

Ultrasonography in diagnosis of acute appendicitis



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PURPOSE: *Acute appendicitis is the most common surgical abdominal emergency. In the early diagnosis of acute appendicitis, the fact that there is no a sign which could be a reliable indicator in most of the patients increases the complications. In this study we aimed to search the relation between Ultrasonography(US) findings in patients with diagnosis of acute appendicitis and postoperative histopathologic investigation on removed appendix..*

MATERIALS AND METHODS: *The files of 174 patients who came in our emergency department with lower right abdominal pain were studied retrospectively from January 2013 to May 2014. Of them, 26 patients were excluded, because these patients were not studied with US. US findings and histopathology reports of 148 patients with suspected acute appendicitis and studies preoperatively with abdominal US were enrolled. Greater than 6-mm diameter of the appendix under compression was accepted as positive sign of appendicitis in US. The demographic characteristics of the patients, US findings (acute appendicitis or not) and the pathology results were recorded on the standard proform.*

RESULTS: *Of these 148 patients, 100 were acute appendicitis in preoperative US, and of these 100 patients, 93 histopathologic reports were acute appendicitis, 7 were normal appendices. The sensitivity of US was 75.6 % and specificity was 72 %. Positive predictive value (PPV) was 93 %, negative predictive value (NPV) was 14.6 % and the accuracy of US value was 81.7%. As a result, although US in diagnosis of acute appendicitis is a reliable technique, negative result doesn't mean no acute appendicitis. In order to determine an accurate diagnosis of acute appendicitis clinical and laboratory findings should be assessed together.*

KEY WORDS: Abdominal pain, Acute appendicitis, Ultrasonography

Introduction

Acute appendicitis is one of the most common surgical abdominal emergency. In western countries, approximately 8% of their population are operated because of acute

appendicitis in one stage of their lifetime. Today, complication of acute appendicitis and negative laparotomy rates still remain high, despite clinical, physical examination and other diagnostic methods. In patients with typical history of acute appendicitis, it is easier to make diagnosis. However, 20-33 % of patients have atypical clinic and laboratory findings ^{1,2}. Difficulty in diagnosis increases negative laparotomy and complication of acute appendicitis ^{3,4}. In these patients, when necessary, US, CT (Computed tomography), MRI (magnetic resonance), scoring systems and laparoscopy can be used ⁵. In the first place, US is one of the imaging test in diagnosis of acute appendicitis. Cost-effectivity, easy to access and use are the advantages of US. However, operator-dependency is a disadvantage of US. The purpose of this study was to investigate the efficiency of US in diagnosis of acute appendicitis.

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Material and Method

The files of 174 patients who underwent appendectomy at Malatya State Hospital were retrospectively analyzed from January 2013 to May 2014. Of them, 26 patients were excluded, because these patients were not studied with US. Histopathology and US reports of the remaining 148 patients were enrolled.

US was performed with Toshiba SSA-660A machine. The superficial abdominal US technique was performed by different Radiologist of radiology department on patients suspected acute appendicitis. In US, tubular structure greater than 6 mm with a non-compressible, blind-ended and indication of intestinal origin, in the right lower quadrant, was acknowledged positive for acute appendicitis. All of the patients were operated (open appendectomy) by 2 different general surgeon and their pathologic specimens were sent to pathology laboratory in order to be analyzed. US findings were matched to histopathology reports. The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of US in diagnosis of acute appendicitis were calculated. The collected data were analyzed with Statistical Package for Social Sciences (SPSS 15 for Windows, SPSS Inc., Chicago, Illinois, USA) computer program.

Results

General/demographic: There were 69 male and 79 female patients in this study. Their mean age was 27.48 (10-80) years. 123 patients of 148 who were operated for acute appendicitis were confirmed acute appendicitis histopathologically. There were 100 (67.5%) patients diagnosed with preoperative US as acute appendicitis. Of these 100 patients, 93 (93 %) were confirmed to be acute appendicitis by histopathology, 7(7%) were normal appendices. The remaining forty-eight patients were negative preoperatively with US. Of them, 30 (62.5%) were diagnosed with histopathology as acute appendicitis and 18 only normal appendices.

Diagnostic accuracy: Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of US were 75.6 %, 72 %, 93 %, 14.6 %, 81.7 % respectively (Table I).

TABLE I - Value of ultrasonography in acute appendicitis

Statistical Results	%
Sensitivity	75,6
Specificity	72
Positive Predictive Value	93
Negative Predictive Value	14,6
Diagnostic Accuracy	81,7

Discussion

Despite laboratory tests, physical examination and imaging techniques, the diagnosis of acute appendicitis could be misdiagnosed with many other diseases, particularly gynecologic diseases. This condition increases negative laparotomy rate. In our study, 25 (16.8%) removed appendices were normal at the histopathologic reports. There were 15 (10.1%) female and 10 (6%) male. Three in 15 female patients undergone to laparotomy were negative and had ovarian pathology. Negative laparotomy rate reported by Henna E. et al. was 18.2% ⁶; however, Taylan O S. et al. reported 15.3% ⁵.

Diagnosis value of US is low in perforated acute appendicitis, because it is operator-dependent. In the prospective study by Richard Nashuti et al., perforation rate was 29 %; however, it was 15.3 % in the studies of Taylan O S. et al. ⁵. In the present study, it was in 24 patients (16.2%). There were 16 (10.8%) female and 8 (5 %) male. Of these, seven were over fifty years old. Moreover, of these patients, eight (5%) were in group where preoperative US was negative and 16 (10.8%) were in the US positive group. We found that patients with perforated appendicitis had onset symptoms starting 54 hours before. We think that patients with acute appendicitis diagnosis should be operated immediately after the diagnosis and also it should be remember that, especially in patients with more than 48 hours long history, acute appendicitis is perforated.

Since US was used in diagnosis of acute appendicitis by Puylaert in 1986, it was reported that US's sensitivity was 44-98%, specificity 47-95 %, positive predictive value 84-96 % and negative predictive value 76-97 % ⁸. In our study, the sensitivity was 75.6 %, specificity 72%, positive predictive value 93 % and negative predictive value 14.6%. Negative predictive value was low in present study. We think that the reason of this is low of true negative value.

In most studies, it is reported that the efficiency of US in diagnosis of acute appendicitis is high. We suggested that US as a imaging test should be performed at first step when there is a suspicion in diagnosis and definitive diagnosis because this technique is easy to access, cost-effective and easy to use. But, tests used in diagnosis and clinical approach ought to be used together, since US alone is not sufficient.

In patients applying with typical history of acute appendicitis, diagnosis can be made easily with clinical approach. However the diagnosis is generally difficult, in atypical history of acute appendicitis. US can not be sufficient in obese, elderly and co-morbid patients, with atypical appendix and non-cooperating. Richard Nshuti at all. found that only 31% of patients applying to the hospital had typical history of acute appendicitis ⁷. US is the first imaging test for the patients in this group. However, in patients with atypical history of acute appendicitis, CT and MRI are necessary for the diagnosis.

Today, the sensitivity and specificity of CT are 87-100 % and 89-99 % respectively ⁹. This increases the use of CT in patients with suspected acute appendicitis.

Although the series of this study is large enough to give founded conclusions, the limitation of this study is because it is retrospective and not a randomised controlled study. Cost effectiveness of US in diagnosis of acute appendicitis is another important issue that this study not considers.

Consequently, in patients with lower abdominal pain and suspected acute appendicitis, US must be as first imaging test choice after physical examination. Also in our study the result is that US is a reliable imaging technique in diagnosis of acute appendicitis. It doesn't mean that it is not acute appendicitis if US is negative. All parameters may be assessed together.

Riassunto

L'appendicite acuta rappresenta la più comune causa di urgenza chirurgica. Il fatto che per la diagnosi precoce non c'è un segno indicativo caratteristico accresce le complicazioni. Con questo studio si è cercato di riconoscere un rapporto tra i casi di appendicite acuta posta con gli US ed i riscontri istopatologici sull'appendice asportata.

Sono state esaminate retrospettivamente le cartelle cliniche di 174 pazienti del dipartimento di emergenza che via via venivano fatto ricorso per dolori in fossa iliaca destra da gennaio 2013 a maggio 2014. 26 di questi pazienti sono stati esclusi perché non studiati preoperatoriamente con l'ecografia, includendo nello studio i referti istopatologici di 148 pazienti che erano stati sospettati di appendicite acuta. Era stata accettata la diagnosi ecografica di appendicite acuta nel caso di un diametro appendicolare superiore ai 6 mm sotto compressione.

Sono state registrate in un modulo standard le caratteristiche demografiche dei pazienti ed i reperti ecografici, positivi o meno per appendicite acuta.

In 100 di questi 148 pazienti la diagnosi ecografica preoperatoria era stata di appendicite acuta, ed il referto isto-

patologico aveva confermato la diagnosi in 93 casi, mentre in 7 casi si trattava di appendici normali. La sensibilità degli US è risultata del 75,6% e la specificità del 72%. Il valore predittivo positivo (PPV) è stato del 93% e quello negativo (NPV) 14,6% con accuratezza del valore ecografico 81,7%.

Risulta che l'ecografia è una tecnica affidabile per la diagnosi di appendicite acuta, ma la negatività non significa negazione della diagnosi. Per una diagnosi più accurata i dati ecografici devono essere associati ai rilievi clinici ed ai dati di laboratorio.

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