

Evaluation of Role of Alvarado Score in Diagnosis of Acute Appendicitis: A Prospective Study.

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Received: October 2016

Accepted: October 2016

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ABSTRACT

Background: The aim and objectives of the study is to validate the role of Alvarado score in diagnosis of acute appendicitis. **Methods:** A total of 310 patients with clinical diagnosis of acute appendicitis were included in this study. Patients were examined thoroughly, investigated and managed accordingly. The relevant data collected and analysed. **Results:** Out of 310 patients, surgical procedures were performed in 22.90% of the patients. The overall negative appendectomy rate was 9.86%, and the percentage of Positive Predictive Value (PPV) for Alvarado score was 90.14%. **Conclusion:** Our study validates the Alvarado score as fast, simple and reliable diagnostic tool for acute appendicitis.

Keywords: Abdominal Pain, Alvarado Score, Appendicitis, Appendectomy.

INTRODUCTION

Acute Appendicitis is one of the commonest conditions responsible for admission of the patients to hospital for surgical treatment. The hospitalization rate for patients over 60 years old ranges from 18% to 42%.^[1] Acute appendicitis is the most common cause of an acute abdomen in young adult with a life time risk of about 6%.^[2] Difficulty in diagnosis arise in very young, elderly patients and females of reproductive age because they usually have atypical presentation and many other conditions also present like appendicitis and literature shows that 2-7% of all adults on exploration have diseases other than appendicitis.^[3]

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Acute exacerbation of COPD showed a hospital mortality Appendicitis may be associated with morbidity and occasionally mortality. If failed to diagnose early, the situation may become more complicated. These complications will lead to rupture of appendix causing peritonitis, which leads to circulatory shock.^[4] Numerous studies have been revealed that the early diagnosis and timely operative intervention is the key for success in the management of acute appendicitis. However, the picture of acute appendicitis may not be classical,

and in such situations, a policy of early surgery to avoid risk may lead to high negative appendectomy rates.^[5,6]

The simple scoring system developed by Alvarado in 1986 was evolved for the purpose of affirmative and earlier diagnosis of acute appendicitis. This scoring system is mainly based on history, examination and simple lab investigations which includes 3 symptoms (Migratory pain in right iliac fossa, Anorexia, Nausea/Vomiting), 3 signs (Fever, Tenderness & Rebound tenderness in right iliac fossa) and 2 lab investigations (Leucocytosis, Shift to left of neutrophils).^[7] This study was designed to evaluate the usefulness of the Alvarado scoring system in earlier diagnosis of acute appendicitis.

MATERIALS AND METHODS

A teaching hospital based present prospective study was conducted on 310 consecutive patients with suspicion of acute appendicitis reported in Surgical wards or OPD of Sanjay Gandhi Memorial Hospital associated with Govt. Shyam Shah Medical College, Rewa, M.P., India, over a period of one year.

Inclusion Criteria: Patients with clinical suspicion of acute appendicitis were included in the present study.

Exclusion Criteria: Patients with appendicular lump, appendicular perforation, appendicular abscess and having significant co-morbidity, or patients with negative consent were excluded from the study.

On admission, the history of presenting complaints was elicited properly and patients were examined thoroughly. Relevant baseline investigations were sent and treatment started simultaneously. Findings were evaluated according to Alvarado scoring system [Table 1] and recorded on predesigned proforma. Plan of management was decided according to the interpretation of Alvarado score as

follows; score 1-4: Appendicitis Unlikely, 5-6: Appendicitis Possible and 7-10: Appendicitis Highly Probable. Patient with Alvarado score 7 or greater, were subjected to appendectomy and rest of the patients were managed conservatively. Histopathological findings of appendectomy samples were recorded on proforma and data analysed.

Table 1: Alvarado Scoring System (MANTRELS).

| Variables | Clinical Features | Score |
|-----------------------|------------------------------|-------|
| Symptoms | Migratory RIF Pain | 1 |
| | Anorexia | 1 |
| | Nausea / Vomiting | 1 |
| Signs | Tenderness in RIF | 2 |
| | Rebound Tenderness | 1 |
| | Elevated Temperature | 1 |
| Laboratory Findings | Leucocytosis | 2 |
| | Shift to Left of Neutrophils | 1 |
| Total Score 10 | | |

RESULTS

The present prospective study included 310 patients with suspicion of acute appendicitis. As shown in the table 2, 192 (61.94%) patients were males and 118 (38.06%) were females (Ratio of Male to Female 1.6: 1). Patients belongs to age group of 21-30 years had maximum incidence of appendicitis which means that the incidence was more common in younger age group [Table 2].

Most common presenting feature was pain abdomen, associated with fever, nausea/vomiting or other

abdominal symptoms [Table 3]. Patients were distributed according to Alvarado scoring and grading systems and organised in [Table 4 and 5], findings reveals that 115 (37.10%) patients had Alvarado score 7 or greater, and advised for surgical treatment. 71 (22.90%) patients underwent appendectomy after positive consent. Histopathology reports showed negative appendectomy in some (09.86%) patients in our study [Table 6]. The Positive Predictive Value (PPV) for Alvarado score was 90.14%.

Table 2: Demographic distribution of the patients (n=310).

| Age Group (years) | No. | % | No. | % | No. | % |
|-------------------|------------|--------------|------------|--------------|------------|--------------|
| 0-10 | 04 | 01.30 | 03 | 00.98 | 07 | 02.25 |
| 11-20 | 51 | 16.45 | 34 | 10.97 | 85 | 27.41 |
| 21-30 | 68 | 21.94 | 42 | 13.55 | 110 | 35.48 |
| 31-40 | 39 | 12.58 | 20 | 06.45 | 59 | 19.03 |
| 41-50 | 11 | 03.59 | 09 | 02.90 | 20 | 06.45 |
| >50 | 19 | 6.12 | 10 | 03.22 | 29 | 09.35 |
| Total | 192 | 61.94 | 118 | 38.06 | 310 | 100.0 |

Table 3: Incidence of Various Symptoms (n=310).

| Sl. No. | Symptoms | No. of Patients | % |
|---------|--|-----------------|--------|
| 1. | Pain Abdomen (Paraumbilical region) | 310 | 100.00 |
| 2. | Migration of Pain in Right Lower Abdomen | 294 | 94.83 |
| 3. | Fever | 196 | 63.22 |
| 4. | Vomiting/Nausea | 176 | 56.77 |
| 5. | Anorexia | 161 | 51.93 |
| 6. | Constipation | 26 | 08.39 |
| 7. | Diarrhoea | 19 | 06.13 |
| 8. | Frequency in Micturition | 12 | 03.87 |
| 9. | Burning Micturition | 08 | 02.58 |

Table 4: Distribution of the patients according to Alvarado Score (n=310).

| Score | No. of Patients | Percentage (%) |
|-------|-----------------|----------------|
| 1 | 00 | 00.00 |
| 2 | 02 | 00.60 |
| 3 | 11 | 03.59 |
| 4 | 39 | 12.58 |
| 5 | 60 | 19.35 |
| 6 | 83 | 26.77 |
| 7 | 45 | 14.51 |
| 8 | 35 | 11.29 |
| 9 | 16 | 05.16 |
| 10 | 19 | 06.13 |

Table 5: Distribution of the patients according to Alvarado Grades (n=310).

| Grades of Alvarado Score | No. of Patients | Percentage (%) |
|--------------------------|-----------------|----------------|
| 1-4 | 52 | 16.77 |
| 5-6 | 143 | 46.12 |
| 7-10 | 115 | 37.10 |
| Total | 310 | 100.00 |

Table 6: Histopathological evaluation of appendicectomy samples (n=71).

| Total number of Patients Operated | Histopathology Report | | | |
|-----------------------------------|-----------------------|---------|----------|---------|
| | Positive | | Negative | |
| | No. | (%) | No. | (%) |
| 71 | 64 | (90.14) | 07 | (09.86) |

DISCUSSION

Acute Appendicitis remains the most common abdominal condition requiring surgical intervention worldwide.^[8] Misdiagnosis and delay in surgery can lead to complications like perforation and finally peritonitis.^[4] Alvarado scoring system (Also known by acronym MANTRELS) was identified as a useful clinical tool for early diagnosis of acute appendicitis, because it is fast, readily available, affordable, and relatively accurate. In this study, we observed that appendicitis was more common in male as compared to females with a ratio of 1.6 to 1, and the incidence was more in younger age groups (21-30 years). Negligence of female health care in our region may be the reason behind the male preponderance. Comparable results were concluded by other studies.^[9-11] Alvarado score was calculated and then compared once the histopathological report was available. The negative appendectomy rate in our study was 9.86%, whereas the Positive Predictive Value (PPV) was the maximum up to a percentage of 90.14% among these patients, which is comparable to other studies.^[5,12,13] On contrast a negative appendectomy rate of 20-40% has been reported in the literature.^[14] Literature shows that if the negative appendectomy rate is less than 10-15%, then the surgeon is operating on too few patients thus increasing the risk of complications.^[4] Removing a normal appendix is a burden both on patients and health resources.^[15] Atypical cases present a diagnostic dilemma. Therefore, clinical diagnosis should be complemented with other diagnostic modalities such as Ultrasound, Computed

Tomography (CT), Laparoscopy, and C-reactive protein levels to reduce the negative appendectomy rate in equivocal cases.^[13] Abdominal Ultrasonography is highly operator-dependent test in diagnosing acute appendicitis^[17] and may end up with false negative results. CT scan may resolve the issue supported by Ultrasonography and assessment of C-reactive protein levels.^[18] No imaging test is 100% correct in diagnosing acute appendicitis.^[19] Different diagnostic aids have appeared recently and among this Laparoscopy and Ultrasonography have shown good results, but they also have limitations and drawbacks.^[14] Lamparelli *et al.* employed a combination of Alvarado score and laparoscopy in adult females to increase the diagnostic accuracy.^[20] However a certain diagnosis can only be obtained at surgery and after pathological examination of surgical specimen.^[21] Studies evaluating usefulness of Alvarado scoring system in paediatric age group shows that it is equally accurate in children with positive predictive values of up to 85.7%.^[22]

CONCLUSION

In conclusion, the results of our study revealed that the presence of high Alvarado scoring is highly predictive of acute appendicitis. Its application in our setup for cases of acute abdomen improves the diagnostic accuracy and further reduces negative appendectomy and complications, and overall improved management. Our study strongly recommends surgical interventions in patients having Alvarado score 7 or greater.

Limitations

As the study was applied only to a small group of patients, so results may not reflect the scenario worldwide, and needs to be evaluated further in a larger group of patients.

Acknowledgement

We are very much thankful to the Prof. Dr. G. P. Shrivastava, Ex H.O.D., Department of Surgery, Sanjay Gandhi Memorial Hospital associated with Govt. Shyam Shah Medical College, Rewa, Madhya Pradesh, India, for providing us the opportunity to study the cases and also encouraging us to report the study.

REFERENCES

1. Marx JA. Rosen's emergency medicine: concepts and clinical practice. In: Hockberger RS, et al. 7th ed., Philadelphia: Mosby-Elsevier; 2010.
2. Ohle R, O'Reilly F, O'Brien K K, Fahey T, Dimitrov BD. The Alvarado Score For Predicting Acute Appendicitis: A Systematic Review. BMC Medicine. 2011; 9: 139.
3. Gilmore OJA, Jones D, Ynag Q. Appendicitis and mimicking conditions. Lancet. 1975;II:421-4.
4. Ohmann C, Yang Q, Franke C. The abdominal pain study group. Diagnostic scores for acute appendicitis. Eur J Surg. 1995; 161:273-81.
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 Coll Surg. 1994; 76: 418-9.
6. Paulson Eal. Clinical Practice: Suspected Appendicitis. N E J M. 2003; 248:236-242.
7. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med. 1986;15:557.
8. Hanif MS, Tahir TH, Sheikh IA, Ranjha MZ. Acute appendicitis: gaining time in mass casualty scenario. Pak Armed Forces Med J. 2010; 3:1e6.
9. Santacroce L. Appendectomy [Internet]. 2010. [cited 2011 Jan 1]. Available from: <http://emedicine.medscape.com/article/195778-Overviews>.
10. Qureshi WI, Durrani KM. Surgical audit of acute appendicitis. Proceeding ShaikhZayed Postgrad Med Inst. 2000; 14:7-12.
11. Amer S. Protocol based diagnosis of appendicitis. J Postgrad Med Inst. 2004; 18:280 3.
12. Kanumba ES, Mabula JB, Rambau P, Chalya PL. Modified Alvarado scoring system as a diagnostic tool for acute appendicitis at Bugando Medical Centre, Mwanza, Tanzania. BMC Surgery. 2011; 11: 1e5.
13. Malik KA, Khan A, Waheed I. Evaluation of the Alvarado score in diagnosis of acute appendicitis. J Coll Physicians Surg Pak. 2000;10:392-4.
14. Hoffmann J, Rasmussen OO. Aids in the diagnosis of acute appendicitis. British Journal of Surgery. 1989; 76(8): 774-779.
15. Khan I, Rehman AU. Application of Alvarado scoring system in diagnosis of acute appendicitis. J Ayub Med Coll Abbotabad. 2005; 17: 41e44.
16. Schneider C, Kharbanda A, Bachur R. Evaluating appendicitis scoring system using a prospective pediatric cohort. Ann Emerg Med. 2007; 49: 778e784.
17. Charles D Douglas et al. Controlled Trial of Ultrasonography in Diagnosis of Acute Appendicitis incorporating the Alvarado Score. BMJ. 2000; 321(7266): 919.
18. Terasawa T, Blackmore CC, Bent S, Kohlwes RJ. Systematic review: computed tomography and ultrasonography to detect acute appendicitis in adults and adolescents. An I Med. 2004; 141: 537-546.
19. Field S. et al. Acute Abdomen. In Sutton D Textbook of Radiology and Imaging. Churchill Livingstone, 7th ed. 2003. Pg 685.
20. Lamparelli MJ, Hoque HM, Pogson CJ, Ball AB. A prospective evaluation of the combined use of the modified Alvarado score with selective laparoscopy in adult females in the management of suspected appendicitis. Ann R Coll Surg Engl. 2000; 82:192-5.
21. Dado G, Anania G, Baccarani U, Marcotti E, Donini A, Risaliti A et al. Application of a clinical score for the diagnosis of acute appendicitis in childhood. J Pediatr Surg. 2000; 35:1320-2.
22. Rehman I, Burki T. Alvarado scoring system in the diagnosis of acute appendicitis in children. J Med Sci. 2003;11:37-41.

How to cite this article: Waskale V, Singh A, Gaharwar APS, Singh V. Evaluation of Role of Alvarado Score in Diagnosis of Acute Appendicitis: A Prospective Study. Ann. Int. Med. Den. Res. 2016; 2(6): SG41-SG44.

Source of Support: Nil, **Conflict of Interest:** None declared