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Role of Ultrasound in Diagnosis of Acute Appendicitis

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ABSTRACT
To evaluate the accuracy of sonography in diagnosing acute appendicitis in King Fahad General Hospital at Albaha (KFGH). This is a retrospective cross-sectional study being performed in KFGH during 9 months (January, 2015 to July, 2016). We evaluate all admitted patients as a case of acute appendicitis . we divided them to two groups: First group those with pre operative ultrasound study only, and second group those with pre operative ultrasound study confirmed by post operative histopathological study. Then we compare between accuracy of ultrasound and histopathology reports .the collected data include all demographic data , history and physical examination. Ultrasound is more useful less invasive especially in female patients.
Keywords: *Appendicitis, Ultrasound, Surgery, Radiograph.*

INTRODUCTION

Background

Acute appendicitis is define as "the most common surgical abdominal emergency with a life time prevalence of one in seven" [(1)]. The diagnosis is mainly clinical but because of myriad presentation and is correct in up to 80% of the patients. As the consequences of missed diagnosis are dire, the common surgical practice has been to operate on doubtful cases rather than to wait and see till the diagnosis is certain. This resulted in negative appendicectomy rate of 20 to 30% and has been considered acceptable. This concept is being challenged at present day of quality assurance. The removal of normal appendix is not a benign procedure and negative appendicectomy carries a definitive morbidity[(2)]. Today's aware patient is also concerned about removal of his normal appendix. In order to improve the diagnostic accuracy different aids were introduced like computer aided programs, different scoring systems. Gastro-intestinal tract contrast studies, Computerized Tomography scan, Ultrasonograhy, Magnetic Resonance Imaging and laparoscopy. Among these modalities, Ultrsono-graphy is simple, easily available, noninvasive, convenient and cost effective[(3,4)]. The ultrasound in the diagnosis of acute appendicitis was first popularized by Puylaert in 1986, one hundred years after the publication of first paper on acute appendicitis by Fitz. In graded compression technique, where a uniform pressure is applied in RIF by a hand held US transducer. Normal and gas filled loops of intestine are either displaced from the field of vision or compressed between anterior and posterior abdominal walls. Inflamed appendix being incompressible is thus optimally seen the inflamed

appendix is seen as a blind ended tubular structure with laminated wall arising from the base of caecum. It is peristaltic, no compressible and its diameter should be more than 6mm.Appendicoliths appear as bright echogenic foci with distal acoustic shadowing, and their visualization is another contributory finding. Similarly there may be increased echogenicity of the periappendiceal fat. Puylaert reported the sensitivity of 89% and specificity of 100% of his technique in the diagnosis of acute appendicitis. Ultrasonic probe tenderness can be elicited and patient himself can localize the most tender point and hence the site of inflamed appendix[5]. Lim HK and Quillin SP had described the usefulness of color Doppler in detecting inflamed appendix. The inflamed thick walled, no compressible appendix fixed in position by compressing transducer will show circumferential color in contrast to the normal gut which is thin walled and compliant with frequent peristalsis transmitting no or minimum signals. Doppler signals disappear when gangrene or perforation occur . Objective of this study is to evaluate the role of graded compression ultrasonography used as a diagnostic tool preoperatively comparing it a protocol where only clinical assessment was used as diagnostic protocols[6,7].

Literature Review

Mohammad Mardan et al did a study; this is a cohort observational study done in Najran General Hospital and Ayub Medical College. This study comparing the adverse outcome in two different groups of patients admitted with suspected acute appendicitis at two different hospitals in two different countries. The first group of 200 patients at Ayub Teaching Hospital Abbottabad, Pakistan, was managed without preoperative ultrasonography. In the second group of 200 patients admitted at Najran General Hospital Najran Saudi Arabia, graded compression abdominal ultrasonography was routinely performed preoperatively. Diagnostic accuracy of the protocol in each group was measured statistically and rates of negative appendicectomy and perforation were determined. Results: Addition of routine ultrasonography in clinical assessment for acute appendicitis decreases the sensitivity but significantly increases the specificity of the protocol thereby reducing the false positive rate translating into decreased negative appendicectomy rate. Rate of negative appendicestomy was 22.5% in group one and 4.7% in group two. Perforation rate was 15.6% in group 1 and 15% in group two. They conclude 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 adverse outcome [8].

Subash KC et al, in Manipal Teaching Hospital, Pokhara, Nepal. Acute appendicitis is commonest cause of acute abdomen necessitating emergency abdominal surgery. Although diagnosis is still largely considered to be a clinical one, ultrasound is established as easily available, less time consuming and very accurate at timely diagnosis of acute appendicitis largely reducing complications as well as negative laparotomies. Due to development of high frequency transducers and better resolution, ultrasound is highly specific and sensitive in diagnosis of acute appendicitis. This study was done to establish the diagnostic role of ultrasound in acute appendicitis in western region of Nepal. Total number of 125 patients were included in the study from May 2013 to May 2015. Findings on ultrasound were finally compared with histopathological report of appendices removed on surgery. Those cases with alternate diagnosis were followed up and proved with other means of investigation. The sensitivity, specificity, positive predictive value, negative predictive value and overall accuracy of ultrasound in diagnosis of acute appendicitis in our study were found to be95.12 %, 88.88 %, 97.5%, 80% and 82 % respectively[9].

MATERIAL AND METHODOLOGY

This study is a cross sectional study . all of the acute appendicitis patients at our hospital had open appendectomy due to facility availability of equipments . this study included the patients who referred from oct. 2015 to June 2016 to KFGH. we

collect and evaluate 345 patients who had undergone open appendectomy, with age from 10 to 30 Include both males and females, our exclusions criteria are (A) married female patients and (B) pregnant patients. All data including the demographic information, history, physical examination, and laboratory data such as leukocytosis, ultrasound and histopathological reports were gathered in the patients files.

RESULTS

After application of exclusion criteria we had total number of 304 patients. 108 of them were male (35.5 %) and 196 patients were females (64.4 %) . patients age range from 10 to 30 years old with mean age of 16.2 . only 7 patients over 25 years old were 9 under 10 years old.

239 patients present with typical presentation include pain and tenderness, Mc Burney's sign and history of fever and anorexia (78.6 %). Were 65 patient present with A typical presentation (21.3 %). Of all the 304 patients had appendectomy. all of them had pre operative ultrasound study , 256 case confirmed by post op histopathological study (84.2%). were 48 case did only ultrasound pre operatively (15.7 %).

Among the patients who had ultrasound study confirmed by histopathology reports, ultrasound show exact diagnosis "in favor acute appendicitis" in 134 case (25.3 %) were the report " suspected acute appendicitis in 83 case (32.4 %). Other finding in 39 (15.2 %).

in these cases who did ultrasound only , the reports show "in favor" in 28 cases (53.8%). were "suspected" in 20 report (38.4 %). And "normal" in 4 cases (7.6 %) .

regarding histopathology study, total number of cases are 256 as mentioned above, The reports show "feature of acute appendicitis " in 239 case (93.3 %) were " other finding " in 17 case (6.6 %).

DISCUSSION

Acute appendicitis is one of the most common etiologies of acute abdomen that leads to operation. Almost 7% of people undergo appendectomy due to diagnosis of acute appendicitis during their lifetime. Although it is a very common pathology its diagnosis still remains a challenge because it mimics many other conditions clinically. Differential diagnosis of acute appendicitis are, but not limited to, mesenteric lymphadenitis, gastroenteritis, constipation, right lower lobe pneumonia and numbers of urologic or gynecologic diseases.

Normal appendix in ultrasound study is a compressible blind ended structure with the diameter of less than 5mm.On the other hand, inflamed appendix has an anteroposterior diameter of ≥6mm and is non-compressible. The existence of appendicolith in sonography also establishes acute appendicitis. Pathologic criteria that are in favor of tissue diagnosis of acute appendicitis are infiltration of neutrophils in mucosa of the appendix and focal superficial ulceration of the mucosa. However, they are not definite for diagnosis of acute appendicitis.

According to some studies ultrasound has a sensitivity ranging from 49 to 90 %, a specificity ranging from 47 to 100 %, a positive predictive value of 84 to 93 %, and an overall accuracy of 72 to 94 % for the diagnosis of acute appendicitis [5].

Accuracy of ultrasound in this study was 84.2 % which is in average. Ultrasound has also some limitations as well, for example appendix can be covered by overlying gas or overriding bony pelvis. The site of the appendix can also influence on the possibility of evaluation of appendix by ultrasound (e.g. a retrocecal appendix). Obesity is another factor influencing the optimality of sonography. Another problem is that we do not have enough data for the terms like “clinically equivocal” or “suspicious case” in literature to exactly guide us when to perform ultrasound

CONCLUSION

Ultrasound is a rapid modality that can be performed bedside; however, in our center it is not performed by a general surgery resident or radiologist in the ER. The procedure is performed by radiology residents in ultrasound room, so it takes some time to consult with radiology resident and send the patient to sonography room. For this

reason, patients who undergo sonography will lose a considerable time. However, it is only a hypothesis because it was not possible for us in this study to exactly measure the time spent from the moment a patient appear to the emergency department till the time that ultrasound is done for him/her. Important to mention here is that most of our patient who were proceeded with surgery without any further imaging studies were male patients.

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