




# Causes of acute abdomen, preferred imaging methods, and prognoses in geriatric patients presenting to the emergency department with abdominal pain

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## SUMMARY

**OBJECTIVE:** Abdominal pain is one of the most common reasons for admission to the emergency department in the geriatric population. The aim of this study was to investigate the diseases frequently detected in elderly patients diagnosed with acute abdomen in the emergency department, the imaging methods used in the diagnostic processes of these diseases, and the prognosis of the patients.

**METHODS:** In all, 175 patients who visited the emergency department due to abdominal pain and were hospitalized with a diagnosis of acute abdomen were evaluated. The patients were categorized into seven groups according to their diagnosis as biliary diseases, pancreatitis, appendicitis, gastrointestinal system perforation, ileus, mesenteric ischemia, and atypical causes.

**RESULTS:** The mean age of the patients was  $76.3 \pm 7.7$  years (range 65–93), and 96 (54.9%) were women. The most common causes of acute abdomen were biliary diseases and pancreatitis. Ultrasonography (88.6%) was the most frequently preferred imaging method in the emergency department, and it was most frequently used for biliary diseases. Notably, 20 (11.4%) patients were treated in the intensive care unit, and 9 (5.1%) patients died.

**CONCLUSION:** The most common causes of acute abdomen in the geriatric population were biliary diseases and pancreatitis, and ultrasonography imaging was the most common choice for the diagnosis of these diseases. In elderly patients with abdominal pain, rapid and accurate diagnosis and selection of the correct imaging method are extremely important.

**KEYWORDS:** Acute abdomen. Aged. Radiological imaging.

## INTRODUCTION

Acute abdominal pain is one of the most common reasons for admission to the emergency department in the geriatric population<sup>1</sup>. With the increase in the elderly population, elderly patients constitute an increasing proportion of patients presenting to the emergency department due to acute abdominal pain<sup>2</sup>. However, this situation causes additional difficulties for emergency physicians. In an elderly patient with abdominal pain, the clinical manifestations may be very different and nonspecific<sup>3</sup>.

However, the diagnosis may be difficult or delayed in elderly patients due to the different manifestations of the disease, cognitive problems, and communication difficulties, which may increase overall mortality. Therefore, the early and accurate diagnosis of acute abdomen in elderly patients is critical and significantly affects the outcomes of these patients.

The aim of this study was to investigate the diseases frequently detected in elderly patients diagnosed with acute abdomen in

the emergency department, the imaging methods used for the diagnosis, and the prognosis of the patients.

## METHODS

This retrospective study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Malatya Turgut Özal University Clinic Ethics Committee (2021, decision no. 83).

All patients aged 65 years and older who were diagnosed with acute abdomen and hospitalized in the Malatya Training and Research Hospital emergency department between June 1, 2021, and January 31, 2022, were included in the study. The number of patients diagnosed with acute abdomen was 175. No patient was excluded from the study for any reason. The images and reports of radiological examinations, reasons for hospitalization, treatments applied, length of hospital stay, and patient outcomes hospitalized in the emergency room were retrieved from the

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hospital data processing system. Ultrasonography (USG) and computed tomography (CT) reports of the patients that were previously recorded in the hospital data processing system were used in the evaluation. Direct abdominal radiographs (DAR) were retrieved from the hospital imaging archive system and evaluated retrospectively by a radiologist. The patients were categorized into seven groups according to their diagnosis as biliary causes (acute cholecystitis, cholangitis, etc.), pancreatitis, appendicitis, gastrointestinal system (GIS) perforation, ileus, mesenteric ischemia, and atypical causes (pyelonephritis, malignant causes, etc.).

### Statistical Analysis

IBM SPSS Statistics for Windows version 22.0 (IBM Corp., Armonk, NY, USA) was used to analyze the data. Descriptive statistics were expressed as mean±standard deviation and minimum-maximum values for continuous variables depending on their distribution. The chi-square test was performed to evaluate the relationship between the diagnosis groups, demographic data, and radiological examinations. The significance level (p-value) was set at 0.05.

## RESULTS

A total of 175 patients aged ≥65 years who were diagnosed with acute abdomen were included in the study. The mean age of the patients was 76.3±7.7 years (range 65–93 years), and 96 (54.9%) were women.

Biliary diseases were the most common cause of acute abdomen (65 patients, 37.1%). Other causes were pancreatitis in 50 (28.6%) patients, atypical causes in 24 (13.7%) patients, and appendicitis in 12 (6.9%) patients. In all, 129 (73.7%) patients had at least one chronic disease. The most common chronic disease detected in the patients was hypertension, followed by diabetes mellitus. The hospitalization period of the patients ranged between 1 and 34 days, and the average hospitalization period was 5.6±4.7 days. Notably, 20 (11.4%) patients were treated in the intensive care unit, and 9 (5.1%) patients died. GIS perforation, in which 4 out of 8 patients died, had the highest mortality rate (50%). The demographic characteristics and diagnosis groups of the patients are shown in Table 1.

As radiological imaging in the emergency department, USG was performed on 155 (88.6%) patients, DAR on 90 (51.4%) patients, and CT on 69 (39.4%) patients. Magnetic resonance imaging (MRI) was not performed on any patient in the emergency department. However, magnetic resonance cholangiopancreatography (MRCP) was performed on seven patients during their hospitalization.

The most common examination was USG, which was performed on 155 (88.6%) patients. DAR was the second most common examination with 51.4%, and CT (39.4%) was the least common examination. When examination modalities were investigated according to the diagnosis groups, DAR was the most frequently used modality in patients with ileus and the least frequently used modality in those with biliary diseases. USG was most frequently performed in biliary pathologies and pancreatitis and least in ileus. CT was performed most frequently in patients with appendicitis and GIS perforation and least frequently in those with biliary diseases and pancreatitis (Figure 1). A significant difference was found in the presence or absence of DAR, USG, and CT examination according to the diagnosis group (p=0.002, p<0.001, and p<0.001, respectively). The percentage distribution and p-values of the examinations are presented in Table 2.

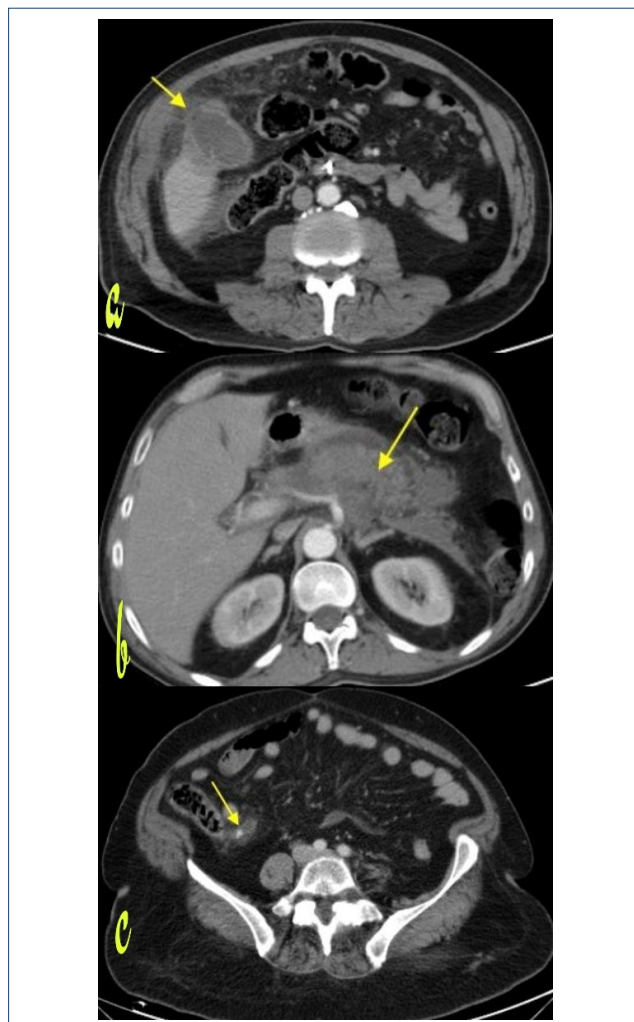
## DISCUSSION

Currently, imaging modalities have become an important diagnostic tool for acute abdomen in the elderly, and CT is the most commonly used method<sup>4</sup>. CT may be considered the primary technique for the diagnosis of acute abdominal pain, except in patients with clinically suspected acute cholecystitis<sup>5</sup>. Intravenous contrast-enhanced CT provides superior anatomical detail and diagnostic

**Table 1.** Percent distribution of patients' demographic characteristics, prognostic status, and diagnosis groups.

	n (%)
Female	96 (54.9)
Male	79 (45.1)
No chronic diseases	46 (26.3)
One chronic disease	72 (41.1)
More than one chronic disease	57 (32.6)
Hospital ward	155 (88.6)
Intensive care unit	20 (11.4)
Discharged	166 (94.9)
Exitus	9 (5.1)
Biliary disease	65 (37.1)
Pancreatitis	50 (28.6)
Appendicitis	12 (6.9)
Ileus	14 (8.0)
GIS perforation	8 (4.6)
Mesenteric ischemia	2 (1.1)
Atypical causes	24 (13.7)

n: number of patients; GIS: gastrointestinal system.



**Figure 1.** Computed tomography images of the patients with gallbladder perforation showing irregularity in the wall of the sac and adjacent fat stranding (a); with pancreatitis showing an increase in thickness and adjacent fat stranding (b); and with appendicitis showing an increase in the diameter, edema in the wall, intraluminal appendicoliths, and adjacent fat stranding (c).

specificity by imaging the intestinal wall, detecting primary and secondary pathologies in the surrounding mesentery, and even showing small amounts of intestinal ischemia and extraluminal air in the peritoneal cavity<sup>6</sup>. CT not only supports the diagnosis but also provides information about the treatment method to be chosen<sup>7</sup>. In a prospective study by Esses et al.<sup>8</sup>, the proportion of cases in which physicians reported a high degree of certainty in the suspected diagnosis increased from 36% before CT to 77% after CT. In the study of Rosen et al.<sup>9</sup>, with patients admitted to the emergency department with nontraumatic abdominal pain, pre- and post-CT diagnoses were found to be compatible only in 37% of the patients. In addition, CT eliminated the need for hospitalization in 17% of patients and the need for emergency surgery in 75% of patients. In our study, CT examination was performed on 69 (39.4) patients. CT examination was performed on patients with the most common diagnoses of GIS perforation (87.5%), ileus (85.7%), and appendicitis (75.0%). All of these patients were definitively diagnosed with CT. Abdominal USG is the first method of choice, especially when evaluating biliary diseases, due to its accessibility and rapid results, low cost, and lack of ionizing radiation<sup>3</sup>. It has been reported that ultrasound has a sensitivity and specificity of over 70% in the diagnosis of appendicitis<sup>10</sup>. In addition, abdominal USG is an excellent rapid screening method for aortic aneurysm, liver tumor or abscess, kidney stones, and hydronephrosis. USG was performed in 88.6% of the patients in the present study. Although USG was preferred most frequently in patients with biliary pathology and pancreatitis, it was least commonly used for ileus. USG was sufficient for diagnosis in patients with biliary pathology.

Radiographic examination, including upright and supine abdominal and upright chest x-rays, is useful in detecting intestinal obstruction, adynamic ileus, kidney stones, and perforation of hollow organs. It is an easily accessible radiological

**Table 2.** Presence of DAR, USG, and CT examination according to the diagnosis group.

	DAR+ n (%)	USG+ n (%)	CT+ n (%)
Biliary (n=65)	25 (38.5)	65 (100)	14 (21.5)
Pancreatitis (n=50)	25 (50.0)	49 (98.0)	15 (30.0)
Appendicitis (n=12)	9 (75.0)	11 (91.7)	9 (75.0)
Ileus (n=14)	14 (100)	4 (28.6)	12 (85.7)
GIS perforation (n=8)	4 (50.0)	5 (62.5)	7 (87.5)
Mesenteric ischemia (n=2)	1 (50.0)	1 (50.0)	1 (50.0)
Atypical (n=24)	12 (50.0)	20 (83.3)	11 (45.8)
Total (n=175)	90 (51.4)	155 (88.6)	69 (39.4)
p-value	0.002	<0.001	<0.001

n: number of patients; GIS: gastrointestinal system; DAR: direct abdominal radiograph; USG: ultrasonography; CT: computed tomography. + indicates the presence of imaging method.

examination in the evaluation of patients with acute abdomen, but it has little place<sup>11</sup>.

Although MRI is used less frequently in the initial diagnosis<sup>5</sup>, today there are studies on its importance in the diagnosis of acute abdomen<sup>12,13</sup>. In this study, no patient underwent an MRI examination in the emergency department. MRCP was performed on 7 (4%) patients during the hospitalization period. The MRCP examinations of these patients did not contribute to the diagnosis.

In this study, the highest mortality rate was recorded in patients with GIS perforation. GIS perforation is an emergency and life-threatening condition that requires immediate intervention. Additional treatment strategies may be needed depending on the underlying causes<sup>14</sup>. On x-ray, a translucent crescent-shaped air under the diaphragm is the finding to be examined<sup>5</sup>. Currently, CT is the imaging method of choice in cases of suspected perforation. Extraluminal air that is too small to be detected with conventional radiography can be demonstrated with CT. CT also shows signs such as phlegmon, abscess, and the presence of fluid<sup>15</sup>. In addition, the location of the perforation can be determined using CT<sup>16</sup>. CT was performed in six and DAR in five of eight patients with GIS perforation in

the present study. X-ray detected subdiaphragmatic free air in two patients. Perforation and accompanying findings were reported in all CT examinations, but the location of the perforation was not specified.

## CONCLUSION

In this study, the most common causes of acute abdomen in the elderly were biliary diseases and pancreatitis. USG imaging was the most common choice in patients diagnosed with biliary diseases and pancreatitis, and CT was the most common choice in the diagnosis of appendicitis, ileus, and perforation. Considering that the diagnostic accuracy is lower and the mortality is higher in elderly patients with acute abdomen compared to younger patients, rapid and accurate diagnosis and choosing the correct imaging method are extremely important.

## AUTHORS' CONTRIBUTIONS

**MI, MA, ME:** Conceptualization, data curation, formal analysis, writing – original draft, writing – review & editing.

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