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ORIGINAL INVESTIGATION / ÖZGÜN ARAŞTIRMA

Evaluation of the Management, Mortality, and Morbidity in Acute Appendicitis in Elderly Patients: A Tertiary Care Hospital Experience

Yaşlı Hastalarda Akut Apandisitte Tedavi, Mortalite ve Morbiditenin Değerlendirilmesi: Üçüncü Basamak Tek Merkez Deneyimi

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ABSTRACT

Objective: This study aimed to present our clinical experiences in the management, mortality, and morbidity and discuss the possible influencing factors of elderly patients with acute appendicitis (AA).

Method: In this case series analysis, we evaluated the elders presented and operated as AA between January 2015 and May 2019 in Kanuni Sultan Süleyman Training and Research Hospital General Surgery Clinic. Primary goals were to determine the mortality, morbidity, and managements.

Results: The study cohort consisted of 83 elders. The mean age was 70.5±6.36 years, of 83 patients, 47 (57%) were female and 36 (43%) were male. The mean duration of symptoms of cases was 9±3 days and the median time from the onset of symptoms to hospital admission was 5 days. The rate of appendiceal perforation and morbidity was 45% (n=37) and 39% (n=32), respectively. The length of time from the onset of first symptoms to hospital admission of perforated cases was 7–9 days. Computerized tomography was used and provided valuable information in 17 (20%) cases in the diagnosis of AA. Operative modality was laparoscopy in 18 (22%) of patients, open appendectomy in 61 (73%), and conversion to open procedure in 4 (5%). There were 3 (4%) mortality in our study group.

Conclusion: Perforation, morbidity, and mortality rates were 45% (n=37), 39% (n=32), and 4% (n=3) in our study. Late presentation and delay in diagnosis and treatment result in increased rates of perforation and morbidities. Laparoscopic appendectomy was safe and feasible in elderly patients.

Keywords: Acute appendicitis, elderly, management, morbidity, perforation, prognosis

ÖZ

Amaç: Bu çalışmada, akut apandisitli yaşlı hastalarda tedavi, mortalite ve morbidite konusundaki klinik deneyimlerimizin ve etkileyen olası faktörlerin tartışılması amaçlandı.

Yöntem: Bu olgu serisi analizinde, Ocak 2015 ile Mayıs 2019 tarihleri arasında Kanuni Sultan Süleyman Eğitim ve Araştırma Hastanesi Genel Cerrahi Kliniğinde akut apandisit tanısıyla ameliyat edilen yaşlı hastalar değerlendirildi. Birincil hedefler, mortalite, morbidite ve yönetimi belirlemektir.

Bulgular: Çalışma grubu 83 yaşlı hastadan oluşuyordu. Yaş ortalaması 70,5±6,36 yıl olan 83 hastanın 47'si (%57) kadın, 36'sı (%43) erkekti. Olguların ortalama semptom süresi 9±3 gün, semptomların başlangıcından hastaneye yatışına kadar geçen medyan süre beş gün. Apendiks perforasyonu ve morbidite oranı sırasıyla %45 (n=37) ve %39 (n=32) idi. İlk semptomların başlangıcından perfore olguların hastaneye kaldırılmasına kadar geçen süre 7-9 gündü. Akut apandisit tanısında bilgisayarlı tomografi kullanıldı ve 17 (%20) olguda değerli bilgiler sağlandı. Operatif modalite hastaların 18'inde (%22) laparoskopi, 61'inde (%73) açık apendektomi, dördünde (%5) açık prosedüre dönüştü. Çalışma grubumuzda 3 (%4) hastada mortalite gelişti.

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Sonuç: Çalışmamızda perforasyon, morbidite ve mortalite oranları %45 (n=37), %39 (n=32) ve %4 (n=3) idi. Geç başvuru, tanı ve tedavide gecikme, perforasyon ve morbidite oranlarında artışa neden olur. Laparoskopik apendektomi yaşlı hastalarda güvenli ve uygulanabilir bulundu.

Anahtar kelimeler: Akut apandisit, morbidite, perforasyon, prognoz, yaşlı, yönetim

INTRODUCTION

Acute appendicitis (AA) is one of the most common causes of acute abdomen in general population with a lifetime risk of 8.6% in males and 6.7% in females.[1] Despite AA being more common in young adults in second through fifth decades of life, with the mean age of 31.3 years and the median age of 22 years, with the aging of the population, in the near future, AA in elderly patients will probably become more common.[2]

At present, there are different findings and controversies regarding the prevalence, mortality, morbidity, and management of AA in elderly patients in the literature.[3,4] Nowadays, with the introduction and improvements of diagnostic imaging modalities (Ultrasonography [USG] and computerized tomography [CT]) post-operative intensive care units, and new antibioterapies, diagnostic accuracy, and post-operative mortality and morbidity are expected to be decreased.[5] Pereira et al.[5] in their prospective multicenter observational study reported that AA is more commonly seen in elders than young patients possibly due to global aging of the population and the elderly population had less time to seek medical assistance and has fewer complications with no mortality, despite being more often admitted to the intensive care unit due to other comorbidities. Some studies evaluating AA in the elderly[6] reported no mortality and little post-operative complications. Controversy still exists over the presentation of AA in elderly patients.[7,8] More studies are needed to determine the presentation, management, mortality, and morbidity, of elderly patients.

This study aimed to evaluate the elderly patients presenting with AA in terms of management, morbidity, and mortality and contribute to the literature in this way.

METHOD

Medical data of patients age over 65 years who underwent laparoscopic or open appendectomy with the histopathologically proven diagnosis of AA between January 2015 and May 2019 in Department General Surgery of University of Health Sciences, Kanuni Sultan Süleyman Training and Research Hospital, Istanbul, Turkey were retrospectively reviewed and recorded. The data were taken from the computerized hospital database, patient files, and phone calls. Demographic data (age and gender), the length of time from the onset of symptoms to hospital admission, comorbidities (hypertension, diabetes mellitus, etc.), imaging tools (USG, CT), laboratory parameters, signs and symptoms, preference of surgery (laparoscopy/open), operation times, complicated or non-complicated cases, histopathological results, hospital stay times, postoperative complications, and mortalities were recorded.

Patients who underwent appendectomy for causes other than AA, ones with incidental appendectomies, and/or being lack of data were excluded from the study. All the data of 83 patients were recorded and descriptive statistical analytic data were obtained. All operations had been performed by six experienced general surgeons of our clinic. These patients were also divided into two groups as Group 1: Laparoscopic appendectomy (LA) (Group 1, n=18) and Group 2: Ones operated with open appendectomy (Group 2, n=61). Operation times, histopathologic results, and hospital stay times of the groups were also analyzed. The patients were also grouped according to the final histopathological results and mean hospital stay times and per-operative findings of appendicitis according to the time of operation were obtained.

The study was carried out according to the principles of the Helsinki Declaration. All the patients were routinely informed about the procedure and provided their written and informed consent. The Ethics Committee approved this study (App. No: KAEK/2019.06.145).

Intravenous antibiotics prophylaxis was commenced at the time of the diagnosis of AA. Operative time was noted as the time elapsed between first incision and last suturing. Simple appendicitis cases did not receive post-operative antibiotics while 3–5 days of intravenous antibiotics were given for perforated appendicitis and additional post-discharge 7 days course of oral antibiotics was routinely prescribed. Operative time was noted as the time elapsed between the first incision and last suturing. Post-operative complications (e.g., wound infection (superficial or deep), wound dehiscence, evisceration, pelvic abscess, deep venous thrombosis, atelectasis, paralytic ileus, and incisional hernia) were recorded. For most of the patients, the primary admission diagnosis was

suspected in the emergency department by an emergency medicine physician and the diagnosis being subsequently confirmed by a senior surgeon.

Histopathological evaluation precisely confirmed the presence of perforation. The normal appendix in negative appendectomies was also confirmed by histopathological examination. The presence of neutrophils within the mucosal ulceration is defined as "simple AA." The presence of transmural inflammation with neutrophilic infiltrate of muscularis propria and intramural abscesses was called "the phlegmonous AA." "Gangrenous appendicitis" was reported when areas of necrosis were present.

Statistical Analysis

Statistical Package for the Social Sciences (SPSS software version16. Inc., Chicago, Illinois, USA) program was used for statistical analyses. Numerical variables are presented as the mean±standard deviation; categorical variables are presented as frequencies and percentages.

RESULTS

During the 52 months, a total of 2850 patients were operated on with the diagnosis of AA, and 562 patients age over 65 years with the complaint of abdominal pain were internalized in surgical wards for advanced diagnosis and treatment. Among them, 83 (2.9%) patients underwent appendectomy with the diagnosis of AA were extracted and analyzed. The median follow-up of these patients undergoing appendectomy was 18 months (range: 9–24). Of all the total 83 elderly patients, 47 (57%) were female and 36 (43%) were male. The mean age was 70.5±6.36 years (Table 1). The ages of the patients were between 65–70 in 25%, 71–79 in 58%, and 80–89 in the remaining 17%. As shown in Table 2, the most common comorbidities were hypertension 43%, diabetes 17%, and 10% coronary artery disease, respectively. Twenty-eight (35%) patients had more than one illness.

The mean duration of symptoms of cases was 9±3 days and the median time from the onset of symptoms to hospital admission was 5 days, nearly 55% of the patients. Clinically, the right iliac fossa pain and diffuse abdominal pain were detected in 47 (57%) and 12 (15%) of patients, respectively. All patients with diffuse abdominal pain had purulent intra-abdominal free fluid. Twenty patients had paracecal, periappendicular or pelvic abscesses. At the time of admission, laboratory findings revealed leukocytosis in 48 (58%), left shift (NE%) in 51 (61%), and 38 (46%) of patients had fever (>38°C) (Table 1). USG was the first imaging modality preferred in all 77 (93%) patients, and CT was preferred in selected cases as 17 (20%) of all cases, 11 (16%) of those patients with atypical presentations whose prediagnoses were acute diverticulitis and malignancies, CT was used as an additional imaging modality. Although we did not calculate the specificity and

Table 1. Demographics and parameters of patients

Variables	n	%	Mean±SD
Median follow-up			18 month
Age (years)			70.5±6.36
Gender			
Male	36	43	
Female	47	57	
Operation			
Laparoscopy	18	22	
Open	61	73	
Conversion to open	4	5	
Incisions			
Paramedian incision	4	6	
Midline incision	3	4	
Mc Burney incision	59	90	
Diagnostic tools			
Ultrasonography	77	93	
Computed tomography	17	20	
Perforated appendicitis	37	45	
Symptoms and signs			
Migrating pain	34	41	
Right iliac fossa pain	47	57	
Diffuse abdominal pain	12	15	
Nausea and vomiting	37	45	
Anorexia	40	48	
Rebound tenderness	46	55	
Fever >38°C	38	46	
Leukocytosis	48	58	
Left shift	51	61	
Mean Hospital stay (days)			
Inflamed appendicitis			2.1±0.77
Gangrenous appendicitis			4.2±1.77
Perforated appendicitis			8±1.2
Laparoscopic appendectomy			3.1±0.9
Open appendectomy			7.2±2.1
Mean operation time (minutes)			
Laparoscopic appendectomy			53.67±15.63
Open appendectomy			50±13.45
Mortality	3	4	

Data are stated as mean Standard deviation (mean±SD) or patient number and percentage (n, %)

Table 2. Comorbidities

Comorbidities	n	%
Hypertension	36	43
Diabetes mellitus	14	17
Coronary artery disease	9	10
COPD	6	7
CHF	6	7
Atrial Fibrillation	4	5
Renal diseases	4	5
Hyperlipidemia	4	5
Alzeimer	3	3

n: Number of patients; %: Percentage; COPD: Chronic obstructive pulmonary disease; CHF: Congestive heart failure

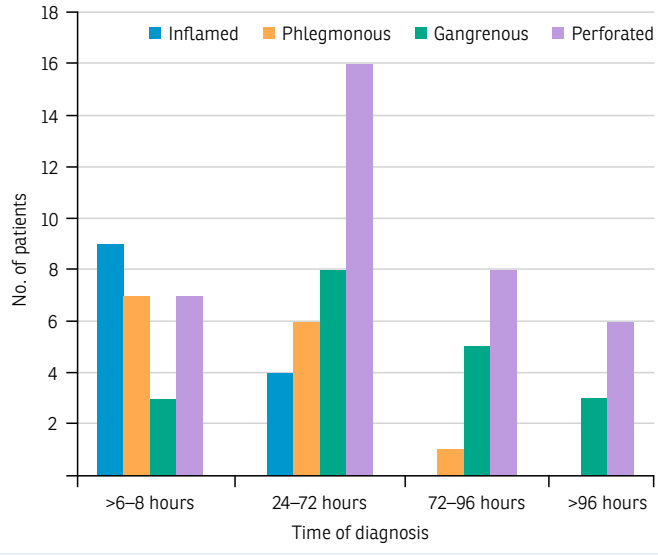

Figure 1. Histopathologic results according to the time of operation

sensitivity of each diagnostic modalities, we found that there were no false-positive results when CT was used (Table 1).

Twenty-six (31%) cases with classical signs and symptoms of AA were operated on within 6–8 h of admission, while 34 (41%) were operated on 24–72 h after detailed laboratory results and repeated examination by surgical consultants. Fourteen (17%) patients were operated on 3–4 days and 9 (11%) were operated on days 5 and 6 of admission. Histopathologically proven appendiceal perforation was detected in 37 (45%) patients. The length of time from the onset of first symptoms to hospital admission of perforated cases was 7–9 days. Among 83 cases, 13 (16%) had acutely inflamed appendix, 14 (17%) had phlegmonous appendicitis, and 19 (23%) had gangrenous appendicitis. Histopathological results according to the time of operation were shown in Figure 1.

Table 3. Post-operative complications

Complications	n	%
Surgical site infection	20	23
Superficial	15	19
Deep	5	4
Wound dehiscence	4	6
Sepsis	3	6
Evisceration	3	4
Pelvic abscess	2	3
Deep venous thrombosis	3	4
Atelectasis	3	4
Paralytic ileus	3	4
Incisional hernia	2	3

Several complications occurred in 32 (39%) patients after surgery. In our study group, several complications were encountered as summarized in Table 3, surgical site infection in 20 (23%) patients, wound dehiscence in 4 (6%), deep venous thrombosis in 3 (4%), paralytic ileus in 3 (4%) cases. Mortality was detected in three cases who had perforated appendicitis and operated 8–9 days after the onset of symptoms. The reason for death was multiorgan failure and sepsis on the 7th–9th day of operation in two cases and sudden cardiac arrest on the 3rd day of surgery in the remaining one.

Hospital stay time in patients with inflamed AA was 2.1±0.77 days, whereas it was 4.2±1.77 days in cases with gangrenous AA and 8±1.2 days in cases with perforated appendicitis (Table 1). Post-operative complications, treatment of comorbidities, and the presence of perforation were determinants of length of hospital stay time.

LA was performed in 18 (22%). Mean operation time was 53.67±15.63 min in laparoscopic cases and 50±13.45 min in open appendectomies. Mean hospital stay time was 3.1±0.9 days in LA group and 7.2±2.1 days in open appendectomy cases (Table 1). However, the patients in both group were heterogenous that more complicated cases were operated in open technique. Conversion from laparoscopic to open surgery was needed in four cases and the reasons for conversion were severe pericecal inflammation and adhesions and inability to visualize the appendix. An open appendectomy was performed in 61 (73%) patients. Incisions used in open surgery were Mc Burney in 59 (91%), right paramedian in 4 (6%), and midline incision in 2 (3%) cases (Table 1).

DISCUSSION

As global aging of the population, the elderly population is increasing rapidly.[9] In Turkey, according to the data of the Turkish Statistical Institute, in 2006, elderly population (age over 65) rate in the general population was 11.8% and by the 2021, it is expected to be 15.4%.[10] As a parallel to this increase, the rate of admission to the emergency room, and AA is expected to be increased in the future.[11] In our study, of the 562 elderly patients admitted to the general surgery clinic with the suspicion of an acute abdomen, 14.7% were operated on with the diagnosis of AA. The rate of AA was detected high in our patient group.

The diagnosis of AA is difficult in elderly patients due to unclear clinical presentation, late seeking care, wide differential diagnosis, and difficulty in communication resulting in higher perforation and complication rates.[12] In the literature, the rate of perforation was reported to be around 18% in the general population while it was up to 55% in the elderly increasing even higher age over 80 years. In our study, the rate of perforation and morbidity was 45% (n=37) and 39% (n=32), respectively. Mortality was detected in 3 (4%) cases. The mean duration of symptoms of cases was 9±3 days and the median time from the onset of symptoms to hospital admission was 5 days in 55% of all cases.

Some authors reported that a typical clinic of AA as the triad of the right lower abdominal pain and tenderness, fever, and leukocytosis was reported to be found in <26% of the elderly.[13,14] Many elderly patients with AA have signs and symptoms consistent with ileus or bowel obstruction.[15,16] The rate of presence of fever was reported in ranges from 30% to 80%.[15–17] However, only a minority of the patients have all of the typical signs and symptoms together.[16] In this study, 41% of the patients (34 patients) had pain moving to the right lower quadrant while 45% of patients (37 patients) had nausea and vomiting. Forty-seven (57%) patients had the right lower quadrant pain and only 12 patients had diffuse abdominal pain. About 46% of the patients had fever (>38°C). Laboratory results revealed leukocytosis in 58% of the patients and the left shift in neutrophil count was detected in 61%. Twenty-six (31%) cases had a classical triad of AA and were operated on within 6–8 h of admission.

It is reported that in the general population, the overall rate of perforated appendicitis is 24.8%, mortality and morbidity increase with the presence of perforation up to 1–2% and 9%, respectively.[18] The delayed and atypical presentation, delay in diagnosis and surgical intervention, presence of comorbidities, and the age-specific physiological changes were postulated to be the reasons for high perforation rates.[19] At present, no clear criteria defining the perforation risk related to AA in elderly patients, while caution should be taken in the presence of sustained abdominal pain, fever over 38°C, and leukocytosis.[20] Moreover, hospital stay is generally longer in elderly patients. This is generally caused by high complication rates, the need for a long antibiotic treatment, treatment of other comorbidities, and communication difficulties.[21] In our study, the perforation and morbidity rates were 45% and 39%, respectively, and mortality was detected in 3 (4%) perforated AA cases. Sepsis-related multiorgan failure and sudden cardiac arrest were the reasons for death. The length of time from the onset of first symptoms to hospital admission was 7–9 days in perforated cases. The most important reasons for morbidity were likely to be delay in hospital admission and atypical clinical findings of the studied cohort. In our study cohort, hospital stay time was longer in patients with appendiceal perforation and post-operative complications. We also detected that as the inflammatory process of AA increased, the length of hospital stay was also increased.

The extensive usage and advances of imaging modalities such as CT scan and USG have increased the rate of correct diagnosis in elderly patients with suspected AA.[13] Selective usage of CT scans was shown to increase the diagnostic accuracy and decrease negative laparotomy rates in patients with suspected AA.[22] The present studies reported the sensitivity of 90–98% in elderly patients.[13] Storm-Dickerson et al.[23] reported that earlier use of CT decreased the incidence of perforation from 72% to 51% in the past 20 years. In our practice, clinical assessment was the first diagnostic modality and because of availability, USG was also performed in nearly all patients. Eight patients with atypical clinical presentations whose prediagnoses were considered to be colon perforation, acute diverticulitis, and sigmoid colon tumor, additionally underwent an abdominal CT scan. CT scan was only used in selected 17 (20%) cases in whom the diagnosis was not reached after repeated clinical examination and USG. Since only the positive cases were evaluated in this study, the sensitivity and specificity of USG and CT were not calculated. However, we did not detect any false-positive results with a CT scan.

According to a recent review published in the New Engl J Med by Flum,[24] AA should be considered the first-line therapy in uncomplicated AA and recommended to the patient, but in those who have strong preferences for avoiding appendectomy or with serious comorbid diseases, it is recommended to treat with antibiotics first NOM. At present, it is also stated that when the technical skills and equipments are enough,

LA has become the recommended approach to AA; guidelines for adult patients recommend laparoscopic surgery in all cases, even in case of perforated AA.[25] Ward et al.[26] in their retrospective study analyzing 247,367 appendectomies over age 65 years in the USA from 1997 to 2008: They found a decreased mortality, hospital stay time, and post-operative complication rate in patients operated on with LA. In our study, NOM was not preferred in any case. LA was preferred in 22% of all cases. The primary intension of the laparoscopy was diagnostic in 11 cases and patients were found to suffer from AA, so appendectomy performed laparoscopically. The mean operation time was found to be higher in LA when compared with open ones (53.67±15.63 min. vs. 50±13.45 min.), mean hospital stay time was 3.1±0.9 days in LA and 7.2±2 days open cases. All the mortalities, the wound infections (deep and superficial), wound dehiscence, and incisional hernia were detected in open cases. Hence, we think when technical skill of surgical team and equipment is available, LA should be applied for benefits as exploring the entire abdomen for other organ pathologies and aiding diagnosis as well as providing an opportunity for definitive treatment.

Our study has some limitations as its retrospective design and relatively small sample size. Large prospective multicentric studies are needed to support and check the accuracy of our findings.

CONCLUSION

As the global aging, more elderly patients with AA will be encountered in the future. Rates of perforation, mortality, and morbidity may be high due to atypical clinical findings, communication problems, and delays in hospital admission. Early diagnosis and surgical referrals are mandatory to decrease the risk of perforation and prevent possible mortality and morbidity. LA was safe and feasible in our study group.

Disclosures

Ethics Committee Approval: The study was approved by The Kanuni Sultan Süleyman Training and Research Hospital Ethics Committee (No: KAEK/2019.06.145, Date: 06/08/2019).

Informed Consent: Written informed consent was obtained from all patients.

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