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A prospective comparative study of Alvarado score and ultrasound imaging in the diagnosis of acute appendicitis

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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 doppler sonography, 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.

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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].

Graded compression ultrasonography performed in 139 patients, 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, not

convincing 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.

References

1. Appendicitis. Medical Dictionary. Merriam-Webster. Archived from the original on 2013-12-30.
2. Graffeo CS, Counselman FL (November). Appendicitis. Emergency Medicine Clinics of North America 1996;14(4):653-71.
3. Hobler K. (spring). Acute and Suppurative Appendicitis: Disease Duration and its Implications for Quality Improvement (PDF). Permanente Medical Journal 1998;2(2).
4. Paulson EK, Kalady MF, Pappas TN. Clinical practice. Suspected appendicitis (PDF). The New England Journal of Medicine 2003;348(3):236-42.
5. Ferri Fred F. Ferri's differential diagnosis: a practical guide to the differential diagnosis of symptoms, signs, and clinical disorders (2nd ed.). Philadelphia, PA: Elsevier/Mosby. pp. Chapter A 2010.
6. Longo Dan L, *et al.* eds. Harrison's principles of internal medicine (18th ed.). New York: McGraw-Hill 2012, 300.
7. Shaffer HA, Harrison RB. Gas in the appendix: A sometimes significant but nonspecific diagnostic sign. Arch Surg 1979;114:587-89.
8. Chen SC, Chem KM, Wong SM. Abdominal sonography screening of clinically diagnosed suspected appendicitis before surgery. World J Surg 1998;22:449-452.
9. Puylaert JBCM. Acute appendicitis: Ultrasound evaluation using graded compression. Radiology 1986;158:355-360.
10. Puig S, Homsann M, Rehbhandl W. Ultrasound as a primary diagnostic tool in relation to negative appendectomy: Six years experience. Radiology 2003;226:101-104.
11. Deutsch A, Leopold GR. Ultrasonic visualization of inflamed appendix; Case report. Radiology 1981;140:163-64
12. Khan I, Ur Rehman A. Application of alvarado scoring system in diagnosis of acute appendicitis. J Ayub Med Coll Abbottabad 2005;17:41-4.