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RESEARCH

## HAS THERE BEEN ANY CHANGE IN THE PAST 40 YEARS IN ACUTE APPENDICITIS AMONG GERIATRIC PATIENTS?

### ABSTRACT

**Introduction:** The proportion of elderly is increasing steadily in the world's population. Concurrently, the number of elderly patients undergoing surgery for acute appendicitis has also increased. Despite the improvements in medical care, the morbidity and mortality rates remain high. We analyzed the records from the past 40 years to determine if there has been any change in the proportion and/or complications of acute appendicitis in geriatric patients.

**Materials and Method:** We reviewed the operating room and histopathologic records of patients who were operated on for acute appendicitis during the last 40 years (1973-2012). Patients, aged 65 and older were classified as geriatric.

**Results:** In total, records for 3229 patients were analyzed. The mean age was 30.06±13.42, 63.5% of whom were male. A total of 120 (3.71%) patients were 65 years of age or older, with an average of 67.88±3.76 years, and 63.3% of these patients were male. The complicated appendicitis ratio was 55/120 (45.83%) in the elderly. The proportion of the elderly patients has increased gradually from 0.74% to 8.08% by decades.

**Conclusion:** The ratio of complicated appendicitis among aged patients still remains high and nothing has changed in last 40 years in our country as in whole world.

**Key Words:** Appendicitis; Geriatric Assessment; Abdomen, Acute; Aged.



ARAŞTIRMA

## YAŞLI HASTALARDA GÖRÜLEN AKUT APANDİSİTTE SON 40 YILDA BİR ŞEY DEĞİŞTİ Mİ?

### Öz

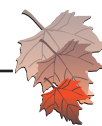
**Giriş:** Toplumda yaşlı nüfus oranı gittikçe artmaktadır. Buna bağlı olarak akut apandisit nedeni ile ameliyat olan yaşlı insan sayısı da artmaktadır. Tıptaki ilerlemelere rağmen morbidite ve mortalite oranları hala yüksektir. Bu tanı ile ameliyat olan yaşlı hasta grubundaki oran ve komplikasyon oranında bir değişiklik olup olmadığını görmek için hastanemiz kayıtlarının son 40 yılını taradık.

**Gereç ve Yöntem:** Hastanemiz ameliyathane ve patoloji rapor kayıtları geriye dönük olarak (1973-2012 periyodu) tarandı. Altmış beş yaş ve daha yaşlı olan hastalar geriatric hasta olarak tanımlandı.

**Bulgular:** Toplam 3229 hasta analiz edildi. Hastaların ortalama yaşı 30.06±13.42 idi ve hastaların %63.5'i erkek idi. Bu hastaların 120'si yaşlı grubuna giriyordu (%3.71) ve ortalama yaşları 67.88±3.76 olup %63.3'ü erkekti. On yıllık periyodlara göre yaşlı hasta oranları yeniden hesaplandığında bu oranın %8.08'e kadar yükseldiği görüldü.

**Sonuç:** Yaşlı hasta grubunda komplike apandisit oranı hala yüksek seyretmekte. Son 40 yıl içinde bu konuda bütün dünyada olduğu gibi ülkemizde de bir değişiklik olmadı.

**Anahtar Sözcükler:** Apandisit, Geriatric Değerlendirme; Akut Karın; Yaşlı.



## INTRODUCTION

Acute appendicitis is one of the most common causes for performing surgical operations globally. The lifetime occurrence of this procedure is approximately 7%, with perforation rates of 17 to 20% (1). The mortality risk is less than 1% in the general population, but this number can rise to 50% among the elderly population (2,3). According to common knowledge, acute appendicitis is the cause of acute abdominal pain among a young population with a peak incidence in the second and third decades of life. By virtue of socioeconomic developments and medical achievements, the proportion of the elderly population is steadily increasing. In Turkey, the proportion of aged people (>65 years of age) was less than 5% in the beginning of the 2000s, but it is expected to rise to 9 or 10% by 2025 (4). As the population ages, it would be expected that the number of elderly patients requiring common surgical procedures would also increase. Accordingly, the prevalence of appendicitis among the geriatric population is also expected to increase. Since morbidity and mortality of acute appendicitis is higher among older patients it could easily be expected that this condition is a candidate for complicated medical problems both for surgeons and aged patients. The aim of this retrospective study is to find out that if there was a change in proportion of acute appendicitis among aged population and complication rates of this entity and compare the global results with the ones in Turkey.

## MATERIALS AND METHOD

Our study was planned in first division of department of surgery at Diskapi Yildirim Beyazit Teaching and Research Hospital upon the permission obtained from the local ethic committee with the number of 07/58 on 18.02.2013. We reviewed the operative records from 1973 to 2012 in our department in order to determine those patients who were operated on for treatment of acute appendicitis. Our review consisted of patients who underwent operations after a preoperative diagnosis of acute appendicitis. Information on these patients was obtained from operative records and final pathology results. In addition, the patient's age and sex were recorded. The final diagnosis of acute appendicitis was accomplished by operative findings and mainly by histopathologic examination. Complicated appendicitis was defined by operative findings of macroscopic perforation and purulent discharge from the appendix, abscess formation in the abdomen

without any perforation, and the presence of a plastron formation. To stratify age we divided the patients into two groups: non-geriatric (G1) (<65 years of age) and geriatric (G2) ( $\geq 65$  years of age). For further analysis, G2 was divided into four groups according to time periods (decades). Only the records of patients whose preoperative diagnosis had been confirmed by final histopathologic examination were analyzed in this study.

Statistical analysis was done by SPSS 17.0. All of the data were based on nonparametric frequency distributions and were analyzed by chi-square analysis. When the p-value was less than 0.05, the result was considered to be statistically significant.

## RESULTS

In last 40 years, totally 41678 patients were operated for any surgical disease. 5997 patients of these were in geriatric age group (14.3%). Among 5997 patients 1093 (18.2%) were operated for the pre-operative diagnosis of any kind of acute abdomen and 120 (10.9%) of these had the final diagnosis of acute appendicitis. A total of 4890 patients with a preoperative diagnosis of acute appendicitis were operated on. The patients with an intraoperative diagnosis other than acute appendicitis (such as diverticulitis, mesenteric torsion and infarct) and the ones whose histopathologic examination reports conforming to acute appendicitis were missing from their patients' records were excluded from the study. Only 3229 patients were diagnosed with acute appendicitis and met the inclusion criteria. The mean age was  $30.06 \pm 13.42$  and 63.5% of these patients were male. A total of 120 (3.71%) patients were 65 years of age or older, with an average age of  $67.88 \pm 3.76$  years; 63.3% of these patients were male. The complicated appendicitis ratio was 55/120 (45.83%) in the G2 Group. This ratio was 615/3109 (19.78%) in Group 1. We performed an analysis according to the decades to see if there were any changes in the numbers of appendicitis cases and complications by time in geriatric group (Table 1). There was a significant rise in total number of geriatric patients between first and second decades ( $p=0.028$ ), but same difference was not present when ratios of complicated appendicitis were compared ( $p=0.052$ ). Between second and third decades, there was no significant difference in total number of patients ( $p=0.08$ ), but there was somewhat significant difference between complication ratios ( $p=0.048$ ). In last decade, there was a significant rise in total number of

**Table 1**— Comparison of Geriatric Appendicitis

Time Intervals	Geriatric Patients	p value	Complicated Geriatric Patients (%)	p value
1973-1982	9	<0.05	3/9 (33.3)	>0.05
1983-1992	21		10/21 (47.6)	
1993-2002	34	<0.05	21/34 (61.7)	>0.05
2003-2012	56		21/56 (37.5)	
<b>Total</b>	<b>120</b>		<b>55/120 (45.8)</b>	

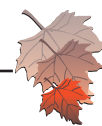
patients ( $p=0.02$ ) according to the third decade, but complication ratios were not different ( $p=1$ ).

## DISCUSSION

Appendicitis is one of the most common diseases. It causes acute abdominal pain and requires surgery. By virtue of socioeconomic developments, the proportion of elderly people in the total population is steadily increasing, and accordingly, the prevalence of appendicitis among geriatric patients is also expected to increase (5). The proportion of this age group is also increasing in Turkey (4). Acute appendicitis is generally considered a disease of the younger population, with a peak incidence in the second and third decades of life (6). However, acute appendicitis can affect all age groups (6,7). In our study, we noticed an increased number of cases in elderly patients. In total, only 0.37% of patients were in the geriatric (G2) group. This number is very low when compared with the reported percentages of 5-10% in the literature (8,9). However, when a sub-group analysis is done according to consecutive decades, it is very clear that there is a statistically significant rise in percentages of acute appendicitis among the geriatric age group. From 2003 to 2012 this percentage was 8.08%, which is very similar to the global reports but higher than the other Turkish study by Durukan et al (10). In geriatric age group, acute appendicitis was the cause of acute abdomen and emergent operation in 10.9% of the patients. Older patients have more complicated appendicitis and more frequently underwent complex procedures, consistent with the findings of other authors (11). The classic symptoms of acute appendicitis are seldom seen in the elderly patient. More subtle symptoms and the more virulent pathologic course allow the disease to progress rapidly and insidiously (12). This leads to delayed hospitalization, diagnosis and treatment. The high incidence of concomitant diseases and the multiplicity of differential diagnostic possibilities in this

age group are also factors. With aging, atherosclerosis affects the blood supply of the appendix. The wall of the appendix is weakened by fibrosis and fatty infiltration. Thus, these changes may predispose the appendix to perforate even with a mild increase in luminal pressure during the early phase of appendicitis (13). In addition, symptoms of older patients are ambiguous because reduced immune function causes unsatisfactory development of fever and an increase in the number of leukocytes (14,15). Abdominal muscular atrophy results in reduced rebound tenderness, and aging may also cause changes in neural responses due to an increased pain threshold and abnormal sensations (5). All of these factors make it difficult to determine the correct diagnosis of acute appendicitis in the geriatric age group and cause some delays for surgical intervention. According to Owens and Hamit, when the elapsed time from the onset of symptoms to surgery was prolonged, the appendix perforation rate increased (14). This finding was also supported by Lau et al (15). In a study conducted by Moon et al, it was reported that as age increases, age, itself, becomes a more important factor than total time elapsed for increased perforation rate (5). All of these factors make contributions to the presence of complications in acute appendicitis. In 1946, Simpson reported that mortality of acute appendicitis in the elderly was 16%-54% (16). Despite improvements in medicine, it seems that nothing had changed over last 70 years. The reported mortality and morbidity rates in the elderly remain high at 25-32% mortality and 48% morbidity (2,3). This somewhat constant mortality rate, most probably, is because of delay in diagnosis and existence of the co-morbidities. Late presentation, delayed diagnosis, presence of perforation and co-morbidities are still associated with poor outcome from surgery. Despite presence of sophisticated imaging techniques, it seems that most important factor to prevent this poor outcome is calling this diagnosis in mind while examining an aged patient with abdominal pain. In our retrospective analysis we recorded very high complication rates, up to 61.7%, among the geriatric group of patients. In total, the complication rate of acute appendicitis in the geriatric age group was 45.8%, but in the non-geriatric group, this number was only 19.78%. This difference is statistically significant ( $p<0.005$ ). In this study, data was mainly obtained from operating room records and histopathologic examination reports. About half of the medical reports of the patients from 1973 to 1992 were missing, so we could not give an accurate morbidity and mortality ratios.

In the last 40 years, total number of geriatric acute appendicitis patients is increasing steadily. This constant increase



can be explained by parallel increase in population and increase in life expectancy. It seems that, despite improvements in imaging techniques and patient management complicated appendicitis ratio remains constant in this age group. This may be due to surgeons' behavior of trying to find out more sophisticated diagnosis when they met an old aged patient complaining abdominal pain.

In conclusion, despite improvements in medical care, acute appendicitis has a high morbidity and mortality rate globally. The proportion of older patients in populations is steadily increasing. Therefore, so is the number of older patients requiring surgical procedures such as appendectomies. As the number of geriatric patients continues to increase, surgeons will likely see an increasing number of cases of acute appendicitis in elderly patients, associated with more complicated appendicitis and more complicated care. In last 40 years nothing has changed in complicated appendicitis in aged patients. It seems that to improve this, this simple diagnosis must be kept in mind while examining an aged patient with abdominal pain.

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