

Ultra-sonographic study in diagnosis of appendicitis in costal Karnataka population

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Abstract

Background: Acute appendicitis (AA) is the most common indicator for emergency abdominal surgery. Early appendicitis may have typical symptoms hence it is difficult to differentiate for GIT, genitor-urinary and gynaecological condition hence radiological approach will confirm the AA. **Method:** 250 patients of AA of different age groups were studied. USG machine 2-5 MHz curvilinear transducer was used. Longitudinal and transducer images of right lower quadrant were obtained compression sonography was performed with documentation of the appearance of appendix was visualised including tip. USG findings were retrospectively graded by using five point scales. Grade-I and II 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 40 patients and more number of patients (108) were observed followed by 52 patients (27 5th grade) in 21-30 years of age and 41 patients (14 in 5th grade) in the years 31-40 years of age and least were 14 (6 were in 5th grade) in above 50 year sonographic negative were 2 and 166 were positive. Sonographic negative were 66 and 16 were positive, 126 (50.4%) proved histo-pathologically 166 (66.4%) true positive, 66 (26.4%) true negative, 16 (6.4%) were false positive, 2 (0.8%) false negative. **Conclusion:** Though CT has higher sensitivity and specificity but its ionising radiations have disadvantages especially in children and young adults hence USG imaging is safer, cost effective and affordable to lower middle class patients.

Keywords: USG = Ultra-sonography, MHz curvilinear transducer, AA=Acute appendicitis, USG grading scale, Karnataka

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INTRODUCTION

Acute Appendicitis (AA) is the most common indicator for emergency abdominal surgery. Early appendicitis may present itself atypically and it is difficult to distinguish from a myriad of gastro-intestinal, genito-urinary and gynaecological condition.¹ The diagnosis of AA is a constellation of history, physical examination coupled with laboratory investigation supplemented by selective focussed imaging. The role of diagnostic imaging USG in

diagnosing appendicitis is good but the accuracy of USG is operator (radiologist) dependent.² The base of appendix is connected to caecum, but its head can be placed in different situation to combat the infection. The diversity of situation is categorised into six locations: retrocecal, pelvic, subcecal, preileal, retroileal, and ectopic.³ Potential pitfalls in the sonographic diagnosis of AA include an incomplete investigation of the appendix resulting in failure to identify segmental or tip of appendicitis and over estimation of increased appendiceal diameter leading to a false positive diagnosis moreover anatomical variations can also complicate the diagnosis.⁴ Higher sensitivity and specificity CT is adequate however the ionising radiation is a disadvantage especially in children and young adults hence attempt was made to evaluate. The AA with USG studies so that it can be guide lines to radiologist for proper and ideal diagnose.

MATERIAL AND METHOD

250 patients of different age groups admitted in surgery department of Karwar Institute of Medical Sciences

Hospital and Tertiary Hospitals of District Karwar-581301, Karnataka were studied.

Inclusive 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 250 patients 14 were between 1 to 10 years of age, 108 were aged between 11-20 years, 52 were aged between 21-30, 41 were aged between 31-40, 21 were aged between 41-50, 14 were above 50 years of age, after detailed history and clinical examination. 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 2-5 MHz curvilinear transducer 4.12 MHz and a standardized protocol involving graded compression technique described by puylaet ⁽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 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 with course of appendix. The ultra

sonographic (USG) findings were retrospectively graded by using 5 (five) point scale.

Scale-I: Represented normal appendix

Scale-II: Indicated that appendix was not seen but no inflammation changing or free fluids were evident.

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

Scale-IV: Fat represent identification of an appendix of border line enlarged size (5-6 mm).

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

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 same criteria. USG findings were compared with subsequence and pathological findings to determine the sensitivity and specificity of sonographic examination. Duration of study was June-2017 to July-2021.

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

This research paper was approved by Ethical committee of Karwar Institute of Medical Sciences Karwar-581301 Karnataka

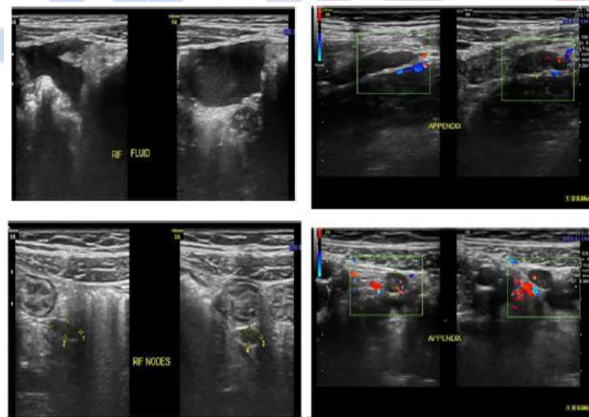


Figure 1

Figure 2

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).

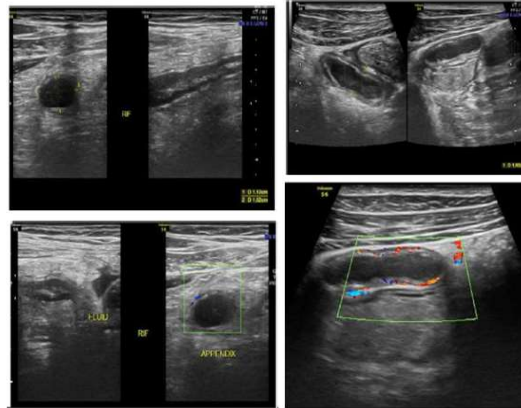


Figure 3

Figure 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 reference age group. In 1-10 year age group had zero, in first grade 5 in 2nd grade 4 in 3rd grade zero in 4th grade 4 in 5th grade. In 11-20 years of zero in 1st grade, 41 in 2nd grade, 17 in 3rd grade, 10 in 4th grade, 42 in 5th grade. In 21-30 years of age – zero in 1st grade, 21 in 2nd grade, zero in 3rd grade, 4 in 4th grade, 27 in 5th grade. In 31-40 years of age – zero in 1st grade, 21 in 2nd grade, 2 in 3rd grade, 4 in 4th grade, 14 in 5th grade. In 41-50 years of age – zero in 1st grade, 11 in 2nd grade, zero in 3rd and 4th grade, 10 in 5th grade. Above 50 years of age – zero in 1st grade, 6 in 2nd grade, 2 in 3rd grade, zero in 4th grade, 6 in 5th grade

Table 1: Ultra sonographic grading of Acute appendicitis with reference to age

US grade	1-10	11-20	21-30	31-40	41-50	> 50
1 st	0	0	0	0	0	0
2 nd	5	41	21	21	11	6
3 rd	4	17	0	2	0	2
4 th	0	10	4	4	0	0
5 th	4	40	27	14	10	6
Total	14	108	52	41	21	14

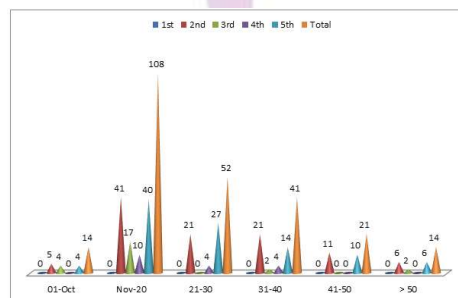


Table 1: Ultra sonographic grading of Acute appendicitis with reference to age

Table-2: Comparison of sonographic diagnosis with surgical, pathological findings in who had underwent surgery. 2 were negative, 166 were positive, 66 were negative, 16 were positive 66 were negative, 16 were positive

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

Sonography	Surgery		Total
	Negative	Positive	
Positive	2	166	168
Negative	66	16	82
Total	68	182	250

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

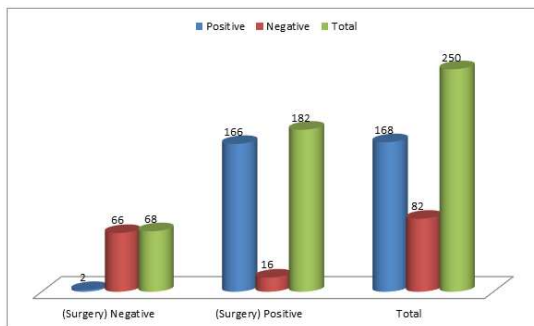


Table 2: Comparison of sonographic diagnosis with surgical pathological findings in who had underwent surgery (Graded 1 and 2 were classified as negative grade, 3 to 5 were classified as positive)

Table-3: Results of sonographic study in acute appendicitis 126 (50.4%) were proved histo-pathologically, 166 (66.4%) were true positive, 66 (26.4%) were true negative, 16 (6.4%) were false positive, 2 (0.8%) false negative.

Table 3: Results of Sonographic studies on acute appendicitis

Total No. of Patients	Proved Histo pathology	True Positive	True Negative	False Positive	False Negative
250	126 (50.4%)	166 (66.4%)	66 (26.4%)	16 (6.4%)	2 (0.8%)

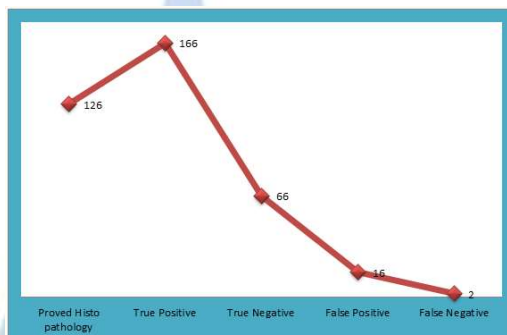


Table 3: Results of Sonographic studies on acute appendicitis

DISCUSSION

Present USG study in diagnosis of AA in south Karnataka population. In 1-10 years of age group, 2nd grade had 5, 3rd grade had 4 and 5th grade had also 4 AA patients. In 11-20 age group 41 patients were in 2nd grade, 17 in 3rd grade, 10 in 4th, 40 in 5th grade. In age group between 21-30, 21 patients in 2nd group, 4 in 4th group, 27 in 5th group. In 31-40 years of age group 21 patients were in 2nd grade 4 were 4th grade, 14 were in 5th grade. In 41-50 age group 11 were in 2nd grade and 10 were in 5th grade. Above 50 age group, 6 were in 2nd grade, 2 were 3rd grade, 6 were in 5th grade (Table-1). In comparison of sonographic diagnosis with surgical pathological findings in who had underwent surgery. In sonographic study 2 were negative, 166 were positive, 66 were negative, 16 were positive (Findings graded 1 to 2 were classified as positive) (Table-2). The results of USG studies were out 250 patients 126 (50.4%) proved AA histo pathologically 166 (66.4%) were true positive, 66 (26.4%) were true negative, 16 (6.4%) were false positive, 2 (0.8%) were false negative (Table-3). These findings are more or less in agreement with previous studies.^{7,8,9} Appendix being a lymphoid organ is prominent

in children because other lymphatic organs are not well developed in child hood. The length of the appendix is longer in children than adults. Appendix is popularly called as soldier of 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 to greater length of appendix and lack of the development of 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 delay in diagnosis and increased patients morbidity. Patients with retro-cecal AA or those presenting in the later months of pregnancy may have pain limited to the right flank or costo-vertebral angle. Male patients with a retro-cecal 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-cecal and pelvic suprapubic pain and urinary frequency may predominate.¹² Physical examination reveals generally soft abdomen with localised tenderness at or about MC Burney's point. Pathological AA is divided into 3 types (1) Catarrhal appendicitis (2) Phlegmous appendicitis (3) gangrenous appendicitis. The laboratory markers for the diagnosis of AA include elevation of WBC, C-reactive protein the proportion of polymorpho nuclear cells, and urine analysis is abnormal in 19% to 40% of patients with AA. Abnormalities include pyria, bacteriuria and haematuria.¹³

SUMMARY AND CONCUSSION

AA is the commonest acute abdominal condition, requiring emergency surgery. As AA is predominantly prevail in children and young adults USG is quite safer technique to confirm the diagnose because imaging radiations of CT or MRI will have adverse impact on viscera of growing children. USG and co-morbid clinical symptoms of AA will be an ideal approach to treat AA surgically or conservatively.

Limitation of Study: Owing to tertiary location of hospital, limited number of patients we have limited findings.

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