Original Research Article

Study of ultrasonography diagnosis of acute appendicitis in Maharashtra population

Nitin Appasaheb Raje[1], Michelle Nitin Raje[2*]

[1,2]Assistant Professor, Department of Radiology, Vedanta Institute of Medical Sciences, Dahanu-401606 Maharashtra, INDIA.
Email: drnitinraje@gmail.com, michellwp27@yahoo.com

Abstract

Background: Acute appendicitis is most common cause of abdominal pain. Imaging method such as Ultra-sonography is safer in all age groups to diagnose easily. **Method:** 500 patients of AA at different age groups were studied on USG Machine. Patient was examined with partially filled urinary using a high frequency linear array transducer 4-12 MHz and a standardized protocol involving graded compression technique. Longitudinal and transverse images of right lower quadrant were obtained. Compression sonography was performed with documentation of the appearance of appendix during compression. The complete appendix was visualized including the tip. USG findings were retrospectively graded by using five point scales: grade 1 and 2 were classified as negative and grade 3 to 5 was as positive. Sonographic diagnosis, surgical/pathological findings were compared. **Results:** In 11-20 years of age 5th grade had highest number of patients i.e. 102 and more number of patients (220) were observed, followed by 21-30 years had 55 patients and 5th graded had 105 AA cases were observed and least number of AA was observed in > 50 years of age. Out of 500 diagnosed sonographic patients in surgical/pathological findings who underwent surgery had 332 true positive, 132 true negative, 32 false positive false and 4 Negative. **Conclusion:** US study being first line imaging modality. As sensitivity of USG had limited range but preferable in children and young patients. USG technique is easily affordable to middle class patients.
Keywords: Acute appendicitis, Sonography, Ultrasound, USG grade scale.

[*]**Address for Correspondence:**
Dr Michelle Nitin Raje, Staff Quarters No. 11, Vedanta Institute of Medical Sciences, Dahanu-401606, Maharashtra, INDIA.
Email: michellwp27@yahoo.com
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INTRODUCTION

Outing to the erect posture appendicitis is quite common problem in human beings, as it is a lymphoid organ when it is inflamed it has to be operated immediately hence acute appendicitis (AA) is commonest cause of Abdominal surgery. It occurs at any age but commonly in youngsters and rare in old age people.[1,2] The most common symptoms of the appendicitis are abdominal pain. Typically, symptoms begin as periumbilical or epigastricpain that migrates towards the right lower quadrant of the abdomen. Later a worsening progressive pain along with vomiting nausea and anorexia are described by the patients. It is reported that, since two decades, the negative appendectomy rate has been relatively constant but rate of perforated appendicitis seems to be increasing.[3] It is established choice that CT (computed tomography) has been the first choice of imaging in AA with acute abdominal pain with sensitivity up to 96% and specificity up to 97%[4] but due to increasing awareness of the radiation imparted to patients by CT and the theoretical increased risk of cancer, more over children are usually kept away from CT image radiations. Hence attempt was to make to evaluate the AA in children's adults of both sexes by USG and easily diagnosed, compared with histopathological studies. So that no patient must have any risk of radiations.

MATERIAL AND METHOD

500 patients of different age groups admitted in surgery department of Vedanta Institute of Medical College Dahanu-401606, Maharashtra were studied.

Inclusion Criteria: All patients irrespective of age and sex. Clinically suspected having Acute Appendicitis were included in the study.

Exclusion Criteria: The patients who needed urgent surgery were excluded as no image was possible due to urgent need of surgery.

Method: Out of 500 patients,28 were between 1-10 years age group, 220 were age between 10-20 years and 150

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were aged between 21-30 years remaining were above 30 years. After recording the history in detail and clinical examination of every patient, the USG of abdomen was done based on the American institute of Ultra sound in medicine practice guide lines[5] which includes imaging of appendix, USG machine(Sonoscape) with 2-5 MHz curvilinear transducer followed by using a linear array transducer 4-12 MHz and a standardized protocol involving graded compression technique described by puylaert.[6] Longitudinal and transverse images of the right lower quadrant were obtained. Compression sonography was performed with documentation of the appearance of the appendix during compression. A normal appendix compresses. The complete appendix was visualized including the tip. Doppler imaging was helpful to evaluate for hyperaemia however a necrotic appendix had decreased or no blood flow. The maximal outer wall diameter and wall thickness was measured along the course of appendix. The Ultra-sonographic (US) findings were retrospectively graded by using 5 (five) point scale:

Scale 1: Represented normal appendix

Scale 2: Indicated that Appendix was not seen but no inflammation changes or free fluid was evident.

Scale 3: Indicated that appendix was not seen but secondary sign of appendicitis were present such as faecolith, periceacal fluid or increased pericecal echogenicity consistent with infiltration of the mesenteric.

Scale 4: Represent identification of an appendix of border line enlarged size (5-6 mm)

Scale 5: Indicated acute appendicitis (AA) defined as an enlarged non-compressible appendix with an outer diameter greater than 6mm.

Findings graded 1 to 2 were classified as negative and 3 to 5 were graded as positive for AA. Original reports were reviewed and graded using the same criteria. US findings were compared with subsequent and pathological finding to determine the sensitivity and specificity of sonographic examination. Duration of study was from May-2019 to June-2021.

Statistical analysis: Various findings of USG, comparison with surgery or pathological findings were classified. The statistical analysis was carried out in SPSS software. The ratio of the male and female was 2:1.

This research paper was approved by Ethical Committee of Vedata Institute of Medical Science Dahanu-401606, Maharashtra.

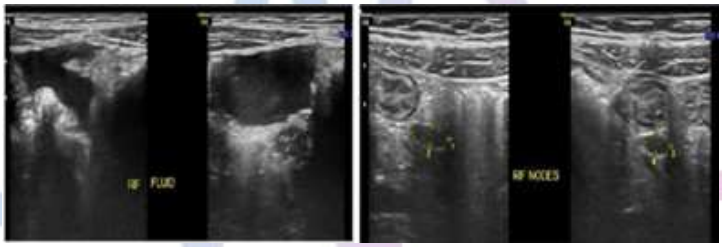

Figure 1: (A, B). 9 year female child with sonogram of right lower quadrant shows focal free fluid & lymph Nodes adjacent to the echogenic bowel loop. The Appendix is not seen (Grade 3).

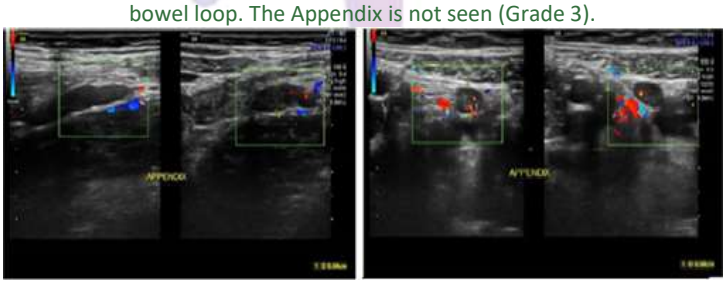

Figure 2: (C,D). Longitudinal & Transverse sonogram of the right lower quadrant in a 11 years old female child reveals border line enlarged appendix of thickness 5.8mm (Grade 4).

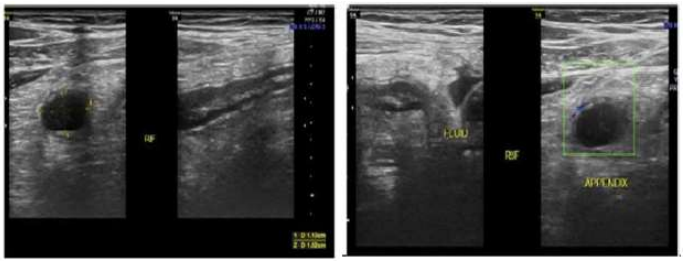

Figure 3: (E,F): E. Transverse & longitudinal Sonogram of the right lower quadrant in 27 years old Adult male shows a dilated, thickened non-compressible Appendix with an outer diameter of 11 mm suggestive of acute appendicitis. F. Transverse colour Doppler Image shows dilated appendix with increased flow in the wall (Grade 5).

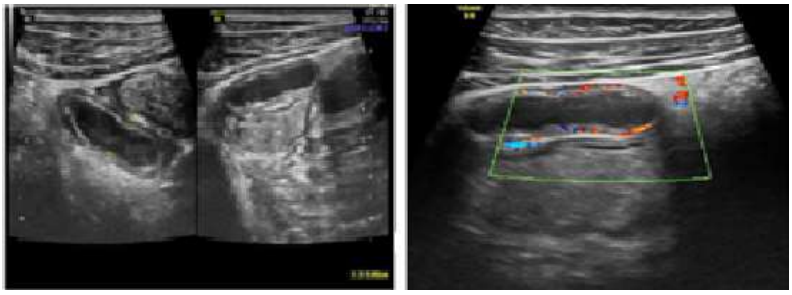

Figure 4: (G,H): G. Longitudinal sonogram of Subhepatic region in a 36 years old female shows findings of Subhepatic Acute Appendicitis. H. Colour Doppler image shows dilated appendix with increased flow in the wall (Grade 5).

OBSERVATION AND RESULTS

Table 1: Ultra-sonographic grading of Acute Appendicitis with references to age

US grade	1-10	11-20	21-30	31-40	41-50	> 50
1st	0	0	0	0	0	0
2nd	10	82	42	42	21	7
3rd	9	16	0	04	0	3
4th	0	20	8	8	0	0
5th	9	102	55	28	21	13
Total	**28**	**220**	**105**	**82**	**42**	**23**

Table 2: Comparison of sonographic diagnosis with surgical pathological findings in who had underwent surgery

Sonographic Diagnosis	Surgery		Total
	Negative	Positive	
Positive	4	332	336
Negative	132	32	164
Total	**136**	**364**	**500**

Findings graded 1 to 2 were classified as negative; grade 3 to 5 were classified as positive

Table 3: Results of Sonographic studies in acute appendicitis

Total No patients	Proven on Histopathology	True Positive	True Negative	False Positive	False Negative
500	252	332	132	32	4

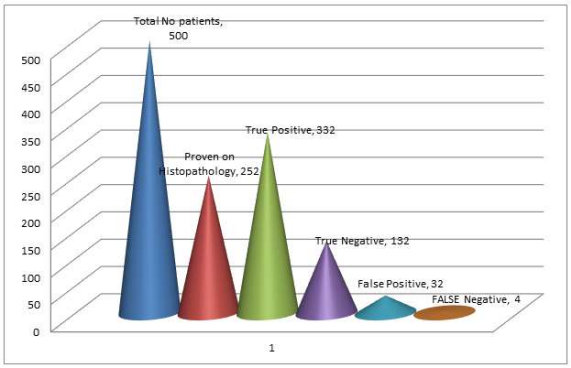

Table 1: Results of Sonographic studies in acute appendicitis

DISCUSSION

Present study of USG diagnosis for acute appendicitis (AA) in Maharashtra Population. In USG grade in 1-10 years of age, 10 cases had 2nd grade, 9 cases had 3rd grade, 9 had 5th grade. In 11-20 years of age, 82 had 2nd grade, 16 had 3rd grade, 20 had 4th grade, 102 had 5th grade. In 21-30 years of age,42 had 2nd grade, 8 had 4th grade, 55 had 5th grade. In 31-40 years of age, 42 had 2nd grade, 4 had 3rd grade, 8 had 4th grade, 28 had 5th grade. In 41-50 years of age, 21 cases 2nd grade, 21 were 5th grade. In > 50 years of age, 7 had 2nd grade, 3 had 3rd grade, 13 had 5th grade (Table-1). In the comparison of sonographic diagnosis

with surgical /pathological findings in the patients who underwent surgery were sonographic positive had 4 negative and 332 positive surgically. In negative findings sonographic study 132 negative 32 positive surgically was observed (Table-2). In the result of sonographic study of 500 patients 252 were proved histo-pathologically 332 true positive, 132 true negative, 32 false positive 4 false negative (Table-3) (Figure- 1, 2, 3 and 4). These findings are more or less in agreement with previous studies.[7,8,9] Appendix being a lymphoid organ is prominent in children as other lymphatic organs is not well developed in childhood. The length of the appendix is longer in children than adults. Appendix is popularly called as soldier of the abdomen because it moves towards the infections by changing its various positions and gets infected, inflamed probably due to luminal obstruction which may result from faecolitis lymphoid hyperplasia, foreign bodies parasites and primary neoplasm's or metastasis.[10] AA is commonly observed in children due greater length of appendix and lack of development of the omentum in young children. It has been suggested that the peak of development of lymphoid tissue which occurs during adolescent leads to an increased liability of the appendix to obstruct and so accounts for the high incidence of the disease.[11] A failure to recognise other presentations of AA will lead to a delay in diagnosis and increased patients morbidity. Patients with a retro-ceacalappendix or these presenting in the later months of pregnancy may have pain limited to the right flank or casto-vertebral angle. Male patients with a retro-ceacal appendix may complain of right testicular pain. Pelvic or retroileal locations of an inflamed appendix will have pain referred in pelvis, rectum, adnexia or rarely in the left lower quadrant, sub-caecal and pelvic supra-pubic pain and urinary frequency may predominate.[12] Pathologically AA is divided in to 3 types (1) Catarrhal appendicitis, (2) phlegmonous appendicitis, (3) gangrenous appendicitis. The Alvarado scores have been reported in numerous studies in paediatric and adult patients with AA.

SUMMARY AND CONCLUSION

The study of USG evaluation for AA will be quite useful to patients especially children and young female patients for whom the gonadal radiation dose should be kept to minimum exposure and for whom it is important to exclude who has ovarian and uterine complications that might mimic appendicitis in youngsters. AS USG study being fist line imaging modality and has limited sensitivity, hence under un-diagnosed AA CT scan image is mandatory moreover Clinical symptoms of AA must be correlated along with this study to finalise the diagnose.

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