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COMPARISON OF ALVARADO SCORE EVALUATION AND CLINICAL JUDGMENT IN ACUTE APPENDICITIS

General Surgery

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ABSTRACT

Background: Diagnosis of appendicitis continues to be an issue in surgeon's lives. Despite the wide availability diagnostic methods, clinical dilemma persists. An ideal diagnostic tool helps avoid unnecessary surgeries without missing on potential complications.
Methods: Current study evaluates the efficacy of Modified Alvarado Scoring System along with ultrasonography as a pre-operative diagnostic tool in acute appendicitis, in correlation with operative and histopathological findings.
Results: Out of the 50 cases the 66% males predominated over 33% females. Histopathological examination with Ultrasonogram made in patients with ≥7 and <7 Alvarado score is useful in identifying the missed-out cases thereby preventing diagnostic delay. By this 36 patients are positive out of 50 in this study.
Conclusions: By this study, we conclude that in beginning the diagnosis in patients suspected of having acute appendicitis, histopathological methods is better compared to USG and Alvarado scoring system. All the three methods were used for diagnosis of acute appendicitis diagnostic accuracy.

KEYWORDS

Appendicitis, Alvarado, Histopathological, Ultrasonography, Clinical scoring systems.

INTRODUCTION

Acute appendicitis (AA) is the most common surgical abdominal emergency diagnosis, occurring in 10% of the general population; nevertheless, it remains a diagnostic problem [1, 2]. Several clinical indices and laboratory diagnostic tests can lead to an exact diagnosis [3] which is of significant value in choosing the appropriate clinical and surgical treatment [4]. Simple appendicitis can progress to perforation, which is associated with a much higher morbidity and mortality, and surgeons have therefore been inclined to operate when the diagnosis is probable rather than wait until it is certain [5].

The appendix is a wormlike extension of the cecum. Appendicitis is inflammation of the inner lining of the vermiform appendix that spreads to its other parts. This surgical condition may occur for several reasons, such as an infection of the appendix, but the most important step is the obstruction of the appendiceal lumen [6]. Appendicitis is a very common disease with a lifetime prevalence of 7-8% [7, 8]. Its incidence is 1.5-1.9/1000 in male and female population [9].

Appendix usually referred as a vestigial organ with no known function is now considered as a specialized part of gastro intestinal tract with concentration of lymphoid tissue. It is an integral part of gut associated lymphoid tissue (GALT). Appendix is useful in reconstructive biliary, tubal and urological surgery. Negative appendicectomy therefore robs the patient of a useful asset and also has a morbidity of 15%[10]. There are study shows Alvarado scoring system reduces the number of negative appendecectomies patients' history and physical examination is very important for proper diagnosis[11,12].

Appendicitis is one of the most common surgical emergencies, and it is one of the most common causes of abdominal pain[11,12]. Surgery for acute appendicitis is the most frequent operation performed (10% of all emergency abdominal operations). The diagnosis of acute appendicitis is purely based on history, physical examination and few laboratory investigations (such as complete blood count, and urinalysis)[11]. Differential diagnosis and management of patient presenting with right iliac fossa pain is a continuing surgical challenge. Difficulty in diagnosis of acute appendicitis arises in very young, elderly patients and females of reproductive age because they usually have atypical presentation and many simulating conditions [10].

Even though, it is well over a century since McBurney reported his study on acute appendicitis with emphasis on early appendicectomy, there has been no major improvement in diagnostic accuracy of acute appendicitis; which ranges from 25-90% and the optimum rate is 80%, which is less in acute appendicitis is essentially a clinical diagnosis [11]. About 6% of the population is expected to have appendicitis in their lifetime. Routine history and physical examination still remain the most practical diagnostic modalities. Absolute diagnosis of course is only possible at operation and histopathologic examination of the specimen [12]. For this reason, it is impractical to have a gold standard for definitive preoperative diagnosis, which leads to an appreciable rate of negative appendicectomy as reported in the world literature varying from 20–40% with its associated morbidity of around 10% [13].

Removing normal appendix is an economic burden both on patients and health resources. Misdiagnosis and delay in surgery can lead to complications like perforation and finally peritonitis[14].

Prompt diagnosis prevents complication by reducing the risk of perforation [15,16]. The most effective and practical diagnostic modality for appendicitis is primarily clinical based on history and clinical examination findings [17]. The majority of children with acute appendicitis have a classic history of abdominal pain. Moreover, anorexia, nausea and vomiting are symptoms that are usually associated. Atypical clinical presentation of appendicitis may necessitate laboratory and imaging investigations to confirm the diagnosis [18].

Scoring systems are valuable and valid for discriminating between acute appendicitis and nonspecific abdominal pain [19]. Various scoring systems have been developing for supporting the diagnosis of acute appendicitis in order to eliminate any risk of perforation which in turn increases the rate of post operative complications. One such scoring system is Alvarado score; a 10-point scoring system based on clinical signs and symptoms and a differential leukocytes count [20]. The use of an objective scoring system such as the Alvarado system can reduce the negative appendicectomy rate to 0-5%.

However, this system is not a substitute for clinical judgment and just an aid in diagnosing acute appendicitis and assist in arriving at a conclusion whether a particular case should be operated or not, so that the number of negative laparotomies will be reduced.

My study is to evaluate the efficacy of Modified Alvarado Scoring System along with ultrasonography as a pre-operative diagnostic tool in acute appendicitis, in correlation withoperative and histopathological findings.

MATERIALS AND METHODS

A prospective study of 50 Patients who present with symptoms & signs of acute appendicitis and suspected enough to warrant surgery for acute appendicitis in Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, Pondicherri under various surgical units, during the period of November 2016 to November 2017 (12 months). Sample size: 50 cases.

Inclusion Criteria:
Patients who present with symptoms & signs of acute appendicitis whoare:-
1. Patients aged above 5 of either sex.
2. Patients willing for investigation and surgery.

Exclusion Criteria
1. Known case of hypersensitive Other inoperable cases
2. Malnutrition and uncontrolled diabetes
3. Other clinally significant medical conditions that would impair wound healing including renal,hepatic ,hematological ,neuroligcal and immunological diseases.
4. Patients receiving corticosteroids, immmunosupressive agents, radiation, or chemotherapy within one month prior to entry into study were also excluded.
5. Patients age - 14 years and below.
6. Pregnant females.
7. Appendicular mass.
8. Patient with recent history of any abdominalsurgeries.

After initial assessment of patients presenting to the Out Patient department or emergency department of Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, with symptoms and signs suggestive of acute appendicitis between November 2016 to November 2017 (12 months), who met the inclusion criteria admitted and are initially subjected for detailed history taking, clinical examination and investigations like Hematological investigations, urine routine, X-ray abdomen/ chest, USG abdomen and CT scan as required. Following which they were evaluated using the Alvarado scoring.

A specially designed proforma was filled in for each patient. These proforma had general information about the patient plus eight variables based on Alvarado scoring system. Then the total score is calculated for each patient and based on the results patients are divided into three groups.

Group 1 - Those patients with scores of >/= 7-10 underwent Appendicectomy.

Group 2- Those patients with scores of 5-7 who were thought on clinical grounds to require Appendicectomy, it was performed.

Group 3- Those patients with a score of <5 were observed and managed conservatively and reassessed.

Diagnosis of acute appendicitis is confirmed by operative findings and histopathological assessment of the Appendicectomy specimen. Finally the reliability of Alvarado scoring system is assessed by calculating sensitivity, specificity, Negative Appendicectomy rate (the proportion of operated patients having normal appendix removed) and Positive predictive value (the proportion of patients with a positive test result who actually have the disease).

Study criteria
Clinical symptoms such as vomiting, abdominal pain (periumbilical, diffuse, or right lower quadrant), abdominal distension, diarrhea, irritability, lethargy, grunting, anorexia, nausea and dysuria, was collected. Temperature upon admission, right lower quadrant tenderness at Mc Burney point, rebound tenderness; pain on percussion, rigidity, guarding, positive cough sign, bowel sounds and gait was noted. Laboratory data [CBCD where WBC and segmented neutrophils] were assessed in addition to CRP. All WBC count above 10000 were considered positive and segmented neutrophils left shift should be equal or greater than 75%. Moreover, radiological findings [KUB, ultrasound, and CT-scan] are noted. Medical treatment IV hydration, Nil per Os (NPO), IV antibiotics, and analgesics is to be recorded. Surgical technique such as open surgery or laparoscopy was collected. Intra-op findings and post-op histopathology report. Complications such as wound infection, perforation, dehiscence, bowel obstruction, abdominal and pelvic abscess, sepsis, shock, and death were noted. Pathology result obtained from patients' medical charts was recorded as normal or abnormal.

Statistical analysis
The data during the study was collected and tabulated. The data which obtained were analysed by statistical package SPSS.

DISCUSSION

The present study was undertaken to evaluate the correlation of histopathological finding and Alvarado scoring system in reducing the number of negative appendicectomy and to evaluate its sensitivity & positive predictive value in the diagnosis of acute appendicitis. Our results and observations were discussed and compared with various other studies. In this study, the males accounted for 66% and the females 34%. The number of patients were highest in the age group 15 to 25 years (56%) followed by 26 to 35 years (40%). The least was in the age group of below 15 years (4%). Out of 50 patients, 33 (66%) were males and 17 (34%) were females. Most of the patients were younger age group. This result shows that there is predominance in the younger age group and the incidence peaks around 15 to 35 years and decreases as age progressed. Pain was the commonest presenting symptom and migratory RIF Pain has been observed in 88% all the cases in the present series. Other symptoms observed were nausea/vomiting in 96% of cases and anorexia in 86% of cases. elevated temperature was present in 92% of cases along with the least shift to left in 58% of cases. Majority of the patients presented within 48 hrs after the onset of pain, with most of them presenting between 12-24 hrs of onset of pain.

On clinical examination, tenderness over RIF point was the commonest sign (94%). Rebound tenderness was present in 76%. In these cases, there was presence of local peritonitis or when inflamed appendix was more anteriorly placed. On laboratory test, leukocytosis was seen in 72% of cases and leucocyte shift to left is seen in 58% of patients.

For assessment, the patients were categorized into 2 groups namely, those patients with scores of >/= 7 and those patients with scores of <7. Out of 33 males, score of ≥7 were 30, score of <7 were 3. Out of 17 female patients, 15 had score of ≥7, 2 had score of <7.

Twenty six males having score of ≥7 had acute appendicitis, 3 patients had normal appendix. Male patients having score of <7 were 5, out of which 3 patients had acute appendicitis, 2 patients had normal appendix .In 15 female patients having a score ≥7, 12 had acute appendicitis, 3 patients had normal appendix with other diseases. In 2 females with score <7, 1 had acute appendicitis, 1 had normal appendix with other diseases.

In our series when the score was more than 7 indicating strong possibility of intra-abdominal infection localized to the Right Iliac fossa, emergency surgery was performed within 6 hours. These patients were found to have badly inflamed appendix with impending perforation once again indicating the sensitivity and specificity of the scoring system. In patients in whom score was <7were observed for a period of 12-24 hours and re-assessed, where there was persistence of abdominal tenderness with increased WBC count appendicectomy was carried out. Thesepatients were also found to have congested and inflamed appendix.

In this study the sensitivity, specificity and positive predictive value were 90%, 30% and 83.7% respectively. The positive predictive value shown by this study is comparable with the studies done by M Kalan, K A Malik and Ohmann who reported 87.5%, 85.3% and 87.4% respectively [78-80].

This study also revealed that Alvarado scoring system is more helpful in lowering negative appendicectomy rates. In the study by Ohmann et al the negative appendicectomy rate was 14.3% respectively [80]. In this study the negative appendicectomy rate is 42.9%.

Like other studies of Kalan et al, Denizbasi A, Al-Hashemy et al, Shrivastava UK et al senstivity were 81.63%, 95.40%, 53.90% and 92.40% were compared to present study was 90%[78,81-83].

Increased proportion of negative appendicectomy is noticed for the Alvarado Score <7 and significantly decreased proportion negative appendicectomy is noticed for the Alvarado Score ≥7.

The only case who had a normal appendix at score >7 in the study by Ahmed et al. was a female [84]. Literature supports the observation that in females additional investigations are needed to support diagnosis, as Lamparelli et al. combined the Alvarado score with selective laparoscopy in adult females to increase the diagnostic accuracy and to avoid negative appendicectomy[85]. In his study it

was 24% at score >7. Malik and Wani, however, reported the use of Alvarado score with positive predictive value at score of >7 of 80% as it had a very high negative appendicectomy rate in females giving asensitivity of 61% in females [86].

The sensitivity, positive predictive value, negative predictive value and accuracy in this study were comparable to other previously published studies using Alvarado score. Sensitivity at score ≥ 7 was 82.4%, comparable to 79% by Pruekprasert et al. Positive Predictive Value at score ≥ 7 was 83.7% in this study, which is comparable to 82.7% reported by Crnogorac and Lovrenski and 83.5% by Khan et al. Several studies validated the Alvarado score, but on the other hand many studies recommend taking the cut-off point at 4 or 6[87-89]. This indicates that high scores (from eight on) could be used in deciding the need for immediate appendicectomy especially for junior surgeons.

Many diagnostic scores have been advocated but most are complex and difficult to implement in a clinical situation [90-92]. The Alvarado score is a simple scoring system that can be instituted easily in the outpatients setting [93]. We found that good clinical acumen remains the main stay of correct diagnosis of appendicitis. Delay in the diagnosis of appendicitis may increases the risk of perforation which in turn increases the rate of postoperative complications [94].

However now-a-days most of the doctor's order ultrasonogram prior to evaluation, where ultrasonography has sensitivity up to 90% and specificity of 80-90% in the diagnosis of acute appendicitis [95]. However ultrasound alone should not supersede the clinical judgment in patients with a high probability of appendicitis [96]. However there are no signs/ symptoms or diagnostic tests that are 100% reliable in diagnosing acute appendicitis. In our study modified Alvarado score system that the accuracy of diagnosis is acceptable and very dependable with higher score patients (Table 7 and 8). Thus, the diagnostic score may be used to decide whether patient needs surgery or observation. Patients with 8 and above should undergo surgery and patients with 5-7 should be kept under observation and evaluated every 4 hours to note if the score remains same or increases accordingly decision may be taken for surgery. Patients with score 4 or less are very unlikely, but not impossible to have appendicitis and they can be discharged from hospital after conservative treatment, with the advice to come back if the symptoms persist or condition become worse. Pain in right iliac fossa with guarding, accompanying fever and elevated leucocyte count are found to be more predictive of appendicitis in most of the cases.

Alvarado system is dynamic one allowing observation and critical evaluation of clinical picture. Its application improved diagnostic accuracy and reduced negative exploration and complication rates. A meta-analysis of different studies showedhigh sensitivity and specificity of USG in diagnosis of acute appendicitis [26]. But drawback is operator dependent and diagnosis becomes difficult when obscured by bowel gases. The specificity of USG is less than sensitivity, because of number of false negatives, some of which cannot be controlled (patient's poor tolerance, presence of bowel gas, obesity and unusual appendix location) [97]. These difficulties can be reduced by employing high resolution real time imaging and by improving the graded compression technique, the high specificity is useful for differential diagnosis of associated pathology [98]. In present study Alvarado scoring has high sensitivity and specificity and also high positive predictive value. Alvarado score is useful tool in clinical decision making especially when USG is unavailable or inconclusive. USG is unnecessary when one's degree of clinical suspicious is high [99]. However the additional information provided by USG does improve diagnostic accuracy in case of negative or equivocal Alvarado scores (Table 10, 11 and 12). So, Alvarado scoring system is best test in diagnosis of acute appendicitis compared to USG alone, and use of USG along with Alvarado score is most useful in increasing diagnostic accuracy. Ultrasound and Alvarado scoring system is the least expensive and invasive of these and has been reputed to have an accuracy of 71% to 95% [100]. Studies show that appendicitis is more common in age group of 11-30 years [98]. In most of the appendicectomy the naked eye examination of appendix shows inflammation quite often confirms diagnosis, but at times a normal looking may be reported as one with appendicitis. Hence, histological report was taken as the final word in the diagnosis of acute appendicitis [101]. A negative rate of appendicectomy is about 20-40% in surgical literature. In our study, it was 12%.

In our present study, usefulness of the both histopathological examination, USG and Alvarado scoring system was demonstrated beyond doubt by reducing number of negative laparotomies especially in men. However in women the positive laparotomy was high and this can be one of the reason by using laparoscopy and abdomino-pelvic USG scan as a diagnostic tool.

CONCLUSION

Acute appendicitis is the most familiar acute abdominal condition requiring surgery. In this adults have high prevalence than young age. Acute appendicitis diagnosis is till now in challenge. Findings by clinician from the sample and the surgeon's experience are of significance in diagnosing acute appendicitis. Although histopathological and USG is used frequently for diagnosis of acute appendicitis, along with Alvarado score is a helpful tool in clinical decision making. In peripheral hospitals, Alvarado score is simple, easily applicable because backup facilities are sparse in abdominal emergencies it can be easily diagnosed. As there is an advantages of histopathological data with USG and Alvarado score for diagnosis of acute appendicitis when one has a high degree of clinical suspicion. The diagnosis in patients with equivocal features can be difficult, and in our sub-population, Alvarado scoring cut-off should be at >7 and <7, which readily increases the accuracy of Alvarado score in diagnosing acute appendicitis. *However, the further information provided by histopathological and USG does improve diagnostic clear in case of negative or positive Alvarado score.* **Thus, we bring to a conclusion that in beginning the diagnosis in patients suspected of having acute appendicitis, histopathological methods is better compared to USG and Alvarado scoring system. So, all the three methods were used for diagnosis of acute appendicitis diagnostic accuracy.**