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Original Research Article

Role of modified Alvarado scoring system and USG abdomen in acute appendicitis: an overview

Rajkishore Singh[1]*, Rajiv Singh[2], Kulwant Singh[2]

[1]Department of Surgery, Government Medical College, Rajnandgaon, Chhattisgarh, India
[2]Department of Surgery, People's College of Medical Science and Research Center, Bhopal, India

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***Correspondence:**
Dr. Rajkishore Singh,
E-mail: ra5555@rediffmail.com

ABSTRACT

Background: Acute appendicitis is the most common cause of an 'acute abdomen' in young adults and, as such, the associated symptoms and signs have become a paradigm for clinical teaching. Appendicitis is sufficiently common that appendicectomy (termed appendectomy in North America) is the most frequently performed urgent abdominal operation and is often the first major procedure performed by a surgeon in training. In this study we correlate the usefulness of Modified Alvarado scoring system(MASS) and ultrasonography(USG) in management of acute appendicitis.
Methods: The study was done on 60 patients of symptomatic appendicitis, requiring management accordingly, attending surgical OPD of People's College of Medical Sciences(PCMS) and Research Centre, Bhopal, India from 1st October 2011 to 30th August 2013. The study includes 60 patients between 5-60 yrs of age. They were prospectively evaluated on admission using the modified Alvarado Score to determine whether or not they had acute appendicitis, all equivocal cases were subjected to ultrasonography examination. The score and ultrasonography were correlated with the operative and histological findings.
Results: All 60 patients underwent surgery. The sensitivity of the modified Alvarado score was 89.65% and sensitivity of USG was 91.37%, out of 60 cases of acute appendicitis male were 36 and remaining 24 cases were female. So, it showed sex ratio of 36:24, 3:2 which correlate with literature and other studies. With use of both MASS and USG as diagnostic tool, out of 60 cases 57 cases were positive and with the help of histopathology, it was confirmed in 58 cases.
Conclusions: The modified Alvarado scoring system is a good diagnostic indicator for acute appendicitis. It helps in minimizing the rates of negative appendicectomy. It can be used as an adjunct to surgical decision-making along with ultrasonography in doubtful cases. When combined, modified Alvarado score and ultrasonography can work very effectively in diagnosing acute appendicitis(AA) correctly and in reducing the number of negative appendicectomy.

Keywords: Acute appendicitis, Alvarado score, Appendicectomy, Histopathology, Ultrasonography

INTRODUCTION

It is going without saying that the abdomen is a magic box and poses new surprise to the surgeon each time. As the abdomen accommodates innumerable viscera and other anatomical compliments, diseases of the abdomen constitute an area full of clinical curiosity. Acute appendicitis is common and affects one in seven persons. The diagnosis of appendicitis can be difficult. Delays in diagnosis complicate the illness.[1] Obstruction of the proximal lumen by fibrous bands, lymphoid hyperplasia, fecoliths, calculi, or parasites has long been considered to

be the major cause of acute appendicitis, though that theory is doubted by many experts. Evidence of temporal and geographic clustering of cases has suggested a primary infectious aetiology. A fecolith or calculus is found in only 10% of acutely inflamed appendices.[2]

Clinical manifestations

Symptom, signs and laboratory findings: abdominal pain is the prime symptom of acute appendicitis. Anorexia nearly always accompanies appendicitis. Although vomiting occurs in nearly 75% of patients. Most patients give a history of obstipation beginning before the onset of abdominal pain. Diarrhoea occurs in some patients, however, particularly children, so that the pattern of bowel function is of little differential diagnostic value. Temperature elevation is rarely >1°C (1.8°F) and the pulse rate is normal or slightly elevated.

Tenderness often is maximal at or near the McBurney point. Direct rebound tenderness usually is present. The Rovsing sign-pain in the right lower quadrant when palpatory pressure is exerted in the left lower quadrant-also indicates the site of peritoneal irritation. Cutaneous hyperesthesia in the area supplied by the spinal nerves on the right at T10, T11, and T12. Mild leukocytosis, ranging from 10,000 to 18,000 cells/mm3, usually is present in patients with acute, uncomplicated appendicitis and often is accompanied by a moderate polymorphonuclear predominance. White blood cell counts are variable, however.[3]

The Alvarado score is a clinical scoring system used in the diagnosis of appendices. The score has 6 clinical items and 2 laboratory measurements with a total 10 points. It was introduced in 1986 and although meant for pregnant females, it has been extensively validated in the non-pregnant population. The modified Alvarado score is at present in use. The two most important factors, tenderness in the right lower quadrant and leukocytosis, are assigned two points, and the six other factors are assigned one point each, for a possible total score of ten points. A score of 5 or 6 is compatible with the diagnosis of acute appendicitis.

Table 1: Alvarado scale for the diagnosis of appendicitis.

	Manifestations	Value
Symptoms	Migration of pain	1
	Anorexia	1
	Nausea and/or vomiting	1
Signs	Right lower quadrant tenderness	2
	Rebound	1
	Elevated temperature	1
Laboratory values	Leukocytosis	2
	Left shift in leukocyte count	1
	Total points	10

A score of 7 or 8 indicates a probable appendicitis, and a score of 9 or 10 indicates a very probable acute appendicitis. The original Alvarado score describes a possible total of 10 points, but those medical facilities that are unable to perform a differential white blood cell count, are using a Modified Alvarado Score with a total of 9 points which could be not as accurate as the original score.[4] The likelihood of appendicitis can be ascertained using the Alvarado scale (Table 1). Among patients with abdominal pain, ultrasonography has a sensitivity of about 85% and a specificity of more than 90% for the diagnosis of acute appendicitis.

Sonographic findings consistent with acute appendicitis include an appendix of 7 mm or more in anteroposterior diameter, a thick-walled, non-compressible luminal structure seen in cross section referred to as a target lesion, or the presence of an appendicolith. Disadvantages of ultrasonography include operator-dependent accuracy and difficulty interpreting the images by those other than the operator.[5] The purpose of this study is to use a 2-dimensional scoring system evaluating the diagnostic accuracy of modified Alvarado Scoring System and USG abdomen in clinical practice for acute appendicitis in patients coming to department of surgery People's Hospital, Bhopal India.

METHODS

Patient coming to dept. of surgery, PCMS, Bhopal from 1st October 2011 to 30th August 2013 with acute abdomen. The study includes 60 patients between 5-60 yrs of age, they were prospectively evaluated on admission using the Alvarado Score to determine whether or not they had acute appendicitis. All equivocal cases were subjected to ultrasonographic examination. The score was correlated with the operative and histological findings.

Study variables were age (5 yrs- 60 yrs), sex (M/F), tenderness in right lower abdomen, raised temperature, duration of pain.

Inclusion criteria

- Patients of both sex (M/F)
- Patients aged > 5 years and < 60 years
- Patients presented with right lower quadrant pain
- Duration of pain less than 72 hrs.

Exclusion criteria

- Patients with clinical signs of appendicular lump/abscess/other problem
- Patients who has underwent operation for appendicectomy.

Modified Alvarado score

- Group A (9-7): Acute appendicitis definite

- Group B (5-6): Acute appendicitis probable
- Group C (1-4): acute appendicitis very unlikely.

Procedure to analyze data, Statistical analysis. Follow up: for histopathological report.

RESULTS

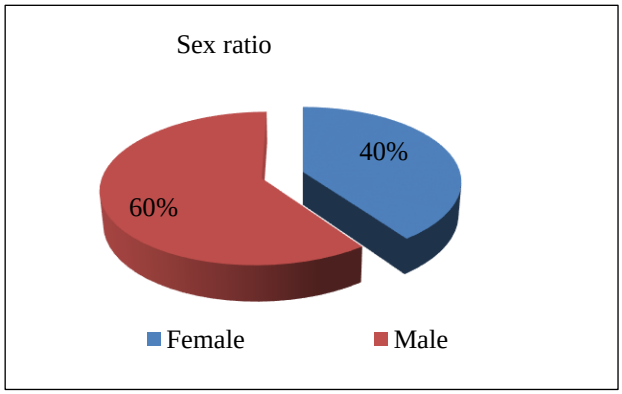

Figure 1: Gender distribution.

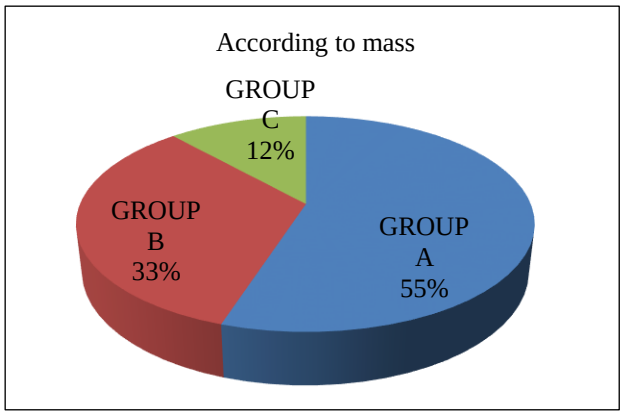

Figure 2: No. of case distribution.

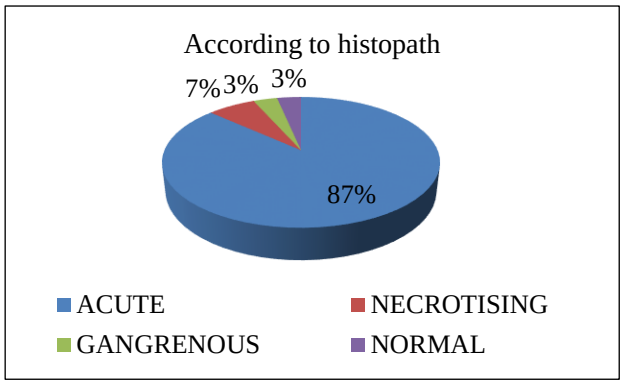

Figure 3: Confirmation outcome of acute abdomen with the help of HPE.

Out of 60 cases, Figure 1 shows gender distribution of acute appendicitis and Figure 2 shows number of case distribution based on modified Alvarado score rating. Figure 3 shows the confirmation outcome of acute abdomen with the help of histopathological investigation (HPE) and Figure 4 showed the outcome of ultrasonography as acute appendicitis.

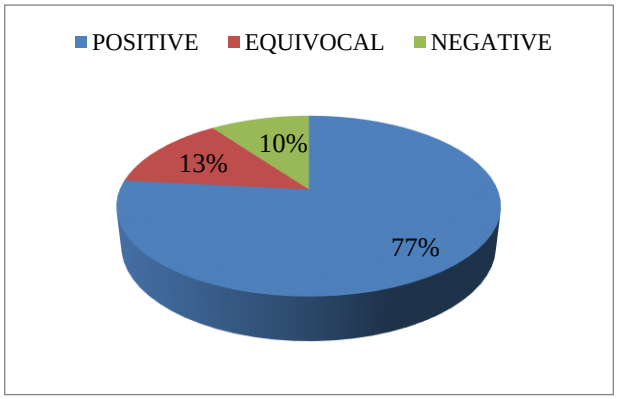

Figure 4: Outcome of ultrasonography as acute appendicitis.

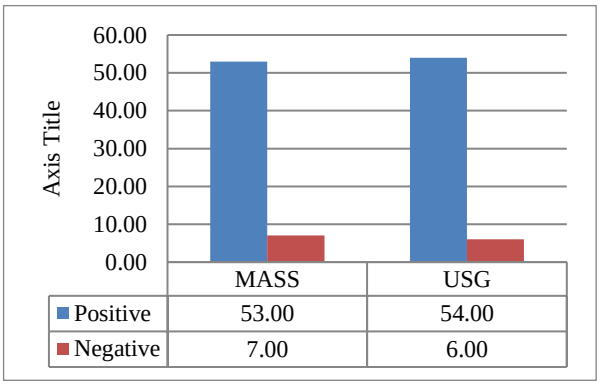

Figure 5: Statistical analysis of modified Alvarado score system verses USG confirmation of acute appendicitis.

Figure 5 shows the statistical analysis of modified Alvarado score system verses ultrasonological confirmation of acute appendicitis and Figure 6 shows statistical result of MASS verses histopathological outcome of acute abdomen as acute appendicitis.

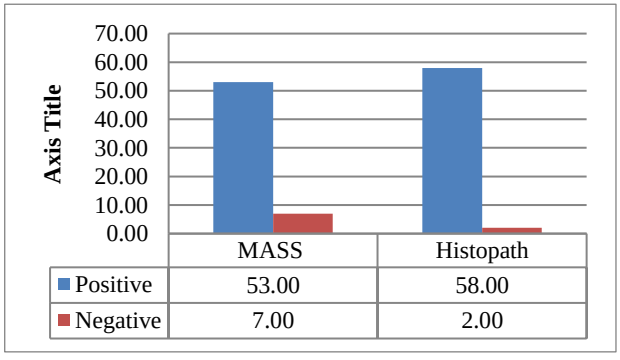

Figure 6: Statistical result of MASS verses histopathological outcome of acute abdomen as acute appendicitis.

The Figure 7 shows statistical analysis of USG and histopathological investigation in case of acute appendicitis and Figure 8 showed the statistical analysis and correlation of combined MASS and USG with histopathological examination, in confirmation of diagnosis.

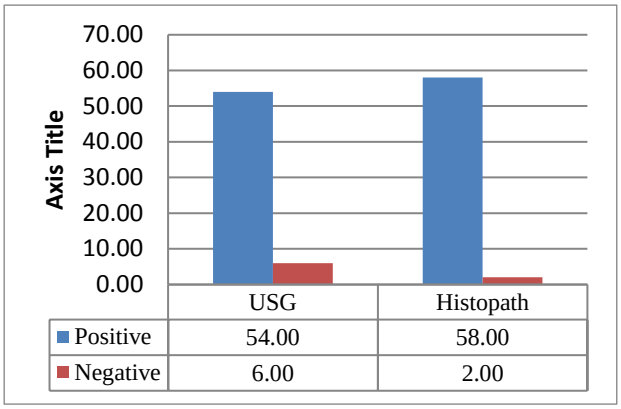

Figure 7: Statistical analysis of USG and histopathological investigation in case of acute appendicitis.

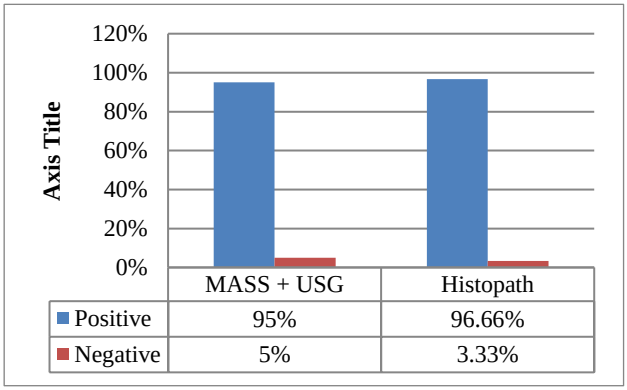

Figure 8: Statistical analysis and correlation of combined MASS and USG with histopathological examination, in confirmation of diagnosis.

Statistical analysis

The statistical analysis was done to determine the sensitivity and specificity of the modified Alvarado score and ultrasonography. The positive and negative predictive values were also calculated. The histopathological examination was considered confirmatory of the diagnosis. Both the variables of the score and ultrasonography were compared with histopathology and the results were obtained.

Statistical analysis- modified Alvarado score

- Sensitivity- 89.65%
- Specificity- 50%
- Positive predictive value- 98.11%
- Negative predictive value- 14.28%.

Statistical analysis- USG

- Sensitivity- 91.37%
- Specificity- 50%
- Positive predictive value- 98.14%
- Negative predictive value- 16.66%.

DISCUSSION

Acute appendicitis is the most common surgical emergency in developed countries. Its incidence has fallen over the last three decades. About one in six of the population undergo appendicectomy. It is rare before the age of 2 years, reaches maximal incidence in childhood and declines thereafter with increasing age.[6]

In the study of 60 cases of acute Appendicitis we see that males are more prone to this condition than females. Out of 60 cases 42% were females and 58% were males. And this result also corresponds to the epidemiological incidences given in the textbooks. The results of this study show that prevalence of Acute Appendicitis is higher in age group between 16 to 30 yrs which showed maximum number that is 32 out of 60 cases.

According to Modified Alvarado Scoring System in 60 cases of acute appendicitis Group A with score between 7-9 had maximum incidence in 32 cases (52%). A number of clinical and laboratory-based scoring systems have been devised to assist diagnosis. The most widely used is the Alvarado score (Table 1). A score of 7 or more is strongly predictive of acute appendicitis.[7]

According to USG as diagnostic tool positive cases were 77%, equivocal were 13% and negative cases were 10%. Abdominal ultrasound examination is more useful in children and thin adults, particularly if gynecological pathology is suspected, with a diagnostic accuracy in excess of 90%.[8] A recent meta-analysis of 14 prospective studies showed ultrasound to have a sensitivity of 0.86 and a specificity of 0.81.[9]

With the use of MASS as diagnostic tool, Acute Appendicitis were positive in 53 cases, whereas in histopathological study 58 cases were confirmed to have pathology. With use of USG as diagnostic tool total number of positive cases of Acute appendicitis were 54 and histopathological study confirmed to have acute appendicitis in 58 cases. Some studies have reported that graded compression sonography improved the diagnosis of appendicitis over clinical examination, specifically decreasing the percentage of negative explorations for appendectomies from 37 to 13%.[10]

With use of both MASS and USG as diagnostic tool, out of 60 cases 57 cases were positive and with the help of histopathology it was confirmed in 58 cases. Although acute appendicitis is the most common abdominal surgical emergency, the diagnosis can be extremely difficult at times. Abdominal ultrasound examination is

more useful in children and thin adults, particularly if gynecological pathology is suspected, with a diagnostic accuracy in excess of 90%.[11] According to current study and other case series it is proved that MASS and USG play a key role in management of acute appendicitis. So, it can be stated that the diagnosis of acute appendicitis can be made more accurately with the help of modified Alvarado scoring system and ultrasonography and they also help in reducing the incidence of negative appendicectomy. The below flowchart showed the role of modified Alvarado scoring system and USG abdomen in acute appendicitis in our study.

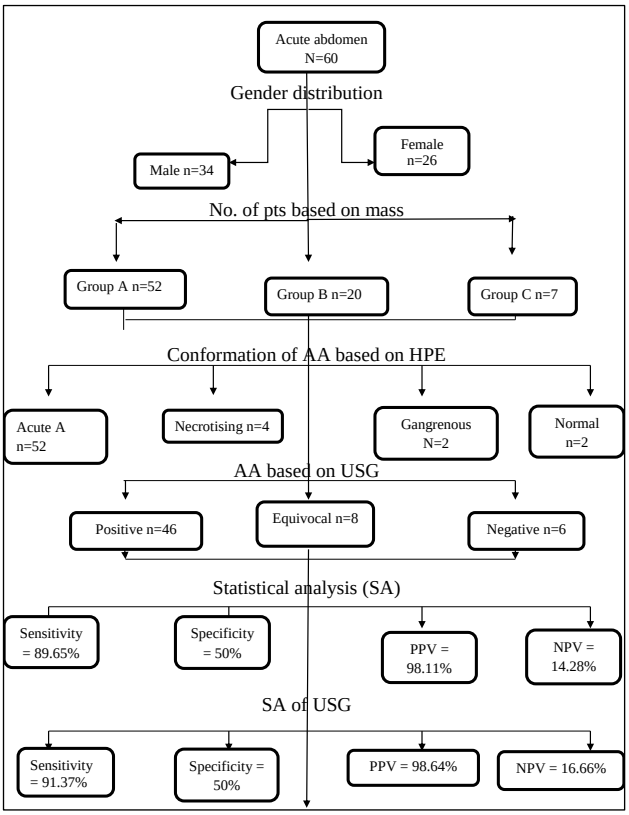

Figure 9: Role of modified Alvarado scoring system and USG abdomen in acute appendicitis.

CONCLUSION

A high rate of negative appendectomy is undesirable. Removal of a normal appendix is associated with all the usual postoperative complications. Additionally, patients can suffer late complications such as adhesive intestinal obstruction. Considerable efforts are being made to improve diagnostic accuracy and prevent unnecessary appendicectomies using the Modified Alvarado Scoring System and imaging modality like ultrasonography.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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