period of eleven months (May 2019- March 2020) in Baquba Teaching Hospital in Diyala governorate. The total number of patients involved in the study was 377 patients, all with features of acute appendicitis. Thirty six patients out of the 377 patients were excluded from the study for certain reasons, some of these reasons mandate undergoing an early appendectomy. The patients who were excluded from the study included patients under 12 years (poor localization of infection and peritonitis) or older than 65 years (high risk of perforation rate), toxic patients and patients with advanced abdominal and vital signs of appendicitis (features of peritonitis), patients diagnosed as having appendicular mass or abscess, pregnant females (high maternal and fetal mortality related to the possible perforation of delay) and those who underwent negative appendectomies (found to have gynecological problems as ovarian problems, those who found obvious mesenteric lymphadenitis, those who found to have Meckel's diverticulitis and patients with features of obstructive appendicitis).

The patients included in the study categorized into two groups for making the comparison (all underwent appendectomy): Group A: 181 patients (male 108, female 73) included those who were operated on within 8 hours of arrival to the hospital and Group B: 160 patients (male 81, female 79) included those who were operated on after 8 hours of arrival to the hospital (many of patients in this subgroup admitted at day time and operated on at the night and others presented near the midnight to be operated on the next morning).

The study form includes the name, age, sex, the interval from onset of symptoms to visit the hospital, time from receiving the patient to the diagnosis of acute appendicitis, the time interval from the diagnosis to operation, vital signs at presentation, laboratory findings at presentation, whether tube drain placed or not, postoperative laboratory findings, time to start oral intake, complications postoperatively, length of hospital stay, and the need for readmission within 30 days of surgery.

Statistical analysis

The data analysis was done using the SPSS statistical program. Demographics and clinical characteristics were expressed as proportions for the categorical parameters and means for the continuous ones. t-test was used to compare differences in the continuous variables. For comparing differences in categorical variables, the Chi-square test was used. The p-value of less than 0.05 was regarded as statistically significant.

Results

The patients in the two groups studded for various demographic, preoperative, intraoperative, and postoperative measures. What is matters in this study, for achieving the objectives is the comparison between the two groups regarding the final postoperative outcome, concentrating on the postoperative measures mentioned in table eightTable (8) As such these variables of concern will be discussed.

Table (1): Distrbution of the number of patients between the two groups

Group category	Number of patients	Total number of patients
Group A (≤ 8 hours)	181 (53.08%)	341
Group B (> 8 hours)	160 (46.92%)	

Table (2): Distribution of patients according to the gender. Total number of patients 341

Gender	Number of patients
Male	196
Female	145
Total	341

Table (3): Distribution of patients according to the sex between the two groups

Gender	Group A (≤ 8 hours)	Group B (> 8 hours)	P-value
Male	108	81	0.6781
Female	73	79	
Total	181	160	

Table (4): Distribution of the patients according to the mean age between the two groups

Group category	Age (yrs)	P-value
Group A (≤ 8 hours)	37.6 ± 11.8	0.2967
Group B (> 8 hours)	35.6 ± 12.3	

Table (5): Distribution of body temperature between the two groups at presentation

Group category	Body temperature	P-value
Group A (≤ 8 hours)	37.3 ± 0.7	0.7612
Group B (> 8 hours)	37.4 ± 0.6	

Table (6): Distribution of patients according to the Initial WBC count at the time of presentation

Group category	Initial WBC count ($\times 10^3/mm^3$) at presentation	P-value
Group A (≤ 8 hours)	11.6 ± 3.5	0.1231
Group B (> 8 hours)	12.3 ± 3.4	

Table (7): Comparisons of demographics, preoperative and intra-operative characteristics between the two groups (Total number of cases 341)

Variables	Group A (≤ 8 hours)	Group B (> 8 hours)	P-value
Presence of comorbidities	24 (13.3%)	19 (11.9%)	0.2014
Hours from the onset of symptoms till hospital arrival	27.3 ± 18.4	24.1 ± 17.4	0.1943
Hours from the arrival to making diagnosis	1.3 ± 0.9	2.4 ± 1.9	<0.0001
Hours from the diagnosis to surgery	3.1 ± 1.1	9.8 ± 3.8	<0.0001
Hours from the arrival to hospital to surgery	4.4 ± 2	12.2 ± 5.7	<0.0001
Operating time (minute)	46.3 ± 19.6	49.5 ± 19.8	0.2345
Complicated appendicitis (%)	11 (6.1%)	13 (8.1%)	0.3106
Use of drain (%)	19 (10.5%)	21(13.1%)	0.2212

Table (8): Comparing the postoperative outcome measures between the two groups

Variables	Group A (≤ 8 hours) Patients (181)	Group B (> 8 hours) Patients (160)	P-value
WBC, postoperative first day	9.6 ± 1.5	8.9 ± 1.1	0.0018
Time to a liquid diet (day)	0.6±0.2	0.5 ± 0.2	0.0715
Length of postoperative hospital stay (day)	1.3 ± 0.8	1.4 ± 0.9	0.0826
The need for readmission within 30 days (%)	3 (0.016%)	4 (0.025%)	0.9984
Complication rate (%)	4 (0.02%)	6 (0.37%)	0.4022

As shown in Table (8), which compare the postoperative outcomes measures between the two groups. Regarding the mean white blood cell count at the first postoperative day, it was lower for group B. than that of group A (p-value 0.0018); this may be explained by being the patients received at least two doses of antibiotics which are usually a combination of two antibiotics (mostly one drug of the cephalosporin group plus metronidazole) before doing the surgery. With regard to the timing of starting a liquid diet, there were no significant differences and the patients in the two groups started oral within the first 24 hours (p-value 0.0715). The immediate and early postoperative complication rate in group A was 0.02% and 0.37% for group B With a (p value 0.4022) which makes it non-significant.

The length of postoperative hospital stay in group A ranges between 2 days and less than one day; for group B, it also range between 2 days and less than one day (p-value 0.0826) which makes it also non-significant.

With regard to the need for readmission within 30 days, 0.016% of the patients in group A and 0.025% for group B (p-value 0.9984) were readmitted for having severe surgical site infection (severe cellulitis or wound abscess) or developing features of adhesional intestinal obstruction. Considering

the P-value more than 0.05 make it non-significant.

Discussion

Appendicitis is still the most common emergency facing the surgeon and the most common surgery performed by the surgeon on duty. It is used to perform appendicectomy when acute appendicitis diagnosed and as quickly as possible because delay means more progression of the inflammation[11].

However, in the last few decades, a revolution occurred in improving the quality of antibiotics and many studies revealed that interval appendicectomy for radiologically small appendicitis related abscess was having better outcome than early surgery and even some recent studies suggested that such abscesses in selected patients can be dealt without interval appendectomy. In addition, successful satisfying outcomes of treating some selected uncomplicated cases with antibiotics canceling the surgery were documented in updated literature. However, still many authors refuse considering acute appendicitis as a medical disease[12].

The timing of appendicectomy is a subject of controversy till now and still exists. Many studies achieved regarding this subject. Some of these studies still supported immediate or early appendectomy saying that it is associated with better outcomes than those in the delayed appendectomy group [13]. The later authors advocated that delayed appendicectomy results in more postoperative complications, most prominently surgical site infection. On contrast, other studies revealed no significant differences regarding the postoperative outcomes, between immediate and delayed appendicectomy [14]. Also, many studies revealed the negative impact of continuous prolonged working hours for the household resident doctors or sleep deprivation on cognitive abilities and clinical performance [15]. In addition, the timing of the operation, particularly after midnight in reality influenced by other factors as limited anesthesia-related availability, limited theater availability, equipment availability, and the surgeon decision results in a pediatric age group. In addition, the number of surgical resident doctors was reduced and the surgical conditions needing operation were increased in the last decade. Therefore post ponding appendectomy for hours became frequently seen despite early appendicectomy had been planned[16].

In this study, there were no differences that can be considered significant in the preoperative values and measures between the early appendicectomy group and the delayed group. This indicates that the disease severity, considering white blood cell and differential count and temperature in the uncomplicated cases of appendicitis do not influence the surgery timing. This is in concordance with the study done by Salminen P et tal (Antibiotic Therapy vs Appendectomy for Treatment of Uncomplicated Acute Appendicitis: The APPAC Randomized Clinical Trial) whose study revealed no significant effect of WBC count and temperature on the timing of surgery[16].

An interesting study was done by Stahlfeld et al (Is appendicitis an emergency surgical problem?) encountered many variables

related to the comparison between early and delayed appendicectomy. In this study, the authors hypothesized that giving parenteral antibiotics and good hydration of the patient on the account of delaying appendicectomy till normal day hours has no negative impact on the patient's mortality and morbidity. In Stahlfeld et al study, eighty one patients were reviewed at a single center; all of them underwent an appendectomy. Group 1, included patients who underwent appendicectomy within 10 hours of diagnosis by CT scan and group 2 included appendicectomies performed 10 hours following diagnosis. Surgical site infection, use of antibiotic, average analgesia required, duration of surgery, and length of hospital stay compared for both groups. The average time to the operation was (3.18 vs 15.85 hours), duration of surgery was (54.1 vs 55.7 minutes), the length of in-hospital stay was (2.65 vs 2.09 days), surgical site infection was (4 vs 0), and the use of antibiotics at the time of discharge (19 vs 3) for group 1 and 2 were not different statistically. These data suggest that delaying appendicectomy to accommodate the surgeon's preference or to maximize the hospital's efficiency does not have a significant impact on the patient[17].

This study did not show significant differences to start a liquid diet, hospital stay length, and rate of complications postoperatively in the two groups. This is in correspond with the results of a study done by [8] (Impact of surgery timing on the outcomes of acute appendicitis). The later study revealed that data demonstrated nearly similar outcome between the time to appendicectomy in patients operated on in less than 24 and those operated on the interval 24 to 48 hours following the diagnosis of appendicitis but it revealed an increase of two folds regarding the rate of complication if appendectomy delayed longer than 48 hours[18].

Another study done by [19] (Outcomes on the short term following appendicectomy is related to the delay preoperatively and not to the timing of the procedure) revealed that the timing of performing an appendicectomy whether at the day time or night time does not seem to has a significant influence on mortality rate and complication. However, a prolonged preoperative hospital stay of more than 24 hours, increases the risk of morbidity and mortality significantly[19].

The current study did not reveal a significant difference regarding the need for readmission within 30 days between the two groups. These results in addition to other variables were supported by many studies as those done by [20] (Delayed versus immediate surgery in acute appendicitis: do we need to operate during the night?). Their conclusion was that in patients having acute appendicitis, delaying the surgery till daytime hours didn't significantly influence the length of the operation, rate of perforation, or complications. In fact, they had been seen that delaying the management permits more effective use of hospital and physician resources and this even, includes reduced involvement of resident doctors in surgeries late in the night. Therefore delayed appendicectomy is safe compared with early appendectomy[13].

Moreover, the mean white blood cell count at the first postoperative day for the delayed

appendicectomy group was lower than that for the early one. These findings may be explained by having effective and sufficient parenteral antibiotics preoperatively to cover aerobic and anaerobic microorganisms, and more than one dose in group B while group A received only a single dose[20]. The majority of literature concluded that the adverse effects of delayed appendicectomy are related to a delay in surgery from symptom onset rather than a delay at hospital arrival. Kim et al in their study (Effect of surgical timing and outcomes for appendicitis severity) concluded that surgeons should take into account the time from symptom onset when deciding on the timing of appendectomy. They recommend that appendectomy be performed within 36 hours from symptom onset [21].

Cameron et al in their study concluded that appendectomy performed within the first 24 hours from the presentation is not associated with an increased risk of perforation or adverse outcomes[22].

Kim et al, in their study (Effects of Timing of Appendectomy on the Risks of Perforation and Postoperative Complications of Acute Appendicitis), concluded that the symptomatic time and overall time were significantly associated with perforation and complications, whereas hospitalization time was not associated with either perforation or complications[23].

Conclusions

This study concluded that delaying appendicectomy is safe for patients with uncomplicated appendicitis. Despite that the clinical outcomes of delayed appendicectomy weren't better than those with early appendicectomy.

Delayed appendicectomy can improve the quality of care provided from the residents' surgeons, anesthetist and theater staff, enhance patient's quality of care, and it allows an increase efficient utilization of medical resources and theaters for other life-threatening emergency cases.

Recommendations

We suggest that surgeons can decide the suitable timing of appendicectomy considering other situations in the hospital and the operating room mainly the available hospital resources.

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