



Research Article

A Prospective Comparative Study of Alvarado Score and Ultrasound Imaging in the Diagnosis of Acute Appendicitis

Dr Sunil Kumar Patil¹, Dr Prashanth kumar²

¹Assistant professor, Department of general surgery, Navodaya medical College, Raichur

²General surgeon, Department of general surgery, Kushal hospital Bidar



Corresponding Author:

Dr Sunil Kumar Patil

Assistant professor, Department of
general surgery, Navodaya medical
College, Raichur

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ABSTRACT

Appendicitis is inflammation of the appendix. Symptoms commonly include right lower abdominal pain, nausea, vomiting, and decreased appetite. However, approximately 40% of people do not have these typical symptoms. Severe complications of a ruptured appendix include widespread, painful inflammation of the inner lining of the abdominal wall and sepsis [1]. Most of the appendicitis patients were in the age group of 31-40 years followed by 41-50 year age group. In the present study 60% of the cases were male and 40% cases were belongs to female gender. Of the 50 patients, 16 patients had score below 7 in which 12 patients had score between 5-7 and 4 patients had score between 1-4. USG showed 50% sensitivity, 50% specificity, 75% positive predictive value, 25% negative predictive value and 50% accuracy in Alvarado score of 1-4. In the score range of 5-7, USG showed 95.24% sensitivity, 100% specificity, 100% positive predictive value, 50% negative predictive value and 95.45% accuracy. In the score of more than 7, USG showed 67.80% sensitivity, 100% specificity, 100% positive predictive value, 66.67% negative predictive value and 68.33% accuracy.

Keywords: Alvarado score, ultrasound, acute appendicitis.

INTRODUCTION

Appendicitis is inflammation of the appendix. Symptoms commonly include right lower abdominal pain, nausea, vomiting, and decreased appetite. However, approximately 40% of people do not have these typical symptoms. Severe complications of a ruptured appendix include widespread, painful inflammation of the inner lining of the abdominal wall and sepsis [1]. Appendicitis is caused by a blockage of the hollow portion of the appendix. This is most commonly due to a calcified "stone" made of feces. Inflamed lymphoid tissue from a viral infection, parasites, gallstone, or tumors may also cause the blockage. This blockage leads to increased pressures in the appendix, decreased blood flow to the tissues of the appendix, and bacterial growth inside the appendix causing inflammation. The combination of inflammation, reduced blood flow to the appendix and distension of the appendix causes tissue injury and tissue death. If this process is left untreated, the appendix may burst, releasing bacteria into the abdominal cavity, leading to increased complications [2]. The diagnosis of appendicitis is largely based on the person's signs and symptoms. In cases where the diagnosis is unclear, close observation, medical imaging, and laboratory tests can be helpful. The two most common imaging tests used are an ultrasound and computed tomography (CT scan). CT scan has been shown to be more accurate than ultrasound in detecting acute appendicitis. However, ultrasound may be preferred as the first imaging test in children and pregnant women because of the risks associated with radiation exposure from CT scans [3]. Abdominal ultrasonography, preferably with dopplersonography, is useful to detect appendicitis, especially in children. Ultrasound can show the free fluid collection in the right iliac fossa, along with a visible appendix with increased blood flow when using color Doppler, and non compressibility of the appendix, as it is essentially walled-off abscess. Other secondary sonographic signs of acute appendicitis include the presence of echogenic mesenteric fat surrounding the appendix and the acoustic shadowing of an appendicolith [4, 5]. In some cases (approximately 5%), ultrasonography of the iliac fossa does not reveal any abnormalities despite the presence of appendicitis. This false-negative finding is especially true of early appendicitis before the appendix has become significantly distended. Also, false-negative findings are more common in adults where larger amounts of fat and bowel gas make visualizing the appendix technically difficult.

Despite these limitations, sonographic imaging with experienced hands can often distinguish between appendicitis and other diseases with similar symptoms. Some of these conditions include inflammation of lymph nodes near the appendix or pain originating from other pelvic organs such as the ovaries or Fallopian tubes. Ultrasounds may be either done by the radiology department or by the emergency physician [4]. Several scoring systems have been developed to try to identify people who are likely to have appendicitis. The performance of scores such as the Alvarado score and the Pediatric Appendicitis Score, however, are variable [5]. The Alvarado score is the most known scoring system. A score below 5 suggests against a diagnosis of appendicitis, whereas a score of 7 or more is predictive of acute appendicitis. In a person with an equivocal score of 5 or 6, a CT scan or ultrasound exam may be used to reduce the rate of negative appendectomy [6].

Alvarado score	
Migratory right iliac fossa pain	1 point
Anorexia	1 point
Nausea and vomiting	1 point
Right iliac fossa tenderness	2 points
Rebound abdominal tenderness	1 point
Fever	1 point
High white blood cell count (leukocytosis)	2 points
Shift to left (segmented neutrophils)	1 point
Total score	10 points

OBJECTIVE

A Prospective Comparative Study of Alvarado Score and Ultrasound Imaging in the Diagnosis of Acute Appendicitis

METHODOLOGY

Fifty patients suspected of suffering from acute appendicitis warranting emergency surgery for the same were evaluated from Jan 2018 to July 2018 at tertiary care center. The scoring system used by Alvarado and USG imaging was used

RESULTS

Table 1: Age Wise Distribution of Cases

Age Group	No. of Patients	Percentage (%)
21-30	03	06
31-40	18	36
41-50	16	32
51-60	09	18
61-70	03	06
71-80	02	04

Most of the appendicitis patients were in the age group of 31-40 years followed by 41-50 year age group.

Table 2: Gender Wise Distribution of Cases

SEX	No. of patients	%
Female	20	40
Male	30	60
Total	90	100.0

In the present study 60% of the cases were male and 40% cases were belongs to female gender.

Table 3: Alvarado Score of Patients Studied

Alvarado score	No. of patients	%
1-4	4	8
5-7	12	24
>7	34	68
Total	50	100.0

Of the 50 patients, 16 patients had score below 7 in which 12 patients had score between 5-7 and 4 patients had score between 1-4.

Table 4: USG Imaging of Patients Studied

USG Imaging	No. of patients	%
Acute appendicitis	34	68
Normal study	16	32
Total	50	100.0

USG showed 50% sensitivity, 50% specificity, 75% positive predictive value, 25% negative predictive value and 50% accuracy in Alvarado score of 1-4. In the score range of 5-7, USG showed 95.24% sensitivity, 100% specificity, 100% positive predictive value, 50% negative predictive value and 95.45% accuracy. In the score of more than 7, USG showed 67.80% sensitivity, 100% specificity, 100% positive predictive value, 66.67% negative predictive value and 68.33% accuracy.

DISCUSSION

Most of the appendicitis patients were in the age group of 31-40 years followed by 41-50 year age group. In the present study 60% of the cases were male and 40% cases were belongs to female gender. Of the 50 patients, 16 patients had score below 7 in which 12 patients had score between 5-7 and 4 patients had score between 1-4. USG showed 50% sensitivity, 50% specificity, 75% positive predictive value, 25% negative predictive value and 50% accuracy in Alvarado score of 1-4. In the score range of 5-7, USG showed 95.24% sensitivity, 100% specificity, 100% positive predictive value, 50% negative predictive value and 95.45% accuracy. In the score of more than 7, USG showed 67.80% sensitivity, 100% specificity, 100% positive predictive value, 66.67% negative predictive value and 68.33% accuracy.

Ultrasonography is often used as the initial diagnostic imaging study in the majority of patients in whom the clinical diagnosis of appendicitis is equivocal. Ultrasound is non invasive and rapidly available and avoids radiation exposure [7, 8].

Deutsch et al. was the first to report ultrasonic visualization of an inflamed appendix, in 1981, in a child suffering from acute leukemia. Abdominal ultrasound examination is more useful in children and in thin adults, particularly if gynaecologic pathology is suspected, with a diagnostic accuracy in excess of 90% [9]

Jeffrey et al. studied 250 cases of acute appendicitis and laid down sonographic criteria for diagnosis [10].

the sensitivity and specificity of ultrasonography for diagnosing appendicitis was 95% and 89% respectively [11]. Jeffrey et al, in a study, pointed out the sonographic pitfalls in the diagnosis of acute appendicitis, in which they observed that a dilated fallopian tube or hypertrophied fibers of the psoas muscle could be mistaken for a target lesion, while a gas containing appendix could be mistaken for a bowel loop. The classical signs and symptoms of acute appendicitis were first reported by Fitz in 1886. The Alvarado score was described in 1986 and has been validated in adult surgical practice. The classical Alvarado score included left shift of neutrophil maturation yielding a total score of 10 [12]. Kalan et al. omitted the left shift of neutrophil maturation parameter and produced a modified score. The modified Alvarado score yields a total of 9. Patients with a score of 1-4 are considered unlikely to have acute appendicitis. Patients with a score of 5-6 have possible diagnosis of acute appendicitis, notconvincing enough to have urgent surgery. Those with a score of 7 – 9 are regarded as patients with acute appendicitis.

CONCLUSION

Alvarado score and USG imaging both are good diagnostic tool for predicting acute appendicitis in classical presentation of acute appendicitis. In patients whose clinical scoring falls between 5 and 7, it is recommended to consider emergency appendectomy. It is recommended to proceed with emergency appendectomy in all patients both men and women whose clinical score is more than 7. With the score less than 4, Alvarado score and USG imaging is not a good clinical

diagnostic system for exclusion or predicting acute appendicitis. Patients in this group need further diagnostic tests to exclude acute appendicitis.

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