MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2023.72.77

A Comparative Study of Early Versus Delayed Emergency Appendectomy

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ABSTRACT
This study aims to compare the morbidity, mortality, postoperative length of stay and 30 days readmission rate of acute appendicitis patients who had appendectomy within 8 hrs of visiting the emergency room with those who had surgery after that period. We hypothesised that delayed appendectomy was associated with worse outcomes. This retrospective analysis of all patients with the diagnosis of acute appendicitis at a single community hospital affiliated with a university was conducted from March 2022-2023. The study population was divided into two groups based on the length of time before the intervention: Early appendectomy (group 1), which included patients who underwent surgery within 8 hrs and delayed appendectomy (group 2), which included patients who underwent surgery after that point. A total of 175 patients met the inclusion requirements for the study population over the course of the 12 months trial period. Within 8 hrs of their arrival at the ED, 100 patients (57.1%) underwent early appendectomy, while 75 patients (42.8%) did so after that time. The age was 42.2 ±17.5years on average. We examined that perioperative morbidity (6.7% vs. 9.8%, p = 0.483) and the 30 days readmission rate (2.7% vs. 4.9%, p = 0.544) did not differ significantly between the two groups. The postoperative duration of stay did not differ significantly between the 2 groups: Median (IQR) 19.5 (11.5-40.5) vs. 20.0 (11.25-58.5) hours, p = 0.68. Our results concluded that an 8 hrs delay in the appendectomy did not lead to longer postoperative stays, an increase in mortality or morbidity, or a higher 30 days readmission rate, of patients with acute appendicitis.

OPEN ACCESS

Key Words
Early, delayed, appendectomy, appendicitis

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Received: 7 March 2023
Accepted: 3 April 2023
Published: 19 April 2023

Citation: Prince Gupta and Nisha, 2023. A Comparative Study of Early Versus Delayed Emergency Appendectomy. Res. J. Med. Sci., 17: 72-77, doi: 10.59218/makrjms.2023.72.77

INTRODUCTION

Appendicitis continues to be one of the most common causes of acute abdomen and historically, an emergency appendectomy has been the best line of treatment. Delaying surgical treatment increases the risk of morbidity and mortality because appendicitis is prone to perforate as it progresses[1]. An appendectomy was once believed to be performed within the first few hours after arrival[2]. The consequences of acute appendicitis (AA), some of which are potentially fatal, include perforation, widespread peritonitis and portal pyemia. Additionally, adhesionolysis frequently results in mass development, surgical site infections and iatrogenic harm to surrounding structures[3]. As people age, these problems become more noticeable[4]. Recently, AA management has tended to adopt a more circumspect attitude. The notion that an unnecessary hurry to operate may not necessarily be necessary has emerged as a result of the development of stronger and more effective antibiotics as well as a general improvement in hospital treatment[5]. Numerous studies have demonstrated that having an appendectomy 8-12 hrs after being admitted does not raise the risk of perforation, lengthen the procedure or the length of the post-operative hospital stay and is not linked to an increase in morbidity and death. When intravenous wide spectrum antibiotics are introduced at the right time, the disease's course is slowed or stopped and the incidence of complications is not noticeably raised[2,6]. A CT scan of the abdomen can be used to determine whether problems are present or not. This might also help in selecting when to schedule the operation[7]. However, several studies have indicated that delaying appendectomy increases morbidity while also significantly altering the risk of appendix perforation, length of post-operative hospital stay and overall cost[1,4,6]. However, the results of a recent study have proven ambiguous in this area. According to a retrospective analysis of more than 1000 patients treated for acute appendicitis, a delayed appendectomy was risky and raised the risk of complications in people with intervention delayed more than 48 hrs. The likelihood of disease progression increased 13 times in the group when appendectomy was delayed for longer than 71 hrs[1]. A later analysis of more than 4000 patients treated for acute appendicitis found a clear correlation between postponing appendectomy by at least 6 hrs and an increased risk of surgical site infection[8]. One study found that delays of more than 12 hrs and more than 24 hrs, respectively, increased the risk of complications and the possibility of developing gangrenous appendicitis[9]. Contrarily, a sizable retrospective analysis from the American College of Surgeons National Quality Improvement Programme (NSQIP) database discovered that postponing an appendectomy for longer than 12 hrs was linked to longer operating times and postoperative hospital stays but not to higher rates of morbidity or fatality[10]. However another retrospective research revealed no significant difference in length of postoperative stay, complication rate, or readmission rate when appendectomy was postponed more than 8 hrs after initial presentation[11].

This study aims to compare the morbidity, mortality, postoperative length of stay and 30 days readmission rate of acute appendicitis patients who had appendectomy within 8 hrs of visiting the emergency room with those who had surgery after that period. We hypothesised that delayed appendectomy was associated with worse outcomes.

MATERIALS AND METHODS

Following clearance from the institutional review board, a retrospective analysis of all patients with the diagnosis of acute appendicitis at a single community hospital affiliated with a university from March 2022-2023 was completed. Patients with an appendicitis diagnosis were located using ICD-9 codes (540, 540.0, 540.1 and 540.9) and ICD-10 codes (K35, K35.3, K35.3 and K35.8).

All patients who underwent appendectomy procedures and met the inclusion criteria were included in the analysis. The following requirements had to be met in order for the subjects to be included: At the time of the appendectomy, the patient had to be between the ages of 18-90 years, have appendicitis confirmed by ultrasound, computed tomography (CT) scan, magnetic resonance imaging (MRI), or clinical suspicion and have the appendectomy performed while they were still in the hospital. Pregnant patients who were diagnosed with acute appendicitis and patients discharged from the hospital before having an appendectomy (i.e., interval appendectomy, individuals leaving against medical recommendation), were excluded[6].

The study population was divided into two groups based on the length of time before the intervention: early appendectomy (group 1), which included patients who underwent surgery within 8 hrs and delayed appendectomy (group 2), which included patients who underwent surgery after that point. The underlying characteristics of the two study groups were then compared, including demographic, clinical, radiological and perioperative data. The 30 days readmission rate, postoperative length of stay and mortality and morbidity were all regarded as outcome measures.

Statistical analysis: Data were manually collected by reviewing patient charts in the electronic medical record. The statistical analysis was carried by utilizing

SAS Enterprise Guide 7.1. Statistical significance was evaluated at $p<0.05$. While categorical variables were provided as frequencies and percentages, continuous variables were reported as means and standard deviations (SD) or, if the data were skewed, as medians and interquartile ranges (IQR). The categorical data were examined using the Pearson 2 test. The mean differences between groups were compared using the Mann-Whitney rank sum test or the unpaired Student t-test.

RESULTS

A total of 175 patients met the inclusion requirements for the study population over the course of the 12-month trial period. Within 8 hrs of their arrival at the ED, 100 patients (57.1%) underwent early appendectomy, while 75 patients (42.8%) did so after that time. The age was 42.2±17.5years on average. Total of48.5% (n = 85) of the population were male patients. 24 (12-48) hours was the median (IQR) amount of time between the onset of stomach pain and attendance at the ED. From arrival at the ED through skin incision, it took an average of 6 (3.3-10) hrs.

Table 1 compares the general patient characteristics of the two research groups in considerable detail. There was little difference between the two groups. All individuals had abdominal pain as a common symptom. Preoperative abdominal and pelvic computed tomography (CT) scans were performed on 89% (156/175) of the patients. The most frequent CT scan finding in 92% (162/175) of patients was peri-appendiceal inflammation, which was followed by fecalith in 44.5% (78/175) of instances. There was no statistically significant difference between the two groups in the CT scan results. One patient had magnetic resonance imaging (MRI) and 15 patients underwent abdominal ultrasonography.

Table 2 includes information on the general perioperative data as well as comparisons between the two study groups. We found no significant differences between the two groups in the operating time ($p = 0.799$), the pathologic diagnosis of non-perforated and perforated appendicitis ($p = 0.681$, $p = 0.56$), or the administration of pre- and postoperative antibiotics ($p = 0.941$, $p = 0.38$). Both the interval between the onset of symptoms and the skin incision as well as the interval between the patient's arrival at the emergency room varies significantly between the two groups ($p<0.001$). Ten of the patients-out of 175-had perforated appendicitis in addition to the diagnosis of acute appendicitis. One normal appendix, one carcinoid tumour, one ruptured appendiceal neoplasm and one sessile serrated adenoma were identified by histopathologic analysis in four patients. Preoperative antibiotics were given to 140 patients (80%) while postoperative medicines were given to only 40 individuals (22.8%). Total of 174 individuals had laparoscopic appendectomy procedures (99.14%). The remaining patient underwent an open procedure conversion.

Overall results and comparisons between the two study groups are shown in Table 3. In the study population, there were no fatalities. Sixteen patients (9.1%) overall experienced postoperative problems, including two postoperative haemorrhage (1.1%), four surgical site infections (2.2%), six pneumonia (3.4%), one urinary tract infection (0.5%) and three patients (1.7%) who experienced multiple organ system failure. Within 30 days of surgery, six patients (3.4%) were readmitted. Perioperative morbidity (6.7% vs. 9.8%,

Table 1: Demographic, clinical and radiological findings

	Early appendectomy (N = 100)	Delayed appendectomy (N = 75)	Overall (N = 175)	p-value
Mean age (in years)	42.6±18	41.4±16.7	42.2±17.6	0.590
Gender				0.540
Male	56	39	85	
Female	44	36	67	
Mean body mass index (kg m^{-2})	29±6.7	28.5±7	28.9±6.7	0.890
History of abdominal surgery (%)	35 (35%)	20 (26.6%)	55 (31.4%)	0.150
Symptoms				
Diarrehea (%)	18 (18%)	9 (12%)	27 (15.4%)	0.420
Fever (%)	14 (14%)	10 (13.3%)	24 (13.7%)	0.080
Anorxia (%)	36 (36%)	18 (24%)	54 (30.8%)	0.290
Nausea (%)	92 (92%)	41 (54.6%)	133 (76%)	0.430
Timing from onset of abdominal pain to arrival to ED in hours, median (IQR	24 (12-48)	24 (15-48)	24 (12-48)	0.340
Average White blood cell count ($\times 109\ L^{-1}$)	13.6±4.2	13.1±5.1	13.8±5.2	0.210
Localized peritonitis (%)	96 (96%)	73 (97.3%)	169 (96.5%)	0.390
Average temperature (%)	36.9±0.8	36.9±0.5	36.9±0.6	0.120
Diffuse peritonitis (%)	4 (4%)	2 (2.6%)	6 (3.4%)	0.740
Abdomen and pelvis CT scan (%)	88 (88%)	68	156 (89.1%)	0.450
MRI (%)	1 (1%)	1 (1.3%)	2 (2.6%)	0.980
Ultrasound (%)	27 (27%)	9 (12%)		
CT findings				
Pneumoperitoneum (%)	3 (3%)	1 (1.3%)	4 (2.2%)	0.320
Peri-appendiceal inflammation (%)	95 (95%)	67 (89.3%)	162 (92.5%)	0.122
Phelogmon/abscess (%)	3 (3%)	1 (1.3%)	4 (2.2%)	0.340
Fecolith (%)	51 (51%)	27	78 (44.5%)	0.150

Table 2: Peri-operative findings

	Early appendectomy (N = 100)	Delayed appendectomy (N = 75)	Overall	p-value
Time between arrival to ED to incision (IQR) (hours)	4 (2-5.5)	12 (9.9-14.4)	6 (3.3-10)	0.002
Onset symptoms to incision (IQR) (hours)	26 (16-52)	41 (31-82)	32 (18-58)	0.001
Mean operative time	55±21	63±31	56±25	0.790
Usage of pre-operative antibiotics (%)	90 (90%)	60	140 (80%)	0.940
Usage of post-operative antibiotics	26 (26%)	14	40 (22.8%)	0.380
Perforated appendicitis (%)	7 (7%)	3 (4%)	10 (5.7%)	0.560
Acute appendicitis (%)	95 (95%)	72 (936%)	165 (94.2%)	0.680

Table 3: Post surgical outcomes

	Early appendectomy (%)	Delayed appendectomy	Overall	p-value
Bleeding (%)	1 (1%)	1 (1.3%)	2 (1.1%)	0.450
Urinary tract infection (%)	0	1 (1.3%)	1 (0.5)	0.180
Surigival site infection (%)	1 (1%)	3 (4%)	4 (2.2%)	0.950
Multiple order dysfunction syndrome (%)	1 (1%)	2 (2.6%)	3 (1.7%)	0.670
Penuomonia (%)	2 (2%)	4 (5.3%)	6 (3.4%)	0.680
Postoperative length of stay (IQR)	19.4 (11.5-39.5)	19.7 (11.5-41.8)	20 (11.35-58.5)	0.642
Readmission within 30 days	2 (2%)	4 (5.3%)	6(3.4%)	0.544

p = 0.483) and the 30-day readmission rate (2.7% vs. 4.9%, p = 0.544) did not differ significantly between the two groups. The postoperative duration of stay did not differ significantly between the two groups: Median (IQR) 19.5 (11.5-40.5) vs. 20.0 (11.25-58.5) hours, p = 0.68).

DISCUSSIONS

Acute appendicitis is a common surgical emergency that affects everyone equally and universally. Appendicitis patients typically have a brief history of discomfort that starts close to the umbilicus and then spreads to the right lower abdomen, along with nausea and appetite loss. In addition to the typical presence of leucocytosis, an ultrasonography may show fluid accumulation in the right iliac fossa[12]. There is a minor possibility that acute inflammation could be malignant, even though appendicular tumours are most usually associated with it. The appendix may rupture where the obstructive lesion is impaction as a result of pressure necrosis. Therefore, to prevent progressively worse results, early surgical intervention is necessary[13].

Given the effectiveness of conservative treatment with antibiotic cover in many patients, the timing of surgery is a challenging subject. Surgery must be performed quickly since in-hospital delays of more than 12 hrs have historically been linked to a higher risk of perioperative problems[14]. Early intervention is typically motivated by concerns about perforation, abscess formation and localised or generalised peritonitis[4]. The majority of studies (6 predict that the rate of problems will be around 10% and won't transcend 14%) even if the therapy is delayed for up to 72 hrs[15]. According to recent studies, pre-hospital delays are more significant than in-hospital delays and delays that occur less than 24 hrs after the patient is admitted do not significantly increase the risk of perforation[2].

In present study, we found that delays of more than 8 hrs in performing appendectomy were not related to postoperative length of stay, 30 days readmission rate, or increased perioperative morbidity. Our results support prior studies that have found no association between short delays-less than 12-24 hrs between having an appendectomy and an increase in morbidity or mortality[1,11,12]. An extensive population-based study using the American College of Surgeons National Surgical Quality Improvement Programme (NSQIP) database supports this semi-elective approach by showing that appendectomy can be delayed for up to 24-48 hrs without appreciably compromising results. In this population based-study the complication rates for appendectomy patients did not change the day after admission but they reported more than doubled for every patient whose surgery was postponed by more than 48 hrs[16]. Similar results have been seen in earlier, more compact research[17,18]. In contrast to evidence indicating safe appendectomy delays, other studies have found a negative impact on outcomes with minor intervention delays, even those of 6-12 hrs[8]. A recent UK study found that having an appendectomy within 48 hrs did not increase the chance of getting severe appendicitis. A lengthy hospital stay of more than 48 hrs, however, was associated to a noticeably raised risk of acute appendicitis[19].

Within 30 days of an appendectomy, the unplanned readmission rate in our sample (n = 4) was 3.4%, which is comparable to the 3.7% reported in a sizable study[20]. An infection, haemorrhage, poor pain relief, ileus, nausea, or vomiting were the reasons for readmission. The most frequent reasons for readmission are intra-abdominal infections and generalised abdominal discomfort. Patients with acute appendicitis should be kept on intravenous fluids and intravenous antibiotics during the waiting period when a delay to surgical intervention is justified.

Patients with acute appendicitis who are admitted overnight can be managed comfortably without surgery until the next morning. But it's a good idea to have a plan in place for how to handle these

circumstances in the morning. Our facility offers an operating block time in the early morning for surgical cases that have been admitted overnight and are in a clinically stable state. As a result, resources for overnight hospitals have been preserved for more serious and urgent circumstances. Numerous studies have shown that the majority of patients with uncomplicated, acute appendicitis can undergo a laparoscopic appendectomy and leave the hospital within 24 hrs of admission[6,10,21]. Although, some believe that surgical intervention may be fully avoided in some cases of uncomplicated acute appendicitis[22], more research is needed to determine if individuals can be expected to recover without surgical treatment. The interval between the time of diagnosis and the appendectomy for individuals who will ultimately require it should be less than 48 hrs and ideally less than 24 hrs.

Our study has several limitations including study design and sample size. In addition to all the drawbacks of retrospective investigations, our study's small sample size has a major impact on its capacity to uncover possibly significant impacts of a number of independent factors on the measured outcomes. The fact that this study was carried out at a single school over the course of a single year restricts the findings' generalizability and raises the likelihood of selection bias. Randomised controlled studies are difficult to do out because patients with acute appendicitis frequently undergo swift operative therapy. However, given the rising body of supportive evidence, a paradigm shift from immediate to brief delay in action may be established in the treatment of this common surgical condition.

CONCLUSION

Our results concluded that an 8 hrs delay in the appendectomy did not lead to longer postoperative stays, an increase in mortality or morbidity, or a higher 30-day readmission rate, of patients with acute appendicitis.

REFERENCES

1. Ditillo, M.F., J.D. Dziura and R. Rabinovici, 2006. Is it safe to delay appendectomy in adults with acute appendicitis? Ann. Surg., 244: 656-660.
2. Kim, H.K., Y.S. Kim, S.H. Lee and H.H. Lee, 2016. Impact of a delayed laparoscopic appendectomy on the risk of complications in acute appendicitis: A retrospective study of 4, 065 patients. Digestive Surg., 34: 25-29.
3. Noorit, P., B. Siribumrungwong and A. Thakkinstian, 2018. Clinical prediction score for superficial surgical site infection after appendectomy in adults with complicated appendicitis. World J. Emergency Surg., Vol. 13. 10.1186/s13017-018-0186-1.
4. Lasek, A., M. Pędziwiatr, J. Kenig, M. Walędziak and M. Wysocki *et al*., 2018. The significant impact of age on the clinical outcomes of laparoscopic appendectomy. Medicine, Vol. 97. 10.1097/md.0000000000013621.
5. Salminen, P., H. Paajanen, T. Rautio, P. Nordström and M. Aarnio *et al*., 2015. Antibiotic therapy vs appendectomy for treatment of uncomplicated acute appendicitis. JAMA, 313: 2340-2348.
6. Seudeal, K., H. Abidi and S. Shebrain, 2018. Early versus delayed appendectomy: A comparison of outcomes. Am. J. Surg., 215: 483-486.
7. Jeon, B.G., H.J. Kim and S.C. Heo, 2018. CT scan findings can predict the safety of delayed appendectomy for acute appendicitis. J. Gastrointestinal Surg., 23: 1856-1866.
8. Teixeira, P.G., E. Sivrikoz, K. Inaba, P. Talving, L. Lam and D. Demetriades, 2012. Appendectomy timing. Ann. Surg., 256: 538-543.
9. Giraudo, G., F. Baracchi, L. Pellegrino, H.M.D. Corso and F. Borghi, 2012. Prompt or delayed appendectomy? influence of timing of surgery for acute appendicitis. Surg. Today, 43: 392-396.
10. Shin, C.S., Y.N. Roh and J.I. Kim, 2014. Delayed appendectomy versus early appendectomy in the treatment of acute appendicitis: A retrospective study. World J. Emergency Surg., Vol. 9. 10.1186/1749-7922-9-8.
11. Nagpal, K., N. Udgiri, N. Sharma, E. Curras, J.M. Cosgrove and D.T. Farkas, 2012. Delaying an appendectomy: Is it safe? Am. Surgeon, 78: 897-900.
12. Miller, E.L.C., L.F.F. Miller, J.G. Carvalho, A. Marsillac, L. Pires, M.A. Babinski and M. Monteiro, 2016. Psoas muscle abscess simulating acute appendicits: A case report. Int. J. Surg. Case Rep., 25: 139-142.
13. Teixeira, F.J.R., S.D.D. Netto, E.H. Akaishi, E.M. Utiyama, C.A.M. Menegozzo and M.C. Rocha, 2017. Acute appendicitis, inflammatory appendiceal mass and the risk of a hidden malignant tumor: A systematic review of the literature. World J. Emergency Surg., Vol. 12. 10.1186/s13017-017-0122-9.
14. Jeon, B.G., H.J. Kim, K.H. Jung, H.I. Lim and S.W. Kim *et al*., 2016. Appendectomy: Should it be performed so quickly? Am. Surgeon, 82: 65-74.

15. Alore, E.A., J.L. Ward, S.R. Todd, C.T. Wilson, S.D. Gordy, M.K. Hoffman and J.W. Suliburk, 2018. Population-level outcomes of early versus delayed appendectomy for acute appendicitis using the American college of surgeons national surgical quality improvement program. J. Surg. Res., 229: 234-242.
16. Fair, B.A., J.C. Kubasiak, I. Janssen, J.A. Myers, K.W. Millikan, D.J. Deziel and M.B. Luu, 2015. The impact of operative timing on outcomes of appendicitis: A national surgical quality improvement project analysis. Am. J. Surg., 209: 498-502.
17. Abou-Nukta, F., C. Bakhos, K. Arroyo, Y. Koo, J. Martin, R. Reinhold and K. Ciardiello, 2006. Effects of delaying appendectomy for acute appendicitis for 12 to 24 hours. Arch. Surg., 141: 504-506.
18. Omundsen, M. and E. Dennett, 2006. Delay to appendicectomy and associated morbidity: A retrospective review. ANZ J. Surg., 76: 153-155.
19. United Kingdom National Surgical Research Collaborative, 2014. Safety of short, in-hospital delays before surgery for acute appendicitis. Ann. Surg., 259: 894-903.
20. Moghadamyeghaneh, Z., G. Hwang, M.H. Hanna, J.C. Carmichael, S. Mills, A. Pigazzi and M.J. Stamos, 2016. Unplanned readmission after appendectomy. Am. J. Surg., 212: 493-500.
21. Ingraham, A.M., M.E. Cohen, K.Y. Bilimoria, C.Y. Ko, B.L. Hall, T.R. Russell and A.B. Nathens, 2010. Effect of delay to operation on outcomes in adults with acute appendicitis. Arch. Surg., 145: 886-892.
22. Styrud, J., S. Eriksson, I. Nilsson, G. Ahlberg and S. Haapaniemi *et al*., 2006. Appendectomy versus antibiotic treatment in acute appendicitis: A prospective multicenter randomized controlled trial. World J. Surg., 30: 1033-1037.