



A CROSS SECTIONAL STUDY TO ASSESS THE ROLE OF ULTRASOUND IN ACUTE APPENDICITIS

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ABSTRACT

Objective: To assess the role of ultrasound in the diagnosis of acute appendicitis. **Methods:** We conducted a prospective cross-sectional study of 120 patients for a period of 8 months from March 2021 to October 2021 in the department of Radiodiagnosis, NSCB, Zonal Hospital, Mandi, Himachal Pradesh. Patients with clinical suspicion of acute appendicitis and posted for appendicectomy were included in this study. Data analysis was done using IBM SPSS 20 software. All the necessary investigations and prior consents were taken before the ultrasounds. **Results:** 120 patients were included in the study, including 72 male patients (60%) and 48 female patients (40%). Mean age of the group was 29(21- 64 years) years. Sensitivity, specificity, Positive predictive value(PPV), Negative predictive value(NPV) and diagnostic accuracy calculated were, 85.94%, 91.07%, 91.67%, 85.00% and 88.33% respectively. **Conclusion:** This study firmly concluded that, ultrasound is a very valuable tool in the diagnosis of acute appendicitis and to rule out associated complications. Liberal use of ultrasound by the radiologist can exclude negative laparotomies associated with acute appendicitis.

KEYWORDS: Acute appendicitis, ultrasonography, appendicectomy, negative appendicectomy rates.

INTRODUCTION

Acute appendicitis is one of the most common surgical emergencies in general surgery^[1], accounting for roughly 10% cases of all the surgical emergencies.^[2] In men overall life time occurrence is approximately 12% and approximately 25% in women.^[2] Overall mortality rate in acute appendicitis is 0.3% in non-perforated appendix and 6.5% in perforated appendix.^[3] Depending upon patient history and clinical examination, diagnosis of acute appendicitis can be established clinically, however diagnosis of acute appendicitis is not always clinically clear since the specificity of symptoms(periumbilical pain migrating to right iliac fossa, nausea and anorexia) is between 37% to 53%.^[4] Missing appendicitis can present with severe consequences with increase in patient mortality and morbidity.^[5] The diagnosis of acute appendicitis becomes more difficult at the extremes of ages and if the patient is pregnant.^[6] Acute appendicitis is one of the common and difficult to diagnose disorder in surgical practice. If anyone only depend on clinical examination, then he will be correct up to 70%. That means it results in a high negative appendectomy rate (NAR), morbidity and mortality. Reduction of NAR is highly recommended. Negative laparotomy rate ranges between 15-35%.^[7] Although certain investigations such as C-reactive protein, ultrasonography and spiral computerised tomography (CT) scan abdomen leads to improvement in diagnosis. The gold-standard for

diagnosis of acute appendicitis is histopathology.^[8] Thus it is recommended in multitude of literature work that imaging modalities like ultrasonography, CT scan should be used in doubtful cases of acute appendicitis and thus to reduce negative laparotomy rates. In our rural health care setup, ultrasonography alone remains most simple, easily accessible, non-invasive modality and has shown to reduce negative laparotomy rate to 8.9% with significant improvement in diagnostic accuracy in clinically equivocal cases.^[9] The diagnostic findings in ultrasound in case of acute appendicitis include^[10], aperistaltic, non-compressible, dilated appendix (>6 mm outer diameter), hyperechoic appendicolith with posterior acoustic shadowing, echogenic prominent pericaecal and periappendiceal fat, periappendiceal hyperechoic structure: amorphous hyperechoic structure (usually >10 mm) seen surrounding a non-compressible appendix with a diameter >6 mm, periappendiceal fluid collection, target appearance (axial section), periappendiceal reactive nodal prominence/enlargement, wall thickening (3 mm or above), alteration of the mural spectral Doppler envelope, a peak systolic velocity >10 cm/s suggested as a cut-off, a resistive index (RI) measured at >0.65 may be more specific. Zielke A et al^[11] in his studies predicts very nice accuracy of USG, these are PPV 0.762, NPV 0.958. This system gave diagnostic accuracy of 0.940(p<0.001), together with a low rate of negative laparotomies(11%). We conducted

this study titled “A cross sectional study to assess the role of ultrasound in acute appendicitis” to elucidate the role of ultrasound in case of acute appendicitis to decrease the rate of NARs.

METHODS

This prospective study conducted for a period of 8 months included 120 patients, including 72 male patients (60%) and 48 female patients (40%) {fig. 1}, who were admitted in the department of Surgery, NSCB ZH Mandi

with clinical suspicion of acute appendicitis. The inclusion criteria included the patients admitted with suspicion of acute appendicitis, regardless of age, sex and associated co-morbidities. Ethical clearance was obtained from the institution. Whole procedure was explained to the patient prior to the beginning of ultrasound examination and consent was obtained from them. Ultrasound was done on the selected patients using 5 to 12 MHz linear array transducer of Siemens Acuson ultrasound machine.

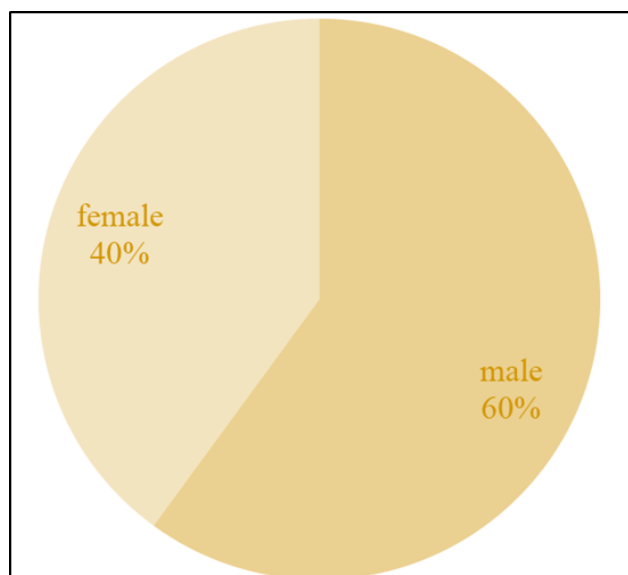


Figure 1: Pie chart showing distribution of sex in the study.

The diagnosis of AA and the decision to operate depends mainly on the clinical picture and investigations, such as white cell count, C-reactive protein level, abdominal and pelvic ultrasonography in case of female patients with child bearing age group. Standard histological examination was conducted for all specimens. Sensitivity, specificity, positive predictive value(PPV), negative predictive value(NPV) and diagnostic accuracy was calculated using IBM SPSS 20 software.

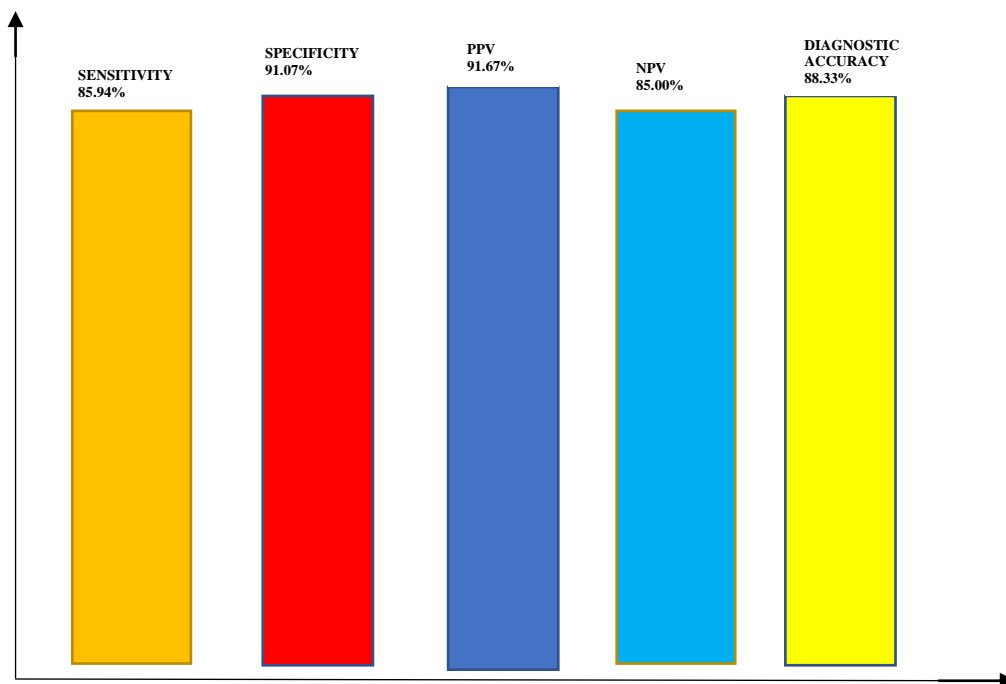
patients with clinical suspicion of acute appendicitis. Sensitivity, specificity, Positive predictive value(PPV), Negative predictive value(NPV) and diagnostic accuracy calculated were, 85.94%, 91.07%, 91.67%, 85.00% and 88.33% respectively. Table 2. represents bar diagram for statistical analysis of the patient group.

RESULTS

120 patients were included in the study, including 72 male patients (60%) and 48 female patients (40%) {fig. 1}. Mean age of the group was 29(21- 64 years) years. Table 1 illustrates correlation between ultrasound findings and histopathological findings in case of

Table 1: Statistical correlation between ultrasound findings and histopathological findings in case of patients with clinical suspicion of acute appendicitis.

ULTRASOUND FINDINGS S/O ACUTE APPENDICITIS	HISTOPATHOLOGICAL FINDINGS OF ACUTE APPENDICITIS	
	YES	NO
YES	55	05
NO	09	51

Table 2: Bar chart depicting sensitivity, specificity, PPV, NPV and Diagnostic accuracy.

DISCUSSION

Acute appendicitis is the most common cause of acute abdomen in young adults. Appendectomy is the most frequently performed urgent abdominal operation by general surgeons. Various anatomical positions of the appendix are well established, which in the decreasing order of incidence include retrocecal (74%), pelvic (21%), paracaecal (2%), subcaecal (1.5%), preileal (1%), and postileal (0.5%). Classical features include periumbilical pain that migrates to the right iliac fossa, anorexia, fever, and tenderness and guarding in the right iliac fossa. Atypical presentations are particularly common in preschool children. Diagnosis is based on imaging findings and clinical presentation. As relying alone on clinical symptomatology leads to higher rates of negative laparotomies, role of imaging modalities has increased tremendously for proper diagnosis of acute appendicitis. diagnostic scoring systems have been developed in an attempt to improve the diagnostic accuracy of acute appendicitis. The most prominent of those scores is that developed by Alvarado.^[12] The modified Alvarado score is a more simplified and practical version of the original one and has been widely accepted after it was successfully tested in different studies.^[13] 120 patients admitted with appendicitis on clinical suspicion and posted for appendicectomy underwent ultrasound with histopathological evaluation of removed appendix. Ultrasound abdomen in present study showed sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy calculated of 85.94%, 91.07%, 91.67%, 85.00% and 88.33% respectively (fig. 2). USG was suggestive of acute appendicitis in 60/120 patients. Histopathology of resected specimen is considered as gold standard for the diagnosis of acute appendicitis. We

found that, in 15/120(12.5%) cases no evidence of acute appendicitis was noted on histopathological evaluation. Negative laparotomy rate in our study was 12.5%. This was much lower in comparison to the study done by Gilani *et al.*^[14] A recent meta-analysis by Birchley D^[15] studied the role of clinical features and inflammatory markers in the diagnosis of acute appendicitis. Author concluded that “Laboratory tests of the white cell count, neutrophil count and C-reactive protein are more effective in supporting a clinical diagnosis of acute appendicitis in patients with typical clinical features than in excluding the diagnosis”. So in combination, white cell count and C-reactive protein can effectively support a clinical diagnosis of acute appendicitis with typical clinical features than in excluding the diagnosis. In our present study, as we included both the laboratory markers/ clinical profile and ultrasound features for diagnosing acute appendicitis, we were able to get a negative appendicectomy rate of 12.5%. This NAR was significantly lower than many of the previous studies. This suggests effective role of USG in reaching correctly to the diagnosis of acute appendicitis.

CONCLUSION

This study firmly concluded that, ultrasound is a very valuable tool in the diagnosis of acute appendicitis and to rule out associated complications. Liberal use of ultrasound by the radiologist can exclude negative laparotomies associated with acute appendicitis.

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