ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

ORIGINAL RESEARCH

To investigate the role of abdominal ultrasonography and the Alvarado score in the diagnosis and prevention of negative laparotomies in acute appendicitis

[1]Dr.Ranjeet Kumar, [2]Dr.Gyanendra Prasad Varshney, [3]Dr.Mratunjai Sharma

[1]Associate Professor, Department of General Medicine, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India

[2]Associate Professor, Department of General Surgery, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India

[3]Associate Professor, Department of Radio Diagnosis, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India

Correspondence:
Dr Gyanendra Prasad Varshney
Associate Professor, Department of General Surgery, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India

Received: 16 August, 2022 **Accepted: 24 September, 2022**

Abstract

Aim: To investigate the role of abdominal ultrasonography and the Alvarado score in the diagnosis and prevention of negative laparotomies in acute appendicitis.

Methods: The fields of general surgery and radiology collaborated on the randomised controlled trial investigation. One hundred adults over the age of seventeen who all agreed to participate in the research by having surgery were included. Clinical evaluation, the Alvarado score, and abdominal ultrasonography were used to evaluate the patients. Histopathology findings were compared to the Alvarado score and ultrasonography abdomen to determine which method was most accurate.

Results: 58 (58%) of patients stayed in the hospital for 3-5 days. The average hospital stay was 5.5 1.5 days. The Alvarado score obtained for the 100 patients revealed that 89 had a value greater than 7. 72(72%) of the 100 patients were inflamed, 9(9%) were gangrenous, 10(10%) perforated, and 9(9%) were normal postoperatively. Histopathology indicated that 90 percent of the patients had appendicitis. After surgery, all 100 patients (100%) obtained primary closure. Postoperative surgical site infection was seen in ten (10%) individuals. Post-operative fever was seen in 46 (46%) of the patients. Using histology as the gold standard, ultrasonography demonstrated to be accurate in predicting appendicitis. The sensitivity was 52, the specificity was 18.7, and the accuracy was 49.5. Using histology as the gold standard, the Alvarado score was >=7 in predicting appendicitis in 88/93 (94.63%) of patients, with a sensitivity of 96.6, specificity of 85.3, and accuracy of 95.8.

Conclusion: Acute appendicitis affects one in seven people at some point in their lives, and a prompt diagnosis is crucial for avoiding complications that might develop if the condition is left untreated for too long. In acute appendicitis, a proper clinical evaluation is the backbone

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

of diagnosis, and tools like the ALVARADO score and USG abdomen can resolve the diagnostic conundrum and avoid unnecessary appendectomies.

Keywords: Alvarado score, ultrasound abdomen, negative appendicectomy, acute appendicitis

Introduction

One of the most frequent reasons for urgent surgery is acute appendicitis. The diagnostic value of the patient's clinical and physical examination results cannot be overstated. In addition to using blood tests like CRP and procalcitonin, scoring systems, ultrasonography, and radiologic exams like CT and MRI are employed in the diagnostic process. [1] Multiple grading systems may be developed based on clinical symptoms, findings, significant complaints, and high white blood cell (WBC) counts and c-reactive protein levels. The Alvarado score is widely used as a clinical grading system for the diagnosis of acute appendicitis. Several investigations from across the globe have verified the strong diagnostic utility of this score system. The scoring system is generallyrecognised as a non-invasive, harmless, easy-to-understand, trustworthy, and reproducible diagnostic tool. When diagnosis and treatment are delayed, death and morbidity rates rise. [2] There is an 8-30% chance of complications after appendectomy. [3, 4] The validity of the Alvarado score in adult surgical practise was shown after its description in 1986. As a result of using this grading method, the percentage of unsuccessful appendectomy procedures may be lowered below 5%. M.Kalan, D.Talbat, W.J.Cunliffe, and A.J.Rich subsequently made some adjustments to it. Many instances of appendicitis may be quickly diagnosed and treated with the use of graded compression ultrasonography, a reliable method that has been around for a while now.[5,6]More than 6% of male patients and 13% of female patients were found to have unfavourable appendectomy outcomes in a research spanning 1999–2000.[7] Examining the effectiveness of the Alvarado score and ultrasonography for diagnosis and lowering false-negative appendectomy rates is the focus of this research.

Material and methods

The prospective randomised control experiment was carried out at the Departments of General Surgery and Radiology. Following clearance from the protocol review committee and the institutional ethics committee. The research comprised 100 consecutive patients over the age of 17 who received a preliminary diagnosis of acute appendicitis, were willing to undergo surgery, and granted permission to participate. Patient presents to the hospital with abdominal discomfort and distention. Pregnant women, any abdominal tumour, those with a history of abdominal surgery, The patient is unwilling to have surgery. The research excluded children under the age of 17 and those receiving interval appendicectomy.

Methodology

After obtaining a complete history using a systematic questionnaire, all patients were clinically evaluated. They were then subjected to a blood test, an ultrasound of the abdomen, and surgery. The specimen underwent histological investigation (HPE). Finally, the histology reports were compared to the ALVARADO Score and USG abdomen results.[5]The data was analysed using SPSS software version 25.0 to get the sensitivity, specificity, predictive values, and other findings.

Results

In our research of 100 patients, 66 (66%) were male and 34 (34%). The majority of patients, 47 (47%), were between the ages of 20 and 60. The majority of patients (100%) were hospitalised due to abdominal discomfort. 58 (58%) of patients stayed in the hospital for 3-5

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

days. The average hospital stay was 5.5 1.5 days. In our research, 80 percent of patients complained of nausea or vomiting upon admission. On admission, 55 (55%) of the patients developed a fever. Anorexia was present in 65 (65%) of patients at the time of admission. In our research, 31 (31% of patients) had a pulse rate of 81-90 beats per minute. All patients in the study exhibited discomfort in the right iliac fossa, and 55(55%) had rebound soreness. The majority of patients, 51(51%), had a complete blood count between 10000 and 15000. On ultra sound, 53 (53%) of the patients in our research exhibited clear evidence of appendicitis. The Alvarado score obtained for the 100 patients revealed that 89 had a value greater than 7. 72(72%) of the 100 patients were inflamed, 9(9%) were gangrenous, 10(10%) perforated, and 9(9%) were normal postoperatively. Histopathology indicated that 90 percent of the patients had appendicitis. After surgery, all 100 patients (100%) obtained primary closure. Postoperative surgical site infection was seen in ten (10%) individuals. Post-operative fever was seen in 46 (46%) of the patients. Using histology as the gold standard, ultrasonography demonstrated to be accurate in predicting appendicitis. The sensitivity was 52, the specificity was 18.7, and the accuracy was 49.5.

Using histology as the gold standard, the Alvarado score was >=7 in predicting appendicitis in 88/93 (94.63%) of patients, with a sensitivity of 96.6, specificity of 85.3, and accuracy of 95.8.

Table 1 Percentage distribution of the patients according to age

Age	**Number**	**Percent**
Below 20	31	31
20 – 30	47	47
30 – 40	13	13
Above 40	9	9
Mean ± SD	26.5 ± 8.7	

Table 2 Percentage distribution of the patients according to sex

Sex	**N**	**%**
Male	66	66
Female	34	34

Table 3 Percentage distribution of the patients according to duration of stay in hospital

Duration of stay in hospital in days	**N=100**	**%**
3 – 5	58	58
6 – 8	37	37
>8	5	5
Mean ± SD	5.5 ± 1.5	

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 4 Predictive power of conclusive in USG in predicting Appendicitis if HPR is gold standard

USG abdomen	**HPR**		
	Appendicitis	**Normal**	**Total**
Conclusive	45	8	53
Inconclusive	45	2	47
Total	90	10	100

Table 5 Sensitivity and Specificity

Sensitivity	52
Specificity	18.7
False Negative	52
False positive	85.3
Predictive value of positive test	90.1
Predictive value of negative test	4.6
Positive Likelihood ratio	2.2
Negative Likelihood ratio	5
Accuracy	49.5

Table 6 Predictive power of ALVARADO Score>=7 in predicting Appendicitis if HPR is gold standard

ALVARADO Score	**HPR**		
	Appendicitis	**Normal**	**Total**
>=7	88	1	89
<7	5	6	11
Total	93	7	100

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 7 Sensitivity and Specificity

Sensitivity	96.6
Specificity	85.3
False Negative	7.4
False positive	18.7
Predictive value of positive test	99.6
Predictive value of negative test	57.6
Positive Likelihood ratio	7.7
Negative Likelihood ratio	0.3
Accuracy	95.8

Discussion

In the current research, the condition is mostly encountered in young people, with 80% of patients being between the ages of 17 and 30. This outcome is comparable to prior research findings. [8,9] A similar picture was seen in the case of the gender predisposition, with men impacting 66% compared to females 34% in a prior research by Hale et al. [10] Only a few individuals had a longer hospital stay owing to an appendix complication; otherwise, the average hospital stay was 5.5 1.5 days. This outcome is quite similar to prior ones. [11,12] The most common clinical characteristic in all of the patients was abdominal discomfort, which was followed by nausea and vomiting. Anorexia and fever followed soon after. These findings are congruent with those of Hardin et al. and Wagner JM etal. [13] In 53 of 100 patients, USG abdomen was judged to be conclusive. This results in a sensitivity of 52% for USG and a positive predictive value of 90.1 with 49.5% accuracy, which is lower than a recent research by Ajerami et al., which had a sensitivity of 84.8% and a positive predictive value of 93.3%. [14] Low sensitivity may be caused by a variety of factors. Ultrasound abdominal findings are operator dependant, and an expert sonographer might provide significantly more favourable results than a novice.

The sonologist's failure to establish proper compression of the right lower quadrant might be owing to the patient's obesity, the presence of acute discomfort or abdominal guarding, excessive intestinal gas, or an unwilling patient, all of which can compromise the ultrasound's accuracy. Because the bowel is situated anteriorly, the anatomical placement of the appendix, as in retrocecal position, is not immediately evident. In 89 instances, the ALVARADO score was greater than or equal to 7, and the sensitivity was 96.6 with a specificity of 85.3. The positive test with ALVARADO Score has a prediction value of 99.6, with 95.8% accuracy. to the fact that a lot of people think about it. [15] Acute appendicitis is a frequent illness that requires a surgeon or a trainee surgeon to be well educated in. Prior to surgery, a patient suspected of having appendicitis should be extensively checked for alternative reasons of abdominal pain. The removal of a normal appendix exposes the patient to needless dangers associated with surgery and anaesthesia, as well as having long-term consequences on the patient's life. As a result, it is critical that a practising surgeon has high clinical acumen and uses appropriate diagnostic methods to arrive at a diagnosis of acute appendicitis. As a result, negative appendectomy rates are reduced, and avoidable complications are avoided. [16,17]

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Conclusion

The purpose of this research was to compare the accuracy of the ALVARADO score to that of ultrasonographic abdominal imaging for the diagnosis of acute appendicitis. Acute appendicitis affects one in seven people at some point in their lives, and a prompt diagnosis is crucial for avoiding complications that might develop if the condition is left untreated for too long. In acute appendicitis, a proper clinical evaluation is the backbone of diagnosis, and tools like the ALVARADO score and USG abdomen can resolve the diagnostic conundrum and avoid unnecessary appendectomies.

References

1. Geographic association between incidence of acute appendicitis and socioeconomic status. Golz RA, Flum DR, Sanchez SE, Liu X, Donovan C, Drake FT. *JAMA Surg.* 2020;155:330–338.
2. Binnebösel M, Otto J, Stumpf M, Mahnken AH, Gassler N, Schumpelick V, et al. Acute appendicitis. Modern diagnostics-surgical ultrasound. Chirurg 2009;80:579-87.
3. Alvarado score in the diagnosis of acute appendicitis: correlation with the tomographic and intra-operative findings. Spina C, Iamarino AP, Rosa OM, Ribeiro MA. *Int J RadiolRadiatTher.* 2018;5:60–64.
4. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med. 1986;15(5):557–64.
5. Kalan M, Talbot D, Cunliffe WJ, Rich AJ. Evaluation of the modified Alvarado score in the diagnosis of acute appendicitis: a prospective study. Ann R CollSurg Engl. 1994;76(6):418.
6. Predictive factors and outcomes of negative appendectomy. Jeon BG. *Am J Surg.* 2017;213:731–738.
7. Association between the Alvarado score and surgical and histopathological findings in acute appendicitis. do Nascimento RR, Souza JC, Alexandre VB, Kock KS, Kestering DM. *Rev Col Bras Cir.* 2018;45:0.
8. Diagnostic importance of Alvarado and RIPASA Score in acute appendicitis. Rodrigues W, Sindhu S. *Int J Sci Study.* 2017;4:57–60.
9. vanRanden A, Bipat S, Zwinderman AH, Ubbink DT, Stoker J, Boermeester MA. Acute appendicitis: meta analysis of diagnostic performance of CT and graded com pression US related to prevalence of disease. Radiology. 2008 Oct;249(1):97–106.
10. Hale DA, Molloy M, Pearl RH, Schutt DC, Jaques DP. Appendectomy: a contemporary appraisal. Ann Surg [Inter net]. 1997 Mar;225(3):252–61. Available from: https://pubmed.ncbi.nlm.nih.gov/9060580
11. Martin LC, Puente I, Sosa JL, Bassin A, Breslaw R, McKenney MG, et al. Open versus laparoscopic appendectomy. A prospective randomized comparison. Ann Surg [Internet]. 1995 Sep;222(3):256–62.
12. Guller U, Hervey S, Purves H, Muhlbaier LH, Peterson ED, Eubanks S, et al. Laparoscopic versus open appendectomy: outcomes comparison based on a large administrative database. Ann Surg. 2004 Jan;239(1):43–52.
13. Wagner JM, McKinney WP, Carpenter JL. Does this patient have appendicitis? JAMA. 1996 Nov;276(19):1589–94.
14. Al Ajerami Y. Sensitivity and specificity of ultrasound in the diagnosis of acute appendicitis. EMHJ-Eastern Mediterr Heal Journal, 18 (1), 66-69, 2012. 2012;
15. Limpawattanasiri C. Alvarado score for the acute appendicitis in a provincial hospital. J Med Assoc Thai. 2011 Apr;94(4):441–9.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

16. JavidiParsijani P, PourhabibiZarandi N, Paydar S, Abbasi HR, Bolandparvaz S. Accuracy of Ultrasonography in Diagnosing Acute Appendicitis. Bull Emerg trauma [Internet]. 2013 Oct;1(4):158–63. Available from: https://pubmed.ncbi.nlm.nih.gov/27162849
17. Dsouza C, Martis J, Rao V. DIAGNOSTIC EFFICACY OF MODIFIED ALVARADO SCORE OVER GRADDED COM PRESSION ULTRASONOGRAPHY. J Heal Allied Sci NU. 2013 Sep 1;03:105–8.