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Original Research Paper

Radiodiagnosis

EVALUATING THE DIAGNOSTIC VALUE OF ULTRASONOGRAPHY FOR ACUTE APPENDICITIS IN ADULTS, COMING FOR ULTRASONOGRAPHY IN RADIODIAGNOSIS DEPARTMENT OF RAJENDRA INSTITUTE OF MEDICAL SCIENCES (RIMS) RANCHI, JHARKHAND.

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ABSTRACT

Background: Acute appendicitis is among one of the frequently encountered surgical problems, but till date there is hardly any confirmatory method. Ultrasound is prescribed for conclusion of an appendicitis case as a simple and noninvasive strategy. Along these lines, because of the spread of disease and the critical need to precisely analyze in every center, we chose to decide the analytic estimation of this comprehensive technique in recognizing a case of appendicitis.

Methodology: The present cross sectional observational study was done over a period of six months starting from November 2017 to April 2018 in the Radiodiagnosis department of RIMS Ranchi. A total of 428 cases were included. All suspected cases for appendicitis were included after consent from the patients. Cases who were not willing to participate and who were not admitted were excluded from the study. Once the USG was done patients, were tracked for the final outcome be it Surgery /Discharge or clinical confirmation based on the Discharge ticket. The findings thus found were compared with surgical and pathological findings and in cases where there was no surgery Discharge diagnosis was taken as the final diagnosis.

Results: Appendix was identified in 56.77%(243/428) of suspected cases. Sensitivity 85.29% with 95% CI (78.21% to 90.78%), Specificity 50.47% with 95% CI (40.63% to 60.28%), Positive Predictive Value 68.64%with 95% CI (64.10% to 72.85%) Negative Predictive Value 72.97% with 95% CI (63.35% to 80.84%) and an Accuracy of 69.96% with 95% CI (63.77% to 75.65%)

Conclusion: Ultrasonography cannot be relied solely for making a correct diagnosis of acute appendicitis, other clinical scores and available modalities should be used to arrive at the confirmation.

KEYWORDS :

INTRODUCTION:

Acute appendicitis is one of the most widely recognized careful emergencies.[1] Appendicitis is regularly found in the second to fourth decade of life, and about 7% of the population enduring during their lifetime,and men are less inclined to include with 13% than ladies with 25%with a higher hazard in youngsters.(2) Evidence suggests pediatric populations have a higher rate of perforation compared with adults. (1,2,3) . Under these circumstances it is but obvious, that apart from clinical acumen a fairly accurate diagnostic tool will help the treating physicians immensely to arrive at a conclusive treatment modality. Usually diagnosing appendicitis is dependent on clinical features based on the findings and history .(4,5) Alvarado Standard has emerged one of the standard criterion to diagnose cases of acute appendicitis based on clinical findings. It has following inclusion criterions based on symptoms (stomach pain and radiation, sickness and vomiting, anorexia, tenderness with presence of reboundness, fever), and research facility (lab) criteria (leukocytosis and left shift). (6) However abnormal form of acute appendicitis do exist and they are responsible for many times the acute appendicitis commonly in pediatric age group , young females , old patients , pregnant ladies and those who have taken antibiotics . (7) As diagnosing acute appendicitis remains a challenge with certainty and removal a surgical procedure fraught with dangers of postoperative complications researchers worldwide are still in search for a reliable and specific predictor or diagnostic tool for confirming the diagnosis of acute appendicitis. (8,9,10,11) Work is incessantly going on across the globe to have a method which can correctly and timely diagnose and thus prevent the complications which might happen after an acute appendicitis like rupture, abscess, peritonitis etc. .(11,12)

An increase in morbidity , and mortality is often associated with delay of an accurate diagnosis of appendicitis which not only increases the number of surgeries to the patients but also seeps in the most dreaded problem of dissatisfaction and loss of faith in medical system . In more than 30% cases often the presentation of acute appendicitis is not as per the typical features and additional imaging techniques like CT Scan, Barium Enema can be used adding to the confusion and dissatisfaction in patients. (12, 13) Such cases should have thorough investigation so that differential diagnosis can be done to arrive at a confirmatory diagnosis.

Of late CT scans have had a fair bit of diagnostic efficacy with correct preoperative diagnostic range of 85-90% (3) while USG have had varied range of diagnostic range from 40% - 80% depending on the setups in which it is done and the skill of the expert doing the USG (14)

Local data pertaining to Jharkhand is not available regarding the accuracy and benefits of the USG modality in medical college set up, as is often seen that the patients with an acute abdomen are routinely advised with USG and many a times they wait for the radiology experts to come and perform the USG while writhing in pain !! With an aim to generate evidence to understand the importance of Routine USG for all Acute Appendicitis patients this study was undertaken.

OBJECTIVES OF THE STUDY

To determine the sensitivity, specificity, positive predictive value and accuracy of the USG in acute appendicitis patients coming to attend the Rajendra Institute of Medical Sciences Radiodiagnosis Department with suspected appendicitis.

METHODOLOGY

The present study was undertaken in the Department of Radiodiagosis, RIMS Ranchi, Jharkhand. The study period was from November 2017 to April 2018. Abdominal sonograms performed at the Radiodiagnosis department by Radiologist for evaluation of acute appendicitis were reviewed, totaling to 428 USG. Patients included were adults with age 20-70 years. Patients with history of appendectomy were excluded from the analysis.

The sonography thus obtained were retrospectively classified as - **Positive** if appendices were identified and had maximal outer diameter (MOD) >6mm. **Negative** if appendices were identified and had maximal outer diameter (MOD)<6mm and **non-visualized** appendix. The findings USG was compared with surgical pathological findings for cases undergoing surgery. A negative diagnosis was confirmed on the basis of treatment for conditions other than appendix.

In case, the adult was discharged with final diagnosis " **other diagnosis/not appendicitis**" but on the USG that adult met the criterion **"Positive"** that male was categorized as **false positive.** All those cases where criterion Positive was met and the pathological results too confirmed the diagnosis as Appendicitis they were termed as **True positive. False negatives** were those where the USG criterion termed them as **Negative** but such cases either underwent surgery for appendectomy or on pathological exam they were found to be having appendicitis. **True Negatives** were those adults where the USG criterion put them in Negative and no appendicitis was found on pathological exam or they were discharged with diagnosis other than appendicitis. Data thus obtained was analysed using MS excel. Evaluation was done using standard statistical measure ; mean , standard deviation and chi square along with using the standard calculation for Sensitivity, specifity and other diagnostic values .p value of <.05 was considered to be of statistical significance.

RESULTS

In our study we found majority of the adults in the age group of 20-35 years (47%), with a mean age of 37.27.27±7.82 . (Table1) In our study we found 243 USGs (56.77%) in which we could visualize appendix out of 428 records reviewed. Out of those 243 USGs we further were able to classify 169 positives and 74 negatives(Table 2). This gave us the diagnostic values of USG for all 243 USGs as Sensitivity 85.29% with 95% CI (78.21% to 90.78%) , Specificity 50.47% with 95% CI (40.63% to 60.28%), Positive Predictive Value 68.64%with 95% CI (64.10% to 72.85%) Negative Predictive Value 72.97% with 95% CI (63.35% to 80.84%) and an Accuracy of 69.96% with 95% CI (63.77% to 75.65%) (Table 2 and 3).

Table 1: Age (In completed years for the USG scans Reviewed in all suspected appendicitis cases)

Age in Completed Years	Frequency	Percentage
20-<25	87	20%
25-<30	45	11%
30-<35	69	16%
35-<40	34	8%
40-<45	21	5%
45-<50	49	11%
50-<55	43	10%
55-<60	21	5%
60-<65	34	8%
65-<70	25	6%
Total	428	100%

Males 180
Females 248
Mean Age 37.27
Standard Deviation 7.82

Table 2: Ultrasound findings and final diagnosis in all patients in whom Appendix was visualized on USG (n=243)

USG	Appendicitis		
	Yes	No	Total
Positive	116 (True Positive)	53 (False Positive)	169
Negative	20 (False Negative)	54 (True Negative)	74
	18	65	243

Table 3: Test Diagnostic Values using the standard formulas for calculating Sensitivity, specificity, accuracy etc.

Diagnostic Test Values		95% CI Intervals
Sensitivity	85.29%	78.21% to 90.78%
Specificity	50.47%	40.63% to 60.28%
Disease prevalence	55.97%	49.48% to 62.31%
Positive Predictive Value	68.64%	64.10% to 72.85%
Negative Predictive Value	72.97%	63.35% to 80.84%
Accuracy	69.96%	63.77% to 75.65%

We also compared USG results with those cases which were further selected for surgery or were found to have appendicitis on pathological examination (Table 4)Using the standard formula for calculating sensitivity,specificity and other values like Sensitivity TP/TP+FN, Specificity TN/TN+ FP, Accuracy TP+TN/TP+FP+FN+TN etc. We obtained Sensitivity 85.29% with a 95% CI (81.40% to 94.13%) and

Specificity of 53.25% with a 95% CI (41.52% to 64.71%) Disease prevalence 58.38% with a 95% CI (50.92% to 65.57% and Accuracy of 74.04% with 95% CI (67.11% to 80.21%) Table 5. A comparison of the sensitivities, specificities and other diagnostic values between table 3 and table 5 gave sensitivity p<.05, specifity p<.005, and accuracy p<.005

Table 4: Ultrasound findings and final diagnosis in all patients in whom appendicitis was visualized on pathology or who underwent surgery for appendicitis (n=185)

USG	Appendicitis		
	Yes	No	Total
Positive	96 (True Positive)	36 (False Positive)	132
Negative	12 (False Negative)	41 (True Negative)	53
	108	77	185

Table 5: Test Diagnostic Values using the standard formulas for calculating Sensitivity, specificity, accuracy etc.

Diagnostic Test Values		95% CI Intervals
Sensitivity	88.89%	81.40% to 94.13%
Specificity	53.25%	41.52% to 64.71%
Disease prevalence	58.38%	50.92% to 65.57%
Positive Predictive Value	72.73%	67.55% to 77.35%
Negative Predictive Value	77.36%	65.83% to 85.84%
Accuracy	74.05%	67.11% to 80.21%

DISCUSSION

In adults appendicitis is a fairly common abdominal emergency (7). In our study too we could see the numbers for cases on the rise. MANTRELS (Pain Migration, Anorexia, Vomiting and Nausea, Tenderness in Right Iliac Fossa, Rebound tenderness) score ≥ 5 relies purely on clinical signs to diagnose the appendicitis with a fair amount of diagnostic value across all age groups with PPV 93% and NPV 83.6% (10) but as said earlier atypical presentations pose more difficulties for one to rely purely on MANTREL score. In our study we found appendix with USG in 243 out of 428 (56.77%) cases. This is in line with quoted wide range of identification ranging from 24.4% to 82% (10,11). The criterion chosen to

categorize USG findings as positive or negative based on the largest MOD>6mm was based on recent articles suggesting this to have highest specificity and sensitivity (12).

In our study we had Negative Predictive value for all patients of 72.97 % which is similar to other available evidence (13), implying the clinical diagnostic importance. However this value of NPV changed to 77.37% for surgical patients implying the importance of USG as a good screening tool only and importance along with its limitations. This is also reported by other studies done in similar settings.(15)

CONCLUSION

We found in our study that USG remains a valuable option for screening in adults coming in health care facilities across our resource limited setting for screening in all suspected cases of appendicitis. Though USG can not be used as the diagnostic imaging modality. If USG is not clear enough to arrive at the diagnosis of acute appendicitis, other available modalities should be employed so that the correct diagnosis can be made on time and further complications can be prevented.

LIMITATIONS

The study was done in a retrospective manner. With larger studies done concurrently the understanding regarding Appendicitis in adults can be done in a better way .

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