*Available online at* **www.ijmrhs.com**

**ISSN No: 2319-5886**

**International Journal of Medical Research & Health Sciences, 2019, 8(10): 94-97**

# Early Appendectomy for Acute Appendicitis in Adults: Is it Valuable?

**Ashraf Abdelazeem Mohamed[1]*, Fauwaz Fahad Al Rashid[2] and Elzahraa Ibrahim Khalil[3]**

[1] *Department of Surgery, Minia University Hospital, Egypt*

[2] *Department of General Surgery, Ha'il University, KSA*

[3] *Department of Histopathology, Minia University, Egypt*

**Corresponding e-mail: Ashraf.azeem@yahoo.com*

## ABSTRACT

***Objectives:*** *Despite much progress in surgery, controversy still exists as regard the timing of appendectomy. This study aims at determining the relationship between pathological severity, complications, hospital stay and timing of appendectomy.* ***Patients and methods:*** *All patients diagnosed as acute appendicitis at Surgery Department in Minia University Hospital over the year 2018 were included. Patients<18 years, patients not recognizing the exact time of symptom onset and patients with negative appendicitis in pathology examination were excluded. The diagnosis was confirmed by ultrasound or CT prior to surgery. Pre-hospital, in-hospital and whole elapsed times were recorded. Macroscopic appearance and stage was described at surgery. Postoperative complications and hospital stay were recorded.* ***Results:*** *The number of included patients was 182; 119 males and 63 females. The mean age was 30.5 ± 6.19 years. Advanced age was significantly associated with advanced pathology (p<0.001). The mean temperature was 37.8 ± 0.75°C with significant associated between high temperature and advanced pathology (p<0.001). Mean WBC count was 12,380 ± 0.98 cells/μL with significant correlation between leukocytosis and advanced pathology (p<0.001). Advanced pathology was significantly correlated to pre-hospital elapsed time (Range 31.26 ± 3.74 to 52.30 ± 2.92 h) and to whole elapsed time (Range 43.43 ± 3.75 to 66.62 ± 2.82 h). Hospital stay (1.66 ± 0.30 days for stage 1 up to 7.50 ± 0.51 days for stage 4) and complication rate (4% for stage 1 up to 100% for stage 4) significantly correlated to advanced pathology (p<0.001).* ***Conclusion:*** *Early appendectomy may stop the pathological progress with subsequent reduction in complication rate and hospital stay. So, early appendectomy is recommended.*

**Keywords:** Appendicitis, Appendectomy, Timing of appendectomy, Pathological severity

## INTRODUCTION

One of the most common surgical emergency cases found in ED is acute appendicitis. Acute appendicitis may be associated with significant morbidity and even mortality if management delayed [1]. Early appendectomy has been emphasized for acute appendicitis since the first appendectomy in 1883 [2] and delayed appendectomy is unsafe and associated with a high incidence of surgical site infection [3]. Despite much progress in surgery, controversy still exists as regards timing of appendectomy [4]. Antibiotic therapy for acute appendicitis has been accepted in pediatrics [5]. This concept of antibiotic therapy challenged the historical concept of emergent appendectomy in adults [6]. However, appendectomy remains the standard of care for adult acute appendicitis despite the success and safety of antibiotic treatment [7]. The risk of perforation of appendix is related to duration of inflammation [8]. So, timing of surgery in relation to symptom onset (Whole elapsed time) is important. Previous studies documented that long time from admission to surgery (In-hospital elapsed time) increases perforation risk which will be associated with higher complication rate and longer hospital stay [9]. However, recent studies revealed that whole elapsed time up to 36 h is accepted [2,10]. This study aims at determining the relationship between whole elapsed time and in-hospital elapsed time on one hand and pathological severity, complications, and hospital stay on the other hand in acute appendicitis patients.

## PATIENTS AND METHODS

This study included all patients diagnosed as acute appendicitis at Surgery Department in Minia University Hospital over the year 2018. The study was approved by Ethical Committee of Minia College of Medicine. Patients younger than 18 years, patients who could not recognize the exact time of symptom onset and patients with negative appendicitis in the pathology examination were excluded. In all patients, diagnosis was confirmed by ultrasound or computed tomography prior to surgery. Time from onset of symptoms to hospital arrival (Pre-hospital elapsed time) was recorded. Macroscopic appearance and stage were described at surgery according to Rosai and Ackerman [11]: S1; acute focal, S2; acute suppurative, S3; gangrenous, S4; perforated. All specimens were sent to a pathologist to be examined. Postoperative complications and hospital stay were recorded. In-hospital elapsed time and whole elapsed time were also recorded. After diagnosis of appendicitis, antibiotics were immediately given to all patients. Extended courses of postoperative antibiotics were applied for patients with intra-abdominal abscess or perforated appendicitis. Appendectomies at our hospital are done with open or laparoscopic approach according to surgeon's preferences.

### Statistical Analysis

For categorical parameters, Pearson's chi-square test was applied. Kruskal-Wallis test was applied for continuous variables. A p-value of<0.05 was considered statistically significant. Data was generated with SPSS software (version 18, SPSS Inc.).

## RESULTS

The number of patients included in our study was 182; 119 males (65.4%) and 63 females (34.6%). The mean age was 30.5 ± 6.19 years (Ranged from 18 to 68 years old). Gender was not significantly correlated to pathological stage (p=0.787), while advanced age was significantly associated with advanced pathology (p<0.001) (Table 1).

**Table 1 Patient demographics and pathological stage**

| | S1=50 | S2=96 | S3=28 | S4=8 | p-value |
|---|---|---|---|---|---|
| **Age (years, mean ± SD)** | 23.4 ± 1.69 | 30.5 ± 1.62 | 38.6 ± 1.57 | 46.8 ± 1.27 | <0.001 |
| Male (No.) | 31 | 62 | 20 | 6 | 0.787 |
| Female (No.) | 19 | 34 | 8 | 2 | |

### Association between Patients' Characteristics and Pathological Stage

Physical examination revealed a mean temperature 37.8 ± 0.75°C (Range 37.0 ± 0.14 to 38.9 ± 1.03°C). The rise in body temperature was significantly associated with advance in pathological stage (p<0.001). With the highest temperature (39.2 ± 0.14°C), pathological stage 3 was noted. Mean WBC count was 12,380 ± 0.98 cells/µL (Range 11,600 ± 0.38 to 14,200 ± 0.51 cells/µL) with significant correlation between leukocytosis and high pathological stage (p<0.001). A high level was noted in stage 3 (Table 2).

**Table 2 Association patients' characteristics and pathological stage**

| | S1=50 | S2=96 | S3=28 | S4=8 | p-value |
|---|---|---|---|---|---|
| **Temperature °C (mean ± SD)** | 37.0 ± 0.14 | 37.8 ± 0.16 | 39.2 ± 0.14 | 38.9 ± 1.03 | <0.001 |
| WBC count (mean ± SD) | 11,600 ± 0.38 | 12,100 ± 0.34 | 14,200 ± 0.51 | 13,750 ± 0.32 | <0.001 |
| Hospital stay (Days, mean+SD) | 1.66 ± 0.30 | 1.80±0.20 | 3.35 ± 0.29 | 7.50 ± 0.51 | <0.001 |
| Complications (No, %) | 2 (4) | 7 (7.3) | 12 (42.8) | 8 (100) | <0.001 |

### Association between Time of Surgery and Pathological Stage

Advanced pathology was observed and significantly correlated to pre-hospital elapsed time (Range 31.26 ± 3.74 to 52.30 ± 2.92 h). The mean time for stage 1 was 31.26 ± 3.74 h, while for stage 4 was 52.30 ± 2.92 h (p<0.001). Also, advanced pathology was observed and significantly correlated to whole elapsed time (Range 43.43 ± 3.75 to 66.62 ± 2.82 h). The mean time for stage 1 was 43.93 ± 4.25 h, while for stage 4 was 66.62 ± 2.82 h (p<0.001). The mean in-hospital elapsed time was 11.57 ± 1.31 h, which did not significantly correlate with the pathological stage (p=0.524) (Table 3).

**Table 3 Association between timing of surgery and pathological stage**

| | S1=50 | S2=96 | S3=28 | S4=8 | p-value |
|---|---|---|---|---|---|
| Pre-hospital elapsed time (mean ± SD) | 31.26 ± 3.74 | 32.50 ± 3.76 | 50.30 ± 3.25 | 52.30 ± 2.92 | <0.001 |
| In-hospital elapsed time (mean ± SD) | 12.65 ± 1.05 | 10.80 ± 0.76 | 11.55 ± 0.82 | 14.25 ± 1.66 | 0.524 |
| Whole elapsed time (mean ± SD) | 43.93 ± 4.25 | 43.43 ± 3.75 | 61.77 ± 3.30 | 66.62 ± 2.82 | <0.001 |

### Association between Hospital Stay, Complication and Pathological Stage

Hospital stay and complication rates significantly correlated to higher pathological stage ($p<0.001$) (Table 3). Complication rates ranged from 4% for stage 1 up to 100% for stage 4 and hospital stay ranged from 1.66 ± 0.30 days for stage 1 up to 7.50 ± 0.51 days for stage 4 (Table 2).

## DISCUSSION

To determine the onset time of symptoms of appendicitis is very crucial to decide when to perform acute care surgery. If surgery delayed from the symptom onset, outcomes will be worse in the vast majority of surgical emergencies [12]. Acute appendicitis in adults is a time-dependent disease in regard to pathological progress and complication rates [13]. Appendectomy for acute appendicitis in adults remains the most effective and safe treatment [14-16]. But still there is controversy as regards the urgency of operation [17]. Prolonged pre-hospital elapsed time and whole elapsed time correlate significantly with pathological stage ($p<0.001$). These results agreed with previous studies [4,10]. We found that in-hospital elapsed time is not statistically significant ($p=0.524$). This agreed with Lee, et al., who documented that the outcome is not affected by the in-hospital elapsed time [6] and Busch, et al., who concluded that longer In-hospital elapsed time more than 12 h is independent risk factor for perforation [9], although at our hospital, the in-hospital elapsed time is relatively short (11.95 ± 0.74 h) when compared with time limit documented in previous studies (12-36 h) [2,10]. This result might be due to assumptions that most perforations occur before admission and that some cases of appendicitis may be resolved spontaneously rather than being perforated. According to this result, in-hospital elapsed time was not found as determining factor of severity, so acceptable time limit should be further studied. Pre-hospital elapsed time was found to correlate significantly with severity ($p<0.001$), this time cannot be easily shortened but shortening of whole elapsed time can be achieved. However, pre-hospital elapsed time might be reduced through public education. We also found statistical significance between high pathological stage and long hospital stay and high rate of complication ($p<0.001$). According to our study, advanced pathological stage correlates significantly with whole elapsed time and also with pre-hospital elapsed time, so urgent surgery is recommended. On the other hand, surgery might be delayed with antibiotic therapy.

## CONCLUSION

We concluded that early appendectomy may stop the pathological progress with a subsequent reduction in the complication rate and shortening of hospital stay. According to significant correlation between symptom onset, pathological severity, and complication rate, early appendectomy is recommended, this agrees with the recommendations of World Society of Emergency Surgery. Also, we recommend further studies to determine the optimal in-hospital elapsed time.

## DECLARATIONS

### Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## REFERENCES

[1] Storm-Dickerson, Toni L., and Mark C. Horattas. "What have we learned over the past 20 years about appendicitis in the elderly?" *The American Journal of Surgery,* Vol. 185, No. 3, 2003, pp. 198-201.

[2] Eko, Frederick N., et al. "Ideal timing of surgery for acute uncomplicated appendicitis." *North American Journal of Medical Sciences,* Vol. 5, No. 1, 2013, p. 22.

[3] Teixeira, Pedro G., et al. "Appendectomy timing: waiting until the next morning increases the risk of surgical site infections." *Annals of Surgery,* Vol. 256, No. 3, 2012, pp. 538-43.

[4] Saar, Sten, et al. "Delay between onset of symptoms and surgery in acute appendicitis increases perioperative morbidity: a prospective study." *World Journal of Surgery,* Vol. 40, No. 6, 2016, pp. 1308-14.

[5] Yardeni, Dani, et al. "Delayed versus immediate surgery in acute appendicitis: Do we need to operate during the night?" *Journal of Pediatric Surgery,* Vol. 39, No. 3, 2004, pp. 464-69.

[6] Lee, Jae Min, Beom Seok Kwak, and Young Jin Park. "Is a one night delay of surgery safe in patients with acute appendicitis?" *Annals of Coloproctology,* Vol. 34, No. 1, 2018, pp. 11-15.

[7] Harnoss, Julian C., et al. "Antibiotics versus surgical therapy for uncomplicated appendicitis: Systematic review and meta-analysis of controlled trials (PROSPERO 2015: CRD42015016882)." *Annals of Surgery,* Vol. 265, No. 5, 2017, pp. 889-900.

[8] Papandria, Dominic, et al. "Risk of perforation increases with delay in recognition and surgery for acute appendicitis." *Journal of Surgical Research,* Vol. 184, No. 2, 2013, pp. 723-29.

[9] Busch, Mirjam, et al. "In-hospital delay increases the risk of perforation in adults with appendicitis." *World Journal of Surgery,* Vol. 35, No. 7, 2011, pp. 1626-33.

[10] Kim, Maru, Sung Jeep Kim, and Hang Joo Cho. "Effect of surgical timing and outcomes for appendicitis severity." *Annals of Surgical Treatment and Research,* Vol. 91, No. 2, 2016, pp. 85-89.

[11] Rosai, Juan. *Rosai and Ackerman's surgical pathology e-book.* Elsevier Health Sciences, 2011.

[12] Surapaneni, Sushama, and VB A. Reddy. "The perforation-operation time interval; an important mortality indicator in peptic ulcer perforation." *Journal of Clinical and Diagnostic Research,* Vol. 7, No. 5, 2013, pp. 880-82.

[13] Ditillo, Michael F., James D. Dziura, and Reuven Rabinovici. "Is it safe to delay appendectomy in adults with acute appendicitis?." *Annals of Surgery,* Vol. 244, No. 5, 2006, pp. 656-60.

[14] Kirby, Andrew, et al. "Appendicectomy for suspected uncomplicated appendicitis is associated with fewer complications than conservative antibiotic management: A meta-analysis of post-intervention complications." *Journal of Infection,* Vol. 70, No. 2, 2015, pp. 105-10.

[15] Podda, Mauro, et al. "Antibiotics-first strategy for uncomplicated acute appendicitis in adults is associated with increased rates of peritonitis at the surgery. A systematic review with meta-analysis of randomized controlled trials comparing appendectomy and non-operative management with antibiotics." *The Surgeon,* Vol. 15, No. 5, 2017, pp. 303-14.

[16] Poillucci, Gaetano, et al. "Laparoscopic appendectomy *vs* antibiotic therapy for acute appendicitis: A propensity score-matched analysis from a multicenter cohort study." *Updates in Surgery,* Vol. 69, No. 4, 2017, pp. 531-40.

[17] Foul, Salma Abu, et al. "Is early appendectomy in adults diagnosed with acute appendicitis mandatory? A prospective study." *World Journal of Emergency Surgery,* Vol. 14, No. 1, 2019.