

## RETROSPECTIVE EVALUATION THE CONCORDANCE OF IMAGING MODALITIES IN PATIENTS ADMITTED TO THE EMERGENCY DEPARTMENT WITH ABDOMINAL PAIN

*Acil Servise Senkop Şikâyeti ile Başvuran Hastalarda 30 Günlük  
Mortalite ve Morbidite Değerlendirilmesi*

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### ABSTRACT

**Introduction:** In the present study, we aimed to evaluate concordance of imaging modalities of patients admitted to the emergency department (ED) with abdominal pain.

**Material and Methods:** The study was conducted between the dates 01.06.2014-31.05.2015 after the local ethical committee approval. Patients admitted to the ED, with abdominal pain, whose multiple imaging were done (abdominal ultrasonography; USG and computed tomography; CT) were screened for 1 year retrospectively. Data analysis was performed using SPSS 15.0.

**Results:** The study included a total of 413 patients of which 242 (58.6%) of women. The final diagnosis of the patients, 133 (32.2%) patients had nonspecific abdominal pain, the most commonly seen surgical diagnosis was acute appendicitis. When the sensitivities of USG and CT evaluated regarding the final diagnosis it was 38.9% and 86.1%, respectively for acute appendicitis, 0% and 30.4% respectively for acute pancreatitis, 65.4% and 98.1% respectively for ovarian pathology, 94.9% and 87.2% respectively for acute cholecystitis. There was detected concordance in 63.2% between USG and CT. While this rate was 61.7% among recent diagnosis with USG, for CT recent diagnoses it was found as 87.7%.

**Conclusion:** In conclusion, when final diagnoses are compared with imaging methods in patients with abdominal pain, CT seems superior to USG. Especially in clinics where USG cannot be performed for 24 hours like in our clinic, CT may be preferred as the first imaging method.

**Keywords:** Abdominal pain, computed tomography, emergency department, ultrasonography

### ÖZ

**Giriş:** Çalışmamızda, acil servise karın ağrısı nedeniyle başvuran hastaların görüntüleme yöntemleri uyumunun değerlendirilmesi amaçlanmıştır.

**Gereç ve Yöntem:** Çalışma lokal etik kurul onayı alındıktan sonra 01.06.2014-31.05.2015 tarihleri arasında retrospektif olarak yapıldı. Acil Tıp Kliniğine karın ağrısı nedeniyle başvuran, birden fazla görüntüleme yöntemi (Batın ultrasonografisi; USG) ve Bilgisayarlı tomografisi; BT) yapılmış hastalar 1 yıl geriye yönelik tarandı. Verilerin analizi SPSS 15.0 kullanılarak yapıldı.

**Bulgular:** Çalışmaya 242 (%58.6)'si kadın toplam 413 hasta dâhil edildi. Son tanılara bakıldığında, 133 (%32.2) hastanın son tanısı nonspesifik karın ağrısı, en sık görülen cerrahi tanı ise akut apandisit oldu. Son tanılara göre USG ve BT'nin duyarlılıkları değerlendirildiğinde, akut apandisit için USG %38.9, BT %86.1, akut pankreatit için USG %0, BT %30.4, over patolojisi için USG %65.4 BT %98.1, akut kolesistit için USG %94.9 BT %87.2 duyarlı bulundu. USG ile BT arasında %63.2 tanı uyumu saptandı. Bu oran USG ile son tanılar arasında %61.7 iken BT ile son tanılar arasında %87.7 olarak bulundu.

**Sonuç:** Sonuç olarak çalışmamızda karın ağrılı hastalarda görüntüleme yöntemleri son tanılarla karşılaştırıldığında BT, USG'ye kıyasla, daha üstün görünmektedir. Özellikle bizim kliniğimiz gibi 24 saat USG yapılamayan kliniklerde BT ilk görüntüleme yöntemi olarak tercih edilebilir.

**Anahtar Kelimeler:** Karın ağrısı, bilgisayarlı tomografi, acil servis, ultrasonografi



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## INTRODUCTION

Emergency Departments (ED) are units where health services are delivered to patients in an uninterrupted manner. Abdominal pain is a common cause to apply the ED and constitutes 5-8% of all ED applications (1). Acute abdominal pain is a non-traumatic evolving symptom that occurs during the course of disease of abdominal organs or organs outside the abdomen which lasts less than a week. Acute abdominal pain may be a sign of a medical or surgical emergency (2). Among the causes of application to ED's abdominal pain takes 6th place and the 4th most common cause of all medical emergencies (2).

Approach to patients with abdominal pain, although the history and physical examination is essential, abdominal pain is difficult to interpret clinically and laboratory results are often nonspecific. For verification of the diagnosis and treatment planning, imaging methods and relevant field consultations are needed. Radiography, ultrasonography (USG) and computed tomography (CT) are imaging methods which are often used in ED. Diagnosis and treatment of acute abdominal pain in the ED, despite all the technological advances, is still one of the important clinical problems.

This study aims to evaluate concordance of imaging modalities of patients admitted to the ED with abdominal pain.

## MATERIALS AND METHODS

The study was conducted retrospectively between the dates 01.06.2014-31.05.2015 after the local Ethical Committee approval (Kecioren Training and Research Hospital Ethical Committee 14.10.2015/914). Patients admitted to the ED, with abdominal pain, whose multiple imaging were made (abdominal USG and CT) were screened for 1 year retrospectively. Age, gender, demographics, physical examination, vital signs, laboratory tests, imaging methods and results,

requested consultations, duration of stay in the ED with the latest diagnostic and surgical procedures as well as the results were recorded in the study forms. In addition, concordance of diagnostic with imaging results and results of imaging methods, and final diagnoses of the patients were investigated.

Surgery and pathology diagnoses were considered for the patients included in the study with a final diagnosis of undergoing surgery. Non-surgery patients were called 1 week later and control imaging results, consultation diagnosis, and service admission diagnoses were obtained from information processing unit of hospital. The final diagnosis was determined by laboratory findings for hospitalized patients.

### Inclusion criteria

- Patients admitted to the ED with short-term abdominal pain less than one week
- Patients with abdominal CT and abdominal USG applied
- Patient with 18 age and older

### Exclusion criteria

- Patients whose information can not be reached
- Trauma Patients
- Patients with abdominal pain lasting more than 1 week
- Patients without abdominal CT or abdominal USG imaging
- Patients younger than 18 years of age
- Pregnant women
- Statistical analysis

Data analysis was performed by using SPSS software (version 15, Inc., Chicago, USA). The Shapiro-Wilk test was used to assess the normal distribution of the variables. Descriptive statistics were shown as mean  $\pm$  standard deviation or median (minimum-maximum), categorical variables were shown with the number of cases as (n) and (%). Categorical variables were assessed using Pearson's chi-square test. *p* value less than 0.05 was considered as statistically significant.

## RESULTS

The study included a total of 413 patients of which 242 (58.6%) of women. The mean age of the patients was found as 40. Most requested consultation was general surgery with 315 (76.3%) consultations. When evaluated the final diagnoses of the patients, the most

common diagnosis was nonspecific abdominal pain, the most common surgical diagnosis was acute appendicitis. The demographic characteristics of the patients are shown in Table 1.

**Table 1:** Demographic characteristics of patients

Sex (n %)	
Female	242 (58.6%)
Male	171 (41.4%)
Age [median (minimum-maximum)] (Year)	
	40 (18–100)
Duration of stay in emergency service [median (minimum-maximum)] (hour)	
	10 (3–70)
Vital Findings [median (minimum-maximum)]	
Systolic Blood Pressure (mmHg)	127 (70–170)
Diastolic Blood Pressure (mmHg)	80 (40–110)
Temperature (C°)	36.6 (35.4–38.9)
Final diagnosis of patients	
Nonspecific abdominal pain	133 (32,2%)
Acute appendicitis	72 (17.4%)
Over pathology	52 (12.6%)
Acute cholecystitis	39 (9.4%)
Renal pathology	20 (4.8%)
Mesenteric lymphadenopathy	32 (7.7%)
Acute pancreatitis	23 (5.6%)
Intestinal obstruction	13 (3.1%)
Other pathologies	29 (7%)
Consultations requested from patients [n (%)]	
General Surgery	315 (76.3%)
Gynecology	103 (24.9%)
Gastroenterology	65 (15.7%)
Urology	16 (3.9%)
Internal medicine	14 (3.4%)
BT Types [n (%)]	
Enhanced contrast	390 (94.4%)
Unenhanced contrast	23 (5.6%)
Emergency Outcome of Patients [n (%)]	
Discharge	206 (49.9%)
Surgery	105 (25.4%)
Hospitalization of Service	100 (24.2%)
Exitus	2 (0.5%)

CT: Computerized tomography

When USG and CT scan results of the patients are evaluated, pathology has been most reported acute appendicitis (12.1% and 17.9%, respectively) (Table 2). In our study, 105 (25.4%) surgical operations were applied. Operation diagnoses are shown in Table 3. According to the latest diagnostic USG and CT sensitivity was evaluated: it was 38.9% and 86.1%, respectively for acute appendicitis, 0% and 30.4%

respectively for acute pancreatitis, 65.4% and 98.1% respectively for ovarian pathology, 94.9% and 87.2% respectively for acute cholecystitis.

The compliance rate was 63.2% for USG and CT. CT recent diagnoses for CT was 87.7% while it was 61.7% for USG recent diagnosis, the compliance of final diagnoses of the patient table with diagnostic USG and CT diagnosis are shown in Table 4.

**Table 2:** Distribution of USG and CT diagnosis according to final diagnosis of patients

Final Diagnosis	USG		CT		p
	n	%	n	%	
Normal	115	86.5	122	91.7	0.711
Acute Appendicitis	39	54.2	8	11.1	0.004
Acute Pancreatitis	14	60.9	9	39.1	0.007
Over Pathology	13	25	1	1.9	0.424
Acute Cholecystitis	2	5.1	5	12.8	0.111
Mesenteric Lymphadenopathy	17	53.1	2	6.3	0.126

USG: Ultrasonography CT: Computerized tomography

**Table 3:** Surgical diagnosis of patients

Surgical Diagnosis	n	%
Normal	3	2.9
Acute appendicitis	72	68.6
Over Pathology	7	6.7
Acute cholecystitis	7	6.7
Acute pancreatitis	2	1.9
Intestinal Obstruction	5	4.8
Intestinal Perforation	3	2.9
Other	6	5.7
Total	105	100

**Table 4:** Concordance of final diagnosis of patients with USG and CT Diagnosis

	USG-CT		Final Diagnosis-CT		Final Diagnosis-USG	
	Concordance		Concordance		Concordance	
	n	%	n	%	n	%
Concordance	261	63.2	362	87.7	255	61.7
Discordance	152	36.8	51	12.3	158	38.3
Total	413	100	413	100	413	100

USG: Ultrasonography BT: Computerized tomography

## DISCUSSION

In this study where we compare the imaging of patients admitted to the emergency department because of abdominal pain to patient results, the recent diagnosis with USG and CT was consistent in 61.7% 87.7% of patients, respectively. CT results have a higher rate of compliance with the final diagnosis in comparison with USG in patients who applied to acute abdominal clinic.

Acute abdomen is a condition that should be evaluated together with clinical, physical examination and laboratory findings of the patient, consultation and imaging methods. USG and CT are used after clinics and laboratory tests to support diagnosis and to make differential diagnosis (3). The combination of the two methods improves the diagnostic accuracy (4).

USG, when compared to CT, is a noninvasive, fast, accessible and is relatively cheaper imaging. CT is often used in the evaluation of patients with acute abdominal pain with high diagnostic accuracy. As there are many diseases that can cause acute abdominal disease, in the failure of validation of suspected pre-diagnosis, to suggest an alternative diagnosis is an important advantage of CT. Rosen et al, in their study involving 536 patients, reported that CT reduced the rate of hospitalization from the ED by 17%. It also prevented unnecessary surgery in 62% of patients and in 13% surgical treatment was applied earlier (5). Rao et al suggested that CT reduced the duration of hospitalization and avoid unnecessary appendectomy and therefore reducing treatment costs (6).

In this study, surgery and pathology diagnosis in patients undergoing surgical diagnosis were accepted as final diagnosis. For other patient groups, clinical, laboratory, imaging findings and consultation of related consultation as a result of hospitalization notes led to final diagnosis. Accordingly, in this study, in 133 of 413 patients (32.2%) patients, no pathology was identified and they were discharged with nonspecific

abdominal pain. These 115 of these 133 patients, (86.5%) USG was reported as normal. When the final CT results of the patients with nonspecific abdominal pain were observed, 122 (91.7%) have been reported with normal CT. When surgical diagnosis was evaluated, 17.4% of all patients with acute appendicitis that we have included in our study, also in patients who underwent emergency surgery by 68.6% is the most common emergency surgical disease. As USG depends on the reliability of the performer in the diagnosis of appendicitis, its reliability ranges between 71-97%, the reliability of CT in the diagnosis of appendicitis is between 93-98% (7). However, our study findings are particularly did not coincide with the data for USG. In the study, we found that lower USG diagnostic rates compared to literature. Among the reasons is that our study is a retrospective study, do it may cause data loss. Secondly, our hospital performs USG only during certain time intervals. This may have an impact on our study results. Another reason may be due to the lack of communication in reporting the pre-diagnosis of patients between department of radiology and ED.

Excessive use of CT may cause loss of productivity, increased costs, contrast agent-induced complications and may cause an increase in radiation exposure. When too little used, it may lead to delay in diagnosis with increased morbidity and mortality (8). In the studies conducted accurate clinical information given before CT, it was seen that sensitivity and diagnostic accuracy rate would be increased (9).

In our study, we found that in 61.7% of patients, the USG diagnosis was concordance with the final diagnosis. In a study conducted by Nuran et al, have evaluated USG in diagnosis and treatment in patients with non-traumatic acute abdomen pain; they found that the first ultrasound diagnosis was concordance with the final diagnosis of 79.3% patients (10). In the study conducted by Siegel et al, this rate was 80.9%

(11). USG concordance is low when we compare it with the literature and this case in addition to the reasons mentioned above, the effects such as intense intestinal gas, obesity, failure to comply with fasting criteria and pain or patient mismatch which are related to the patient, as well as other factors such as trying to be complete the examination of ultrasound in emergency conditions in a shorter period. When CT concordance is assessed final diagnosis was consistent with 87.7% of patients diagnosed with CT. In the study conducted by Tsushima Y et al, that have found CT diagnosis compatible with the clinical final diagnosis of in 92.8% of patients (12). Our CT concordance was similar to the literature. We found CT results in patients presenting with abdominal pain in a higher rate of compliance with the final diagnosis in comparison with USG. Our findings were similar to the literature studies. In the study of Salem 60% of patients that CT examinations confirmed USG findings but did not give additional information, in 33% CT results not only confirmed the USG findings but at the same time gave additional information (13).

Our study is a single centered retrospective study. The small number of cases is also one of the limitations of our study. In our hospital, USG is made only during certain periods of time; USG can not be done in the evenings and weekends. Patients could not be taken in the study in this period. This may have an impact on our study results. There is also the possibility of incomplete or incorrect data available in our records in our retrospective study. In our study, radiation exposure, allergic contrast agents nephropathy, reactions due to CT could not be evaluated.

It is presented with a large number of patients with abdominal pain in the ED, which will be determined as acute abdominal pain and to reveal whether abdominal pain requiring emergency surgery, to make differential diagnosis is difficult, despite the use of many laboratory and imaging methods. In conclusion, in our study, when imaging methods are compared with a

final diagnosis of patients with abdominal pain, CT seems superior to USG. Especially in clinics where USG cannot be performed for 24 hours like in our clinic, CT may be preferred as the first imaging method. However, contrast agent-induced complications and radiation exposure should be considered.

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Conflict of interest; The authors declare that they have no conflict of interest.

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