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THE ACCURACY OF ABDOMINAL ULTRASONOGRAPHY IN THE DIAGNOSIS OF ACUTE APPENDICITIS

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Abstract

Acute appendicitis is the most common causes of abdominal emergencies that necessitate surgical intervention. This study aimed to evaluate the accuracy of abdominal ultrasonography in the diagnosis of acute appendicitis.

This prospective study was performed in Alsadr Teaching Hospital from November 2015 to January 2017 involving 131 patients.

The results showed that 84.7% of the patients who presented with positive features of acute appendicitis were confirmed by ultrasonographic study, while 15.2% of the patients showed negative ultrasound examination confirmation.

In conclusion, ultrasound study is effective in the assessment of patients presented with clinical features of acute appendicitis.

Keywords: Surgery, Ultrasound, Abdomen, Acute appendicitis, Diagnosis accuracy

Introduction

Acute appendicitis is one of the most common causes of emergencies which require surgical intervention. Early diagnosis of acute appendicitis is very important for successful outcome[1]. The vermiform appendix is a tubular structure arising from the cecum, it is about 10 cm long[2].

Acute appendicitis is an inflammation of the appendix which is either caused by obstructive or non-obstructive factors[2] and is mainly diagnosed by the clinical picture in which there is anorexia, migratory pain to the right iliac fossa (RIF) and vomiting. On examination, there may be RIF tenderness, rebound tenderness especially at McBurney's point and elevation in body temperature[3].

Many diagnostic tools are used to assist the diagnosis of acute appendicitis such as the Alvarado score system, plain abdominal film, Barium enema, abdominal ultrasonography and CT scan of the abdomine[4].

Ultrasound test is a technique that depends on high frequency (7-7.5MHZ)[5]. The possible criteria of acute appendicitis in ultrasonography are: non compressible, a peristaltic blind tubular structure, An outer diameter of 6mm or more, presence of fecolith, Peri-appendicular fluid or collection, and hyper-vascularization of the appendix on color doppler[6].

This study aimed to assess the accuracy and effectiveness of abdominal ultra-sonography in patients suspected to have acute appendicitis to help in the diagnosis that aid to improve the outcome and decrease the complications.

Patients and methods

A prospective study was done in Al-Sadr Teaching Hospital from November 2015 to January 2017 on 131 patients.

History and clinical examination were done for all the patients. Patients were sent for WBC counts and GUE. All patients included in the study underwent abdominal ultrasonography using graded compression technique. Features of acute appendicitis which were found by ultrasound were recorded.

After reaching diagnosis of acute appendicitis, the patients were admitted to the surgical ward, and then were subjected to appendectomy. The specimens of the appendices were send for histopathological examinations. Data about ultrasound, operative and histopathological results were analyzed for sensitivity, specificity, positive predictive value, negative predictive value and accuracy.

Results

One hundred and thirty one patients were included in this study. They were 69 males accounting for 53% and 62 females accounting for 47%. The age of the patients ranged from 10 to 70 years with the most frequent age group between 20 to 29 years representing 37.4% of the cases.

From the patient's symptoms and signs, results were as follows: Anorexia 88.8%, Right iliac fossa pain 87%, Vomiting 72.5%, right iliac fossa tenderness 96.1%, fever 85.6%, and rebound tenderness 84.3%.

The positive features by ultrasound for acute appendicitis were demonstrated in table I.

Table I: Ultrasonographic findings.

U/S features	No. of patients	Percentage
Non compressible	80	61%
Fecolith	74	56.4%
Free fluid	52	39.6%
Distended appendix ≥6mm	46	35.1%
Mass	2	1.5%

After surgery the specimens were sent for histopathological examination and the results were as shown in table II.

Table II: Histopathological examination result.

Histopathology Results	No. of patient	Percentage
Catarrhal inflammation	74	56.4%
Suppuration	20	15.2%
Appendicolith	18	13.7%
Follicular lymphoid hyperplasia	12	9.1%
Chronic inflammation	2	1.5%
Normal	5	3.8%
Total	131	100

The ultrasonographic, operative and histopathological findings regarding sensitivity, specificity, positive predictive values, negative predictive values and accuracy are described in number of patients and percentage in tables III & IV.

Table III: True and false positive and negative results.

Result	No. of patient	Percentage
True positive	109	83.2%
True negative	3	2.2%
False positive	2	1.5%
False negative	17	12.9%
Total	131	100

Table IV: Sensitivity and specificity predictors of accuracy

Value	Percentage
Sensitivity	86.5%
Specificity	60%
Positive Predictive Value	98.1%
Negative Predictive Value	15%
Accuracy	85.4%

Discussion

Acute appendicitis is one of the most common surgical emergencies that need early management and intervention. In spite of it is common, it should be carefully diagnosed because it has wide range of differential diagnosis such as renal, gynecological, and gastrointestinal pathologies[1].

In this study, 131 patients were included, number of males was 69 (53%) which is higher than females 62 (47%), and it is a similar frequency as in other studies[7,8]. Acute appendicitis occurs most frequently at the age of 20-29 years in this study, which correlate with other studies[7,9].

Regarding symptoms and signs of acute appendicitis: anorexia was the most common symptom, right iliac fossa pain is the next symptom in frequency, vomiting was the least common one as found in another study[10].

There was an increase in WBC counts in 57 patients representing 43.5% of all patients in this study, while it is within normal range in 74 patients (56.4%). Normal WBC counts may occur in elderly, immunocompromised patients, patient with malignancy and others. So WBC counts may not reflect the severity of the disease[11].

In comparing ultrasound, and histopathological results, it was found that 111 patients (84.7%) showed positive findings in ultrasound study, and 109 patients (83.2%) were found to be positive by histopathological examination, this represents the true positive results. Two patients (1.5%) out of 111 were found positive by ultrasound study and they had negative results by histopathology, this represents the false positive results. Twenty patients (15.2%) had no features of acute appendicitis by ultrasound, 17 patients of them (12.9%) had inflamed appendix on histopathology examination and this represents the false negative results. While three patients (2.2%) out of the 20 patients had negative ultrasonographic results and were normal by histopathology, this reflects the true negative results.

The presence of the appendix in some positions like retrocecal appendix, or when the inflammation confined to the tip of the appendix, the presence of large amount of gas within the bowel loops, or in case of perforated appendix, all these may lead to difficulty in identifying the appendix and thus will give false negative results[12]. There are other abdominal conditions like inflamed Mickle's diverticulum, Crohn's disease, inflamed fallopian tube or tubo-ovarian abscess, these may be falsely identified as inflamed appendix and lead to false positive results[12]. In this study the sensitivity was 86.5%, specificity was 60%, positive predictive value was 98.1%, negative predictive value was 15%, and the accuracy was 85.4%.

In conclusion, the clinical picture in addition to ultrasound findings suggests the diagnosis of acute appendicitis, this combination have significantly high sensitivity and accuracy values in the diagnosis of acute appendicitis especially in cases with atypical presentations.

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