DOI: https://doi.org/10.53350/pjmhs2216132

ORIGINAL ARTICLE

A Comparative Study of Modified Alvarado Score Versus Routine Clinical Assessment in the Management of Acute Appendicitis

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ABSTRACT

Background: Pain in right Iliac fossa is one of the most common presenting symptom in the surgical emergency in which acute appendicitis is the most probable amongst the differentials. Patients with equivocal signs and symptoms pose a significant diagnostic dilemma for which they are admitted for observation.
Aim: To compare the efficacy of modified Alvarado scoring system with the routine clinical diagnosis.
Study design: A randomized controlled trial was set up to compare clinical diagnosis (control group) with a diagnostic protocol using modified Alvarado scoring system (intervention group).
Setting: This study was conducted in a government administered tertiary care referral center (Mayo Hospital Lahore), Pakistan, from Septembers 15, 2019 to September 14, 2020.
Method: A total of 256 patients referred to surgical department with suspected appendicitis were included in the study. Patients above the age of 12 years were included in the study. Patients were randomly divided into two groups. Group A included 128 patients who were assessed on the basis of the Modified Alvarado score while the Group B also included 128 patients which were assessed on routine clinical evaluation. Histopathology was the Gold Standard which determined the Diagnostic Accuracy (DA) and Negative Appendectomy Rate (NAR), which were duly recorded.
Results: The Diagnostic Accuracy (DA) of the Group A evaluated on the Modified Alvarado Scoring System was 88% in which 113 out of 128 patients were positive for acute appendicitis on histopathology while Negative Appendectomy Rate(NAR) was 12%.Only 15 out of 128 were negative on histopathology . However the Group B had a (DA) of 79% in which 101 patients out of 128 were proven positive through the histopathology while (NAR) was 21%. The mean age of the was found to be 25.34 years with a male to female preponderance ratio of 1.22:1
Conclusion: we have found the Alvarado scoring system to be an effective and a convenient scoring tool. We recommend its regular application in the emergency for the diagnosis of Acute Appendicitis.
Keywords: Alvarado score, Acute appendicitis, Histopathology, Clinical diagnosis.

INTRODUCTION

Appendicitis is the most common surgical emergency that primary health care provider has to consider when a patient presents with right iliac fossa pain. Patients with equivocal signs and symptoms pose a significant diagnostic challenge and are often admitted to surgical department for observation[1]. Owing to these aspects and higher rates of litigation, the non-surgical option is also being considered seriously, the medical treatment has come up as an effective alternate to the surgery because of its cause effectiveness and a high success rate[2].

Appendicitis is caused by obstruction of appendiceal lumen in 80% of cases. Obstruction causes increased intraluminal pressure, collapse of draining veins, ischemia and bacterial overgrowth[3].

No other cause other than the obstructive pathology has a well-defined etiology but low dietary fiber and high sugar intake[4] and viral infection[5] and allergy[6] are amongst the possible causative factors. Other reports of acute appendicitis seem to support an infectious etiology[7,8,9].

The diagnosis of acute appendicitis is mostly clinical with typical features of peri-umbilical pain shifting to right iliac fossa along with anorexia, nausea, vomiting, localized tenderness and rebound tenderness in right iliac fossa[10].

Migration of the pain to the right iliac fossa and /or guarding/rigidity are the classical symptoms of acute appendicitis. The absence of anorexia, nausea and vomiting always make the diagnosis doubtful, even the persistence of symptoms for more than 72 hours without apparent perforation and / or the absent tenderness in the right iliac fossa[11].

Patients in extremes of age and obesity are especially vulnerable, wherein the diagnosis is often difficult and delayed. This leads to the greater frequency of negative appendectomies which may amount to 51.1% in children and 50.1% in old patients and 44.1% in octogenarians[12]. Childhood obesity also leads to a higher negative appendectomy rate of 24.6% in obese vs. 9.9% in non-obese children[13].

It is also reported that in negative appendectomy the rate of postoperative complications, such as wound infection, abscess and fistula formation may be higher[13,14].

As appendicitis is a polymicrobial infection comprising of gram-positive and gram-negative aerobes and anaerobes, a logical selection of antimicrobial therapy should cover all the possible pathogens. Susceptibility varies from hospital to hospital depending on the local resistance pattern[15].

The major concern of the present day surgeon confronted with a case of suspected acute appendicitis is the risk of negative finding on exploration as opposed to the hazards of an inflamed appendix bursting before operation by adopting a safe policy. Clinical diagnosis leads to removal of normal appendix in 20-30% of cases. This number can be reduced by applying the modified Alvarado scoring system. Alvarado score has been modified by Bengezi and Fallouji into a more practical, reliable and easy score for junior doctors to interpret and use it for a safe and a more accurate decision making[13,15]. This modification by Bengezi and Fallouji is rather a simpler, cost effective and much safer tool in diagnosis of acute appendicitis and hence it decreases Negative Appendectomy Rate[18,19]. Its sensitivity is very high if the score is 6 points or higher in many of the studies conducted[20].

In doubtful cases, other diagnostic aids can help to diagnose acute appendicitis from other pathologies which mimic acute appendicitis. These alternative diagnostic tools used in diagnosis of acute appendicitis include ultrasonography, computed tomography, laparoscopy, imaging techniques, peritoneal aspiration cytology, barium enema, systemic cytokines level and isotopes scanning. On the other hand, it is neither cost effective nor safe to use the diagnostic modalities like CT Scan or Diagnostic laparoscopy for the routine diagnosis of Acute Appendicitis[21] but the Dutch College for Surgeons still advocates prior imaging before carrying out emergency appendectomy. Ultrasonography should be the first imaging technique in patients with the suspicion of acute appendicitis followed by a CT Scan if

Received on 11-07-2021
Accepted on 22-12-2021

the above mentioned modality is negative or inconclusive[22] but all of this is stipulated with the availability of resources.

CRP is also being used as one of the diagnostic modalities. C-reactive protein along with WBC is useful tool in distinguishing acute appendicitis from other diagnoses in pediatric patients. WBC count greater than >12 cells × 1000/mm(3) and CRP greater than 3 mg/dl makes the diagnosis of acute appendicitis more plausible[23].

Another method of combining modified Alvarado score with selective laparoscopy is also gaining popularity and recommendation in the management of suspected acute appendicitis[24].

The objective of the study was to find out the valid of modified Alvarado scoring system in diagnosis of acute appendicitis in comparison with routine clinical assessment.

MATERIALS AND METHODS

A randomized controlled trial was comparing clinical diagnosis/ controlled group) with a diagnostic protocol using modified Alvarado scoring system (intervention group). This study was conducted in Surgical Unit-I, Department of Surgery, Sir Ganga Ram Hospital for a period of one year from-15th Sep 2009 to 14th Sep 2010 after permission from Institutional Ethical Committee. This randomized control trial of 256 patients was tested further on histopathology as a gold standard to confirm the diagnosis. The informed consent was taken followed by a random allocation by a blind observer using a sealed envelope into one of the two groups Group A and Group B. In Group A, Modified Alvarado scoring system was applied while in Group B routine clinical assessment was applied. Group B was designated as the control group. Only male and female patients above 12 years of age, presenting as acute appendicitis were included in this study. Patient below age of 12 years, presenting with suspected appendicitis were excluded from the study because of an established unit of Children Hospital.

RESULTS

A total of 256 patients irrespective of sex above the age of 12 years with suspected diagnosis of acute appendicitis were included in the study. Out of these 256 patients, 141 were male and 115 were female with a male to female ratio of 1.22:1 (Table 1-4). All patients underwent appendectomy and all the specimens were sent to histopathology for diagnosis of true appendicitis and to rule out other appendiceal diseases. In Group A, Alvarado score was performed on all patients on admission. Based on the clinical evidence 128 patients were operated. Out of these 128 patients, 113 (88%) were positive on histopathology for acute appendicitis and 15 (12%) were negative on histopathology. The mean Alvarado score was 8.46 and the overall diagnostic accuracy of the scoring system was 88%.

Those operated on the basis of clinical judgment were 128 patients. Out of these 128 patients, 101 (79%) were positive on histopathology and 27 (21%) were negative on histopathology. The overall diagnostic accuracy of the clinical judgment was 79%. The intra-operative alternative diagnosis was made in 32 patients. Out of these 32 patients, 1 was a case of ectopic pregnancy with rupture, 1 case was perforated peptic ulcer, 9 were torsion of the ovarian cysts, 13 were pelvic inflammatory disease, 5 were ileocecal TB, 2 were adenocarcinoma of colon and 1 case of acute caecal diverticulitis. Perforated appendix was found in 19 cases while gangrenous appendicitis was found in 13 cases.

The histopathology report was negative in 15 patients diagnosed as acute appendicitis on the basis of modified Alvarado scoring system. Out of these 15 patients, 11 patients were female of young age group, 1 was ectopic pregnancy, 4 were torsion of ovarian cysts and 5 were cases of pelvic inflammatory disease. In 1 case, no pathology was found. Out of 4 male negative cases 2 cases were Tuberculosis of ileocecal junction, 1 case was of acute caecal diverticulitis, which is rare but presents similarly to acute appendicitis and 1 case with no pathology was found. The Histopathology report was negative in 27 patients out of which18 were female in which 05 had torsion Ovarian cyst , 08 were pelvic inflammatory disease, 01 was ileocecal tuberculosis and in 04 patients the diagnosis could not be made. Out of 09 males 02 were cases of ileocecal junction tuberculosis, 02 were cases of adenocarcinoma of the colon, 01 was Crohn's Disease, 01 was perforated peptic ulcer and 01 was carcinoid tumor and in 02 patients diagnosis could not be made.

Tenderness in right iliac fossa was present in 100% of the cases, rebound tenderness in 90% cases and anorexia in 87% cases. Nausea and vomiting was present in 67% cases and elevated temperature in 39% and leukocytosis in 76% cases. Extra signs like Psoas test and Rovsing's signs were elicited in 34% cases. Migratory pain was noted in 48% of the cases. The mean leukocyte count was 13672 mm^3. The mean age was 25.34 years. The mean postoperative stay in the hospital was 02 days.

Table 1: Age distribution (n=256)

Age (years)	=n	%age
12-20	93	36.32
21-30	75	29.29
31-40	53	20.70
41-50	23	8.98
51-60	12	4.68

Table 2: Age distribution of patients in Alvarado Scoring System (n=128)

Age (years)	Male	Female
12-20	25	22
21-30	22	17
31-40	13	10
41-50	7	5
51-60	5	2
Total	72	56

Table 3: Age distribution of patients in Clinical features group (n=128)

Age (years)	Male	Female
12-20	25	21
21-30	19	17
31-40	16	14
41-50	6	5
51-60	3	2
Total	69	59

Table 4: Sex distribution (n=128)

Sex	=n	%age
Male	141	55.07
Female	115	44.92
Ratio	1.22:1	

DISCUSSION

Acute appendicitis is the commonest surgical emergency making about 35% of the emergency surgical procedures. The main concern is related to delayed diagnosis and its consequences like perforation, peritonitis and septicemia with intra-abdominal abscesses formation and appendicular mass with abscess. This increases the mortality and morbidity of the disease. If diagnosed early, the mortality from this disease and appendectomy for it should be less than 0.1. Also the appendectomy for normal appendix has high morbidity as compared to appendectomy for acute appendicitis. The diagnosis of acute appendicitis is clinical. In patients with equivocal clinical findings, other tests must be applied for correct diagnosis such as graded compression sonography, computed tomography, contrast enhanced appendiceal computed tomography, laparoscopy and C–reactive protein[14].

In this study, the diagnostic accuracy of modified Alvarado scoring was under study in comparison with routine clinical assessment. The male and female ratio in this study was 1.22:1, which was comparable to the study conducted by Canavosso L et al 1.09:1[14], while in a study conducted by Jang SO et al it was 1.69:1[20] and in those conducted by both Abou Merhi B and Turhan

AN it was 1.9:1[2,25]. The mean age group of the patients evaluated both clinically and with modified scoring system was 25.34 years, which is comparable with that of Turhan AN 26.25[2] and Aamir and Shami[26].

The overall diagnostic accuracy of the modified Alvarado scoring system was 88% with a 12% negative appendectomy rate found on histopathology, which is comparable to Jang SO et al 90.9%[20] & Canavosso L et al 91% [14]and Kalan [27]and Fente BG et al 90.9[19] and a bit higher than Chan M Y and Abou Merhi B[9,25].

The diagnostic accuracy of the routine clinical assessment was 79% with 21% negative appendectomy rate which is comparable to Fente BG et al[19] with an accuracy of 73.6% and NAR of 23.4% done between June 2000 to May 2002 while lower than the accuracy and Negative appendectomy rate of 80.5% and 19.5% respectively done by the same author [19]on another occasion between June 2004 and May 2005 . This is also comparable to Ohene-Yeboah M et al[28] which is a NAR of 25.9% and it is lower than Fashina IB et al[29], Ma KW et al[30], Chamisa I et al[31] and Abou Merhi B et al[25] which is 13.4%, 17% 18.2% and 13% respectively.

In this study, the commonest sign on examination was tenderness in the right iliac fossa, which was present in 100% same as that of Adesunkanmi et al[32] a bit higher than Ohene-Yeboah M et al and Abou Merhi B et al [19, 25] which is 89.22% and 96.1% respectively and higher than Fashina IB et al[29] 74.4%. The rebound tenderness in the right iliac fossa was present in 90% cases, which matches with that of Bhopal et al[5] but higher than Fashina IB et al[29] which is 59.2%. In this study, the mean leucocytes count was 13672/mm^3 .This leukocyte count also matches with that of Thompson et al[14] and Ma KW et al [31]. In this study, the anorexia as a first symptom was present in 87% of cases, which is similar to that of Malik et al[15] and Adesunkanmi AR et al[32] which was 77% but higher than Fashina IB et al[29], Ohene-Yeboah M et al[28], Ma KW et al[31] which was 48%, 49% and 49% respectively. Nausea and vomiting was noted in 67% of the patients which is comparable to 57.4% of Ma KW et al[31] but higher than Fashina IB et al[29] which was 47.8 and significantly lower than Ohene-Yeboah M et al[28] which is 87.5%.

In this study, migratory pain starting in the periumbilical regions and shifting to the right iliac fossa was present in 48% of cases, which is higher than that Ohene-Yeboah M et al[28] which was 38%. Fever was noted in 39% of the patients which is comparable to Ma KW et al[31] Fashina IB et al[29] 41% and 48.4% and lower than Ohene-Yeboah M et al[28] and Abou Merhi B et al[24] which is 73% and 89% respectively.

CONCLUSION

It is suggested that Modified Alvarado Scoring System is relatively more useful than the clinical assessment for diagnosis of acute appendicitis.

Conflict of interest: Nil

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