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ORIGINAL ARTICLE

Prospective Assessment of Ultrasonography Accuracy in Diagnosing Acute Right Lower Quadrant Pain

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ABSTRACT:

Introduction: The aim of this study was to Investigate the Accurateness of Ultrasonography in the Diagnosis of Acute Right Lower Quadrant Pain. **Materials and Methods:** The patients were diagnosed as having appendicitis via US performed by EPs based on the following findings: appendix-anteroposterior diameter over 6 mm, non-compressible and aperistaltic appendix image, periappendiceal anechoic fluid collection, a 2-mm increase in appendiceal wall thickness, the presence of appendicolith, and the presence of ultrasonographic McBurney sign. **Results:** For the purpose of the study, true positive (TP) was 'positive both sonographically and surgically'; false positive (FP) was 'positive sonographically and surgically negative'; false negative (FN) was 'negative sonographically and surgically positive'; and true negative (TN) was 'negative both sonographically and surgically. **Conclusion:** If clinical signs and the symptoms are combined with USG findings, the diagnostic accuracy is significantly increased. USG helps in identifying alternative causes of RIF pain thus excluding appendicular pathology. USG does not replace clinical diagnosis, but is a useful adjunct in the diagnosis of acute appendicitis.

Keywords: Accuracy, Diagnosis, Ultrasonography, Lower Quadrant Pain

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INTRODUCTION

Appendectomy is the gold standard treatment for AA 1. A successful outcome depends on an early diagnosis followed by appendectomy before development of any complication such as gangrene or perforation.2,3 Several scoring systems have been used globally for early diagnosis of AA. One of the most practical scoring systems is the Alvarado scoring system which is based on history, physical examination, and some laboratory investigations that are convenient to apply .4-6 Nevertheless, definite diagnosis can only be made after the operation and by histopathology examination of the collected specimens.7 The alvarado score consists of 8 parameters (Table 1).4 Patients with Alvarado scores of 9 or 10 almost certainly have AA, so the accepted management for these patients is to proceed with appendectomy as soon as possible without further work up.1,8 Patients with scores 0-4 have very low chance of having appendicitis and imaging studies are not recommended for them as well1.. Those that have scores of 7 and 8 are still very likely to have appendicitis and scores of 5 or 6 are not exactly diagnostic but may still have AA.1,8 These clinically equivocal cases need further investigations helping with the diagnosis.8 Computed tomography (CT scan) has been shown in many studies, to be highly sensitive and specific for diagnosing AA and is fewer operators dependent.8-11 It is also possible to have a dynamic view of all abdominal organs as well.9 We take advantage of ultrasound commonly at our center to diagnose acute appendicitis.Among the imaging studies, ultrasonography (USG) has become an important tool which can efficiently recognize patients with possible life-threatening conditions of different origins.12 effective technique carrying no risk to the patient. After thorough literature and Medline search, it was found that very little work has been done in our country on the subject.

MATERIALS AND METHODS

Three randomly selected emergency medicine (EM) specialists, who were not experienced in bedside ultrasound (BUS) detection of appendicitis, each underwent a one-day introductory course. The topics of the course included ultrasound for trauma, intrauterine pregnancy, abdominal aortic aneurysm, cardiac ultrasound, biliary ultrasound, urinary tract, deep venous thrombosis, musculoskeletal ultrasound, thoracic ultrasound, ocular ultrasound, and procedural guidance. After this course, they took a second course on six-hour appendicitis assessment as a core course given by an experienced radiologist.[13] During this course, they underwent hands-on training on 25 patients in order to learn to detect appendicitis. These courses were prepared under the guidance

of the International Federation for Emergency Medicine's Point-of-Care Ultrasound (PoCUS) Curriculum Guidelines.[14] Each working shift was arranged to include one physician from the US group. The patients were diagnosed as having appendicitis via US performed by EPs based on the following findings: appendix-anteroposterior diameter over 6 mm, non-compressible and aperistaltic appendix image, periappendiceal anechoic fluid collection, a 2-mm increase in appendiceal wall thickness, the presence of appendicolith, and the presence of ultrasonographic McBurney sign. They were recorded in a formal US report by radiologists who were blinded to the study protocol, and if necessary the radiologists consulted the surgeon who was also blinded to the study protocol. This was a limited ultrasound (US) and no attempt was made to identify other abdominal pathologies. Those who refused surgery or did not come back with postoperative or histopathological findings were excluded, and so were those who were morbidly obese with poor echo window. Informed consent was obtained from all those who volunteered to participate.Detailed history was taken from all patients, especially regarding the marital status, duration of pain and associated symptoms.Menstrual cycle regularity and last menstrual period (LMP) were also documented.USG examination was performed under the supervision of consultant radiologist. All possible causes were evaluated by thoroughly examining all organs of RLQ. Ultrasonographic findings with possible diagnosis were recorded in every patient proforma containing relevant information. Postoperative findings were checked and recorded from the operating surgeon/from patient follow-up proforma by contacting the patient on the telephone. Data was analyzed using SPSS 10.

RESULTS

For the purpose of the study, true positive (TP) was 'positive both sonographically and surgically'; false positive (FP) was 'positive sonographically and surgically negative'; false negative (FN) was 'negative sonographically and surgically positive'; and true negative (TN) was 'negative both sonographically and surgically' [Table1].

Table 1: Positive and negative predictive values

Group	Surgically +ive	Surgically - ive
Ultrasonographically+ive	TP (38)	FP (6)
Ultrasonographically - ive	FN (5)	TN (11)

TP: True positive FP: False positive TN: True negative FN: False negative

Of the 60 patients enrolled in our study, 36(60%) were True Positive, and 25 (41.6%) of them showed either acutely inflamed non-compressible thickened blind ending appendix or had a focal fluid collection along with probe tenderness in RLQ with sonographically normal pelvic viscera, and 20 (33.3%) were unmarried. In the remaining 13 (21.6%) patients, 3 (5 %) had an ectopic pregnancy with a typical history of missed cycle along with a positive pregnancy test, and 10 (16.6%) had ovarian cysts. Two (4%) of these 13 had torsion surgically not picked up sonographically, 4 (6.6%) had ruptured ovarian cysts, and 4 (6.6%) had simple ovariancysts.

Table 2: Diagnosis Distribution.

No. of cases	U/S findings
22	Acute Appendicitis
3	Ectopic Pregnancy
10	Ovarian cyst
4	Endometrioma
4	Dermoid
6	OHSS
11	Normal Study

DISCUSSION

Appendicitis is diagnosed using US by demonstrating the lack of compressibility of a non-peristalsing tubular structure found in the lower-right quadrant that measures more than 6 mm in diameter. Depending on the patient's body habitus, it may be necessary to use constant pressure in the lower-right quadrant with a transducer to compress subcutaneous fat and displace loops of the bowel.Apart from individual case reports, to date there have been four published clinical trials on EP-performed BUS for the diagnosis of appendicitis.[15,16-18] Chen et al[16] found that BUS had a sensitivity of 96.4% and a specificity of 67.6% for the diagnosis of appendicitis, compared to a sensitivity of 86.2% and a specificity of 37% based on surgeons' clinical judgment. However, the prevalence of appendicitis was 75% in their

study and all physician sonographers had extensive BUS experience reflecting a setting atypical for most EDs. Fox et al[17] Acute appendicitis, though a common cause of acute RLQ pain, may be mimicked by a range of gynaecological pathologies in women of reproductive age. The most commonly encountered are ovarian cyst rupture or torsion, haemorrhage into an ovarian cyst, hydrosalpinx or pyosalpinx, endometriosis and ectopic pregnancy. Thus, ultrasound evaluation of this subgroup of patients presenting with RLQ pain is very important as faulty diagnosis results in undue surgical intervention, negative surgeries and at times a number of complications such as adhesions. These can be one of the causes of infertility. This reduces possible physical and mental trauma to the patient and surgical complications. The data augments other studies suggesting the same that undue surgeries are associated with an increased risk of infertility, perinatal mortality and morbidity.[19-22]

Addition of routine USG in clinical assessment for acute appendicitis decreases the sensitivity, but significantly increases the specificity of the protocol,

thereby reducing the FP rate translating into decreased negative appendectomy rate. Proper clinical assessment is the mainstay of diagnosis in acute appendicitis and addition of routine ultrasound by graded compression technique can improve the diagnostic accuracy and reduce adverse outcome.[23,24] The similar results can be seen in our study.Because of USG's sensitivity and specificity, its efficacy in diagnosing acute appendicitis in non- gravid patients has been reported as more than 90%.[25]

CONCLUSION

Emergency physician performed bedside ultrasound has an acceptable overall accuracy but its sensitivity is low thus it can help emergency physicians to diagnose the acute appendicitis when used in conjunction with other clinical and para-clinical evaluations but not per se. If clinical signs and the symptoms are combined with USG findings, the diagnostic accuracy is significantly increased. USG helps in identifying alternative causes of RIF pain thus excluding appendicular pathology. USG does not replace clinical diagnosis, but is a useful adjunct in the diagnosis of acute appendicitis.

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