ULTRASONOGRAPHY FOR SUSPECTED ACUTE APPENDICITIS (RADIOPATHOLOGICAL STUDY)

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SUMMARY

Background: Acute appendicitis is one of the commonest surgical emergencies. Simple appendicitis can progress to perforation, which is associated with a much higher morbidity and mortality, and surgeons have therefore been inclined to operate when the diagnosis is probable rather than wait until it is certain.[1]in this study we asses the role of ultrasonography in adition to clinical and laboratory data to reach the final diagnosis of acute appendicitis.

Patients and methods: in this combined retrospective and prospective study to 75 patients who referred to surgical service. A complete clinical history, physical examination, WBC count, neutrophils count, and ultrasonography. A histopathological correlation done for 57 cases undergo surgical operation.

Results: for 57 cases of acute appendicitis most patients was between 11-30 years old (59.65), male: female ratio was 1: 1.5, most common symptoms was abdominal pain present in all cases. The sensitivity of ultrasonographic examination was 94.7%, specificity was 88.9% and accuracy was 93.3%. leukocytes count was $\geq 10x10^9$ in 43 (75.43%) of acute appendicitis cases, and the neutrophil count $\geq$ 75% in 34 (59.64%) of acute appendicitis ccases.

Conclusion: ultrasonography is an accurate procedure that leads to prompt diagnosis and early treatment of many cases of appendicitis.

Key words: acute appendicitis , ultrsonography.

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INTRODUCTION

Acute appendicitis is one of the commonest surgical emergencies. Simple appendicitis can progress to perforation, which is associated with a much higher morbidity and mortality, and surgeons have therefore been inclined to operate when the diagnosis is probable rather than wait until it is certain.1 A clinical decision to operate leads to the removal of a normal appendix in 15% to 30% of cases (although the figure may be higher or lower in certain demographic groups).[1] This proportion may be reduced by observing equivocal cases for a period of time, a practice that seems to be safe for most patients.[2] Some cases of appendicitis may resolve spontaneously.[3,4] None the less, if a period of observation culminates in the diagnosis of a ruptured appendix, the patient may have suffered a poor

outcome that was avoidable. Reductions in the number of "unnecessary" or non-therapeutic operations should not be achieved at the expense of an increase in number of perforations.[5]It has been claimed that diagnostic aids can dramatically reduce the number of appendicectomies in patients without appendicitis, the number of perforations, and the time spent in hospital.[1] Methods advocated to assist in the diagnosis of appendicitis include laparoscopy,[6,7] scoring systems,[8,9] computer programs,[10] ultrasonography,[11] computed tomography,[12] and magnetic resonance imaging.[13] Imaging techniques have been shown to be particularly accurate. Recently, imaging techniques such as ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) were evaluated as diagnostic modalities in acute appendicitis and were shown to improve diagnostic accuracy and patient outcomes. However, the routine use of imaging studies in all patients is not well established. Ultrasonography is the least expensive and least invasive of these and has been reported to have an accuracy of 71% to 95%,[14] but doubts have been raised about the influence of ultrasonography on patient outcomes.[15] Furthermore, it has been argued that findings at sonography should not supercede clinical judgment in patients with a high probability of appendicitis.[16] This raises questions about whether sonography should be performed at all in patients at high risk and whether there is some reliable means of selecting those who can benefit from imaging. The pathophysiology of appendicitis begins with obstruction of the narrow appendiceal lumen. Obstruction has many sources, including fecaliths, lymphoid hyperplasia (related to viral illnesses such as upper respiratory infections, mononucleosis, or gastroenteritis), gastrointestinal parasites, foreign bodies, and Crohn's disease. Continued secretion of mucus from within the obstructed appendix results in elevated intraluminal pressure, leading to tissue ischemia, over-growth of bacteria, transmural inflammation, appendiceal infarction, and possible perforation.[17,18] Inflammation may then quickly extend into the parietal peritoneum and adjacent structures.

Clinical Findings

In a typical presentation, the three clinical findings with the highest predictive value for acute appendicitis are right lower quadrant pain, abdominal rigidity, and migration of pain from the periumbilical region to the right lower quadrant.[7] These classic findings occur in about 50 percent of patients,[5] however, making missed diagnosis of appendicitis a common successful malpractice claim against family and emergency department physicians.[19] *Table 1*[20-22]summarizes the prevalence of common signs and symptoms of appendicitis.

Ultrasonography

Ultrasonography *(Figure 2)* is inexpensive, safe, and widely available. Diagnostic accuracy, reported to range from 71 to 97 percent,[24,25] is highly dependent on operator skill. Ultrasonography is especially useful in women who are pregnant or of childbearing age, and in children. Major advantages to ultrasonography include noninvasiveness, short acquisition time, lack of radiation exposure, and potential for discovering other causes of abdominal pain (e.g., ovarian cysts, ectopic pregnancy, tubo-ovarian abscess).[26]Criteria for diagnosis of acute appendicitis by ultrasonography are well established and reliable.[5,23] The most useful finding on

ultrasonography that is suggestive of appendicitis is an outer appendiceal diameter of 6 mm or greater on cross section.[24] Periappendiceal findings of inflammatory fat changes frequently are apparent on ultrasonography with acute appendicitis. Findings of appendiceal perforation include loculated pericecal fluid, phlegmon (an ill-defined layer structure of the appendiceal wall) or abscess, prominent pericecal fat, and circumferential loss of the submucosal layer.[25]

Morphology

The histologic examination reveals neutrophilic infiltration of the muscularis propria which is requisite for the diagnosis. Usually , neutrophils, and ulcerations also present in the mucosa.[27]

PATIENTS AND METHODS:

In this combined retrospective and prospective study a 75 patients who referred to surgical service at Al-Emam Al- Hussein Teaching Hospital in Al- Nassirya City, and at Al- Amal privet hospital in Al- Hilla city between may 2009 till February 2010. the number of appendicitis cases were 57. Only patients who have complete clinical history , leukocyte count and differential, and ultrasonic report were considered in this study. A histopathological examination done for each case. Graded compression ultrasonography results were designated positive, negative, or equivocal by the attending sonographer by using the following criteria: positive results considered when appendix identified, tender and non-compressible or appendiceal phlegmon or abscess seen; also when appendix not identified but abnormal amount of free fluid seen with thickened, dilated, or non-peristaltic bowel in the region of the caecum. Negative results considered when appendix not identified, no other relevant abnormality seen.The diagnosis of appendicitis was made on histological grounds on the basis of infiltration of the muscularis propria by neutrophil granulocytes.A correlation between clinical, ultrasonography, and histopathological findings were done.mucosa.

RESULTS

In this study we found that the number of male cases was 23 while the number of female cases was 35; so male: female ratio was 1:1.5. Table (3) shows the distribution of cases according to age, we notice that most of the cases were between 11-20, and 21-30 years old (16, and 18 respectively). Table (4) shows the most common presenting signs and symptoms which were abdominal pain in 100% , lower quadrant tenderness in 87 % of cases. Leukocytes count was $\geq$ 10x 10^9/L in 43 cases, while it was < 10x10^9/L in the remainder 14 cases. Leukocytes differential showed neutrophilia (Leukocytes differential with neutrophils count $\geq$75%) in 34 cases, while in the remainder of cases the neutrophils count < 75% (table 5).

DISCUSSION

abdominal pain is a common presenting complaint, accurate and timely diagnosis of acute appendicitis is essential to minimize morbidity, in our study it was present in all cases table (4). The diagnosis of appendicitis traditionally has been based on clinical features found primarily in the patient's history and physical examination. While the clinical diagnosis of appendicitis may be straightforward in patients with classic signs and symptoms, atypical presentations can result in delays in treatment, unnecessary hospital admissions for observation, and unnecessary surgery.

In our study we confirmed that the clinical diagnosis and laboratory investigation only were not enough for the final diagnosis of acute appendicitis since they did not present in all cases (table4) and similar signs and symptomsmay be also present in cases were proved to be negative for acute appendicitisd, so another confirmatory test was important to reach the perfect diagnosis of acute appendicitis. We see in this study that leukocyte count and differential was important additive diagnostic aid which reflect the presence of an inflammatory condition, and it was elevated in most cases of acute appendicitis table(5), but an elevated white blood cell count has a low predictive value for appendicitis because it is present in a number of conditions.This result is correlated with result obtained by other studies.[5,6]Unnecessary surgery for suspected appendicitis exposes patients to increased risks, morbidity, and expense. Recently, imaging techniques such as ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) were evaluated as diagnostic modalities in acute appendicitis and were shown to improve diagnostic accuracy and patient outcomes. However, the routine use of imaging studies in all patients is not well established. If the diagnosis of appendicitis is clear from the patient's history and physical examination, no further testing is needed, and prompt surgical referral is warranted.[15] Imaging studies are cost effective if a definitive diagnosis can be made and observation in a hospital can be avoided.[16] More importantly, imaging studies of patients with an uncertain diagnosis may reduce the rate of perforation, and thus reduce morbidity, mortality, and postoperative hospital stays.[5]We have confirmed the high sensitivity and specificity of ultrasonography in the diagnosis of appendicitis table(6). Patients with equivocal signs of appendicitis are usually admitted to hospital for a day or night of observation. If the result on ultrasonography is positive, however, the surgeon can operate immediately.
Table (6) shows the sensitivity of ultrasonography in the diagnosis of acute appendicitis was 94.7%, the specificity was 88.9%, and the accuracy was 93.3%.

TABLE 1: Prevalence of Common Signs and Symptoms of Appendicitis

Sign or symptom	Frequency (%)
Abdominal pain	99 to 100
Right lower quadrant pain or tenderness	96
Anorexia	24 to 99
Nausea	62 to 90
Low-grade fever	67 to 69
Vomiting	32 to 75
Pain migration from periumbilical area to the right lower quadrant	50
Rebound tenderness	26
Right lower quadrant guarding	21

TABLE 2: Common Signs of Acute Appendicitis

Sign	Description
McBurney sign	Localized right lower quadrant pain or guarding on palpation of the abdomen (the single most important sign)
Psoas sign	Pain on hyperextension of right thigh (often indicates retroperitoneal retrocecal appendix)
Obturator sign	Pain on internal rotation of right thigh (pelvic appendix)
Rovsing sign	Pain in the right lower quadrant with palpation of the left lower quadrant
Dunphy's sign	Increased pain in the right lower quadrant with coughing
Hip flexion	Patient maintains hip flexion with knees drawn up for comfort
Other peritoneal signs	Rebound tenderness, hyperesthesia of the skin in the right lower quadrant

NOTE: The absence of these signs does not exclude appendicitis. Information from references 17,18,23.

Table (3): Distribution of 57 cases of acute appendicitis according to age.

Age (year)	Number of cases	% of cases
8- 10	11	19.3
11- 20	16	28.07
21- 30	18	31.58
31- 40	10	17.54
> 40	2	3.51

Table (4): Prevalence of common signs and symptoms of 57 cases of acute appendicitis.

Signs or symptoms	Frequency (no.)	(%)
1- abdominal pain.	57	100
2- lower quadrant tenderness.	50	87
3- anorexia.	32	56
4- nausea.	48	82.2
5- vomiting.	41	71.9
6- low grade fever.	55	96.5
7- rebound tenderness.	38	66.66

Table (5): Leukocytes and count differential of 57 cases of acute appendicitis.

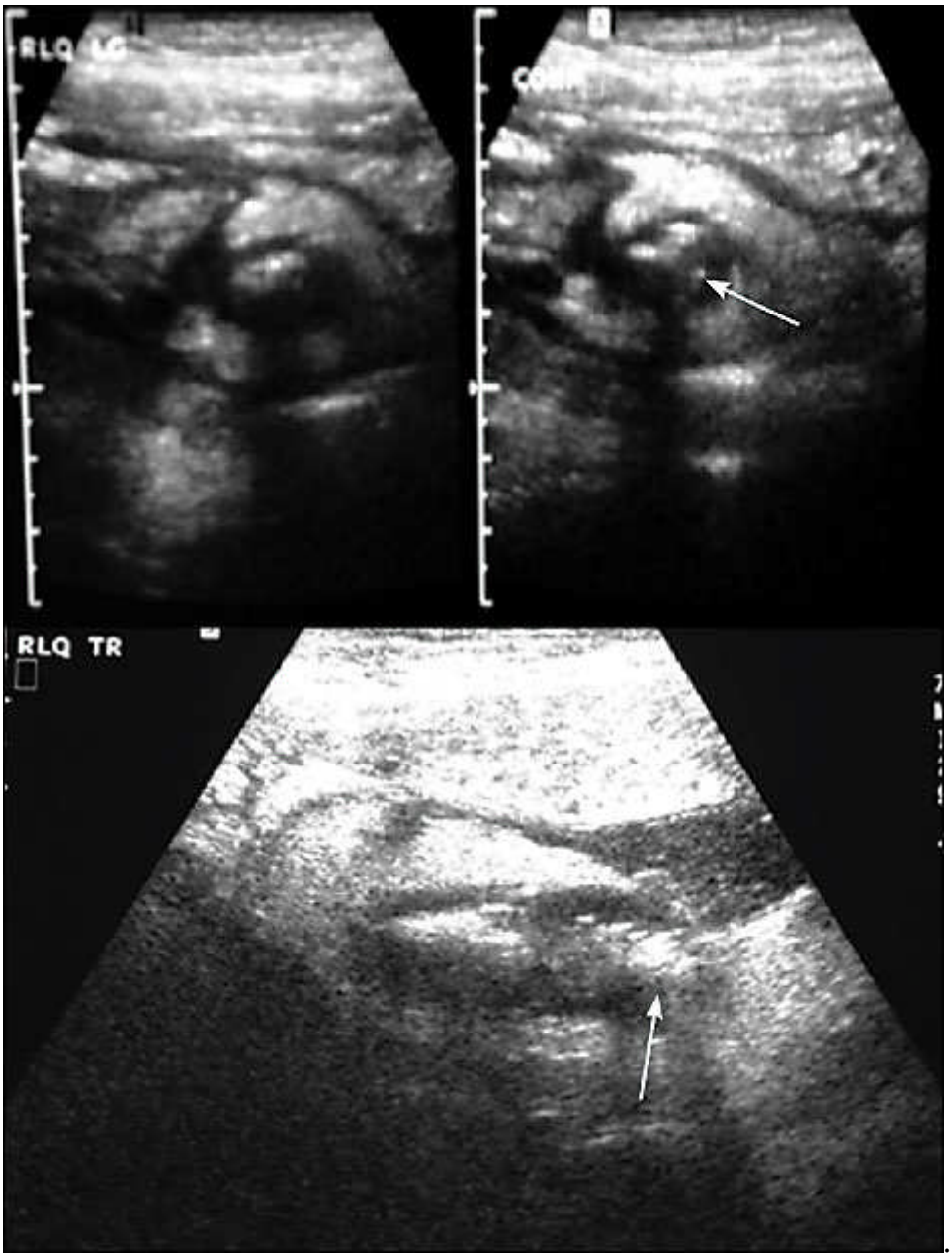
Item	Number of cases	% of cases
Leukocytes count < $10x10^9$ /L	14	24.56
Leukocytes count ≥ $10x10^9$ /L	43	75.43
Leukocytes differential with neutrophils count <75%	23	40.35
Leukocytes differential with neutrophils count ≥75%	34	59.64

Table (6): Results of ultrasonography and sensitivity and specificity* for diagnosis of appendicitis

Result	Appendicitis (histologically confirmed)	Not appendicitis (histologically confirmed)
Positive	54	2*
Negative	3	16*
Total	57	18

*Sensitivity 54/57 (94.7%); specificity 16/18 (88.9%). Accuracy 70/75 (93.3%). Calculations based on histologically proved cases.

Figure 1. (Top) Transverse ultrasound image of the right lower quadrant of the abdomen (left view, noncompressed; right view, compressed) revealing a thick-walled, noncompressible tubular structure (an inflamed appendix) with a shadowing appendicolith (arrow), and (bottom) a longitudinal ultrasound image revealing the thick-walled inflamed appendix and appendicolith (arrow) and a small periappendiceal fluid collection



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دور الأمواج الفوق الصوتية في تشخيص التهاب الزائدة الدودية الحاد

*** أ.م.د.مها شاكر حسن**

الخلاصة

التهاب الزائدة الدودية الحاد واحدة من أكثر الحالات الجراحية شيوعا،التهاب الزائدة الدودية البسيط قد ينتهي بتمزق الزائدة الدودية المصحوبة بزيادة نسبة المعانات للمريض والتي قد تؤدي للوفاة، لذلك فان الجراحين يقومون بإزالتها عندما يكون التشخيص محتمل متجنبين الانتظار لحين التأكد من التشخيص.

في هذه الدراسة نحن نقيم أهمية الأمواج الفوق الصوتية في تشخيص الالتهاب بالإضافة إلى المعلومات التي نحصل عليها من أعراض المرض،و فحص المريض، و النتائج المختبرية، ومقارنتها بالتحليلات النسيجية.

من خلال دراسة ٧٥ حالة ٥٧ خضعوا للجراحة، وقد استنتجنا ان للفحص بالأمواج فوق الصوتية أهمية كبيرة للمساعدة في التشخيص، وان حساسية الفحص كانت ٩٤،٧%،وخصوصيته كانت ٨٨،٩%،و دقته كانت ٩٣،٣%.

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