International Surgery Journal
Anupriya R et al. Int Surg J. 2019 Jun;6(6):2080-2083
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20192370

Original Research Article

A comparison of Tzanakis and Alvarado scoring system in the diagnosis of acute appendicitis

R. Anupriya, C. P. Ganesh Babu*, K. V. Rajan

Department of General Surgery, Mahatma Gandhi Medical College and Research Institute, Pondicherry, India

Received: 06 March 2019
Accepted: 17 April 2019

***Correspondence:**
Dr. C. P. Ganesh Babu,
E-mail: drcpgb@gmail.com

ABSTRACT

Background: Appendicitis is the most common abdominal emergency worldwide. Lifetime risk of acute appendicitis is 8.6% and 6.7% for man and women respectively. Clinical examination is helpful in diagnosis of acute appendicitis in only 70-87% of the cases. To compare Tzanaki and Alvarado scoring system in diagnosing acute appendicitis.
Methods: This was a prospective, comparative, cross-sectional study, which was conducted at the Mahatma Gandhi Medical College and Research Institute Hospital. Patients with acute appendicitis were included in the study. Relevant history, examination and laboratory investigations done. Patients were scored according to both Alvarado scoring system and Tzanakis scoring, and both were documented in the proforma. Sensitivity, specificity, positive predictive value, negative predictive value were assessed and compared for both scoring systems.
Results: 70 patients were included in this study. 54.3% of patients have Tzanakis score more than 8. 35.7% of patients have Alvarado score more than 7. 82.9% of patients had evidence of appendicitis in histopathological examination. Tzanakis score: sensitivity– 65.52%, specificity- 100%, PPV– 100%, NPV– 37.50%, accuracy– 71.43%. Alvarado score: sensitivity– 36.21%, specificity– 66.67%, PPV- 84%, NPV– 17.78%, accuracy– 41.43%.
Conclusions: Tzanakis scoring system is an effective scoring system in diagnosing acute appendicitis.

Keywords: Acute appendicitis, Alvarado score, Tzanakis score

INTRODUCTION

Acute Appendicitis is the common acute surgical condition of the abdomen. Over the past 100 years, the morbidity and mortality rates related to this condition have markedly decreased.[1] This is because of the early recognition of the effects of appendicular perforation. Thus an aggressive surgical treatment strategy involving early operation with the acceptance of a high negative appendicectomy rate of 15% to 30% is universal.[2,3] Although the negative appendicectomy has negligible mortality, it has associated morbidity rate of 10%. Appendicitis still poses a diagnostic challenge, and many methods have been investigated to try to reduce the removal of a normal appendix without increasing the perforation rate. Radiological methods such as ultrasonography and computed tomography, as well as laparoscopy, are all methods that have been investigated previously. Many diagnostic scores have been advocated, but most are complex and challenging to implement in a clinical situation.[4,5]

Alvarado described the scoring system in 1986. Kalan et al in 1994 later modified it by taking one laboratory finding off the scoring system. The Alvarado scoring system in patients with the pre-operative clinical diagnosis of appendicitis has been useful in the early diagnosis of acute appendicitis as demonstrated by various studies and was helpful in reducing the incidence

of negative appendectomies without increasing the morbidity and mortality.[6]

Tzanakis scoring system was first conducted in Athens University, Medical School, Greece by Nicolaos E Tzanakis in 2005. Tzanaki's scoring system is one of these scoring systems; combining clinical assessment, raised leucocytes count and ultrasonography. There are only four variables with a total of 15 points, and a score of either 8 or more is considered acute appendicitis requiring surgical treatment.[7]

Aim of the study was to compare Tzanaki and Alvarado scoring system in diagnosing acute Appendicitis and to assess the efficacy of Tzanaki and Alvarado scoring system in diagnosing acute Appendicitis (negative appendicectomy rate) by comparing both the scoring system with histopathology report.

METHODS

This was a prospective, comparative, cross-sectional study, which was conducted at the Mahatma Gandhi Medical College and Research Institute Hospital, a rural tertiary care hospital with an annual volume of above 1,00,000 patients over one year period.

All patients admitted to the general surgery service at Mahatma Gandhi Medical College between October 2017 and October 2018 with a diagnosis of acute appendicitis was included. As per previous year's records, the expected sample size would be at least 50 cases.

Inclusion criteria

• All patients diagnosed with acute appendicitis undergoing open or laparoscopic appendicectomy

Exclusion criteria

- Patients not fit or not willing for surgery
- Appendicular mass

Even when both the scores were below cut-off value patients subjected for appendicectomy based on clinical judgement.

Relevant history, examination and laboratory investigations done. Patients were scored according to both Alvarado Scoring System and Tzanakis scoring, and both were documented in the proforma. Sensitivity, specificity, positive predictive value, negative predictive value were assessed and compared for both scoring systems.

The decision to operate on the patient (versus conservative line of management) was based solely on the clinical suspicion of an experienced Surgeon who was not part of/involved in the study. Scoring was performed at every review until a decision was made from either appendicectomy or continued conservative line of management. The diagnosis of acute appendicitis was confirmed by operative findings and histopathological assessment of the appendicectomy specimen with the ultimate criterion for the final diagnosis of acute appendicitis being the histological demonstration of polymorphonuclear leukocytes throughout the thickness of the appendix wall.

Data were analyzed using Pearson chi-square test to calculated sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy.

RESULTS

70 patients admitted to the general surgery service with diagnosis of acute appendicitis was included. Mean is 33.31±11.08 years. 44 patients were male and 26 patients were female. Most of the patients are in 21 to 30 years age group, followed by 41 to 50 years age group. 10% of patients are in younger group. According to Tzanakis score, more than 8 were diagnosed to have appendicitis. 54.3% of patients have Tzanakis score more than 8. According to Alvarado score, more than 7 were diagnosed to have appendicitis. 35.7% of patients have Alvarado score more than 7. Histopathological examination shown that 82.9% of patients had evidence of appendicitis.

Table 1: Distribution of age group.

Age group (in years)	Frequency	Percentage (%)
<20	7	10.0
21-30	30	42.9
31-40	7	10.0
41-50	22	31.4
51-60	3	4.3
>61	1	1.4
Total	70	100.0

Table 2: Crosstabulation of Tzanakis Score with HPE.

Tzanakis Score	HPE		Total	P value
	Positive	Negative		
>8	38	0	38	<0.0001
<8	20	12	32	
Total	58	12	70	

According to Tzanakis score, 38 patients were diagnosed to have appendicitis. Out of these 38, all patients had evidence of appendicitis histopathologically. No patients were falsely diagnosed to have appendicitis by Tzanakis scoring system. Out of the 32 patients diagnosed by Tzanakis as not having appendicitis 20 patients were had evidence of appendicitis histopathologically. The Tzanakis score had 65.52% sensitivity to correctly identify the appendicitis with confidence interval of 51.88% to 77.51%. Specificity of Tzanakis score is

100%, normal appendices is correctly identified with score <8 with confidence interval of 73.54% to 100.00%. Tzanakis score had 100% positive predictive value and having 37.50% negative predictive value. Accuracy of Tzanakis score is 71.43%.

Table 3: Cross tabulation of Alvarado score with HPE.

Alvarado Score	HPE		Total	P value
	Positive	Negative		
>7	21	4	25	0.85
<7	37	8	45	
Total	58	12	70	

According to Alvarado score, 25 patients were diagnosed to have appendicitis. Out of these 25, 21 patients had evidence of appendicitis histopathologically, 4 patients were falsely diagnosed to have appendicitis by Alvarado scoring system. Out of the 45 patients diagnosed by Alvarado as not having appendicitis 27 patients were had evidence of appendicitis histopathologically. The Alvarado score had 36.21% sensitivity to correctly identify the appendicitis with confidence interval of 23.99% to 49.88%. Specificity of Alvarado score is 66.67%, normal appendices is correctly identified with score <7 with confidence interval of 34.89% to 90.08%. Alvarado score had 84% positive predictive value and having 17.78% negative predictive value. Accuracy of Alvarado score is 41.43%.

Table 4: Cross tabulation of Alvarado score <7 with Tzanakis score.

Tzanaki score	HPE		Total	P value
	Positive	Negative		
>8	17	0	17	0.015
<8	20	8	28	
Total	37	8	45	

When comparing the results of Tzanakis score with 45 patients of Alvarado score <7. We found that Tzanakis score was >8 in 17 patients which are all had evidence of appendicitis in histopathological examination. 20 patients were had <8 Tzanakis score who are all had evidence of appendicitis in histopathology. 8 patients were had normal appendices in <8 Tzanakis score.

DISCUSSION

In this study, we compared the Tzanakis score with the Alvarado score in the diagnosis of appendicitis in 70 patients. Male predominance is observed in our study at 62.9%.

Incidence was in higher in the age group of 21 to 30 years. Suresh et al reported that male dominance was observed 55% and the incidence is more common in the age group of 21 to 30 years.[8] In our study, 54.3% of patients had Tzanakis score greater than 8 and 35.7% of patients had Alvarado score greater than 7. Histopathological examination showed that 82.9% of patients had evidence of appendicitis. Recent studies have indicated that the accuracy of diagnosing acute appendicitis in Asian populations using the Alvarado Scoring gave much poorer result. Memon et al reported a higher accuracy rate in 89.3% with 8.3% of negative predictive value.[9]

Sigdel et al found the effectiveness of Tzanakis score in 100 patients undergone emergency appendectomy having sensitivity, specificity, and overall diagnostic accuracy was 91.48% and 66.66% and 90%.[10] Shashikala et al studied the sensitivity, specificity, positive predictive value and negative predictive value of Tzanakis score in 50 clinically diagnosed cases of acute appendicitis and it was 79.62%, 83.3%, 97.72%, and 31.25%.[11]

In our study, as per Tzanakis score of 38 patients out of 70 (54.2%) were opted score of >8 which indicates need of surgery whereas HPE revealed that 58 patients (82.85%) had evidence of appendicitis. Tzanakis score had the sensitivity of 65.2%, specificity of 100%, 100% positive predictive value, 37.50% negative predictive value, the accuracy of 71.43%. Which resembles with the study done by Tzanakis et al. have published that it's scoring system had sensitivity and specificity of 95.4% and 97.4% respectively. Lakshminarasimhaiah et al, in his study, he showed the sensitivity of 85.49%, Specificity of 71.43%, the positive predictive value of 98.80%, the negative predictive value of 15.15%, diagnostic accuracy of 85%.[12] A larger negative appendectomy rate of 15% to 25% has been allowed in the past in the cost of preventing appendicular perforation in the studies of Raja et al and Joshi et al.[13,14]

Hsiao et al conducted a retrospective study and found sensitivity and specificity for an Alvarado score ≥7 were 60% and 61% respectively.[15] Rezak et al, in their retrospective study, found a higher sensitivity and specificity- 92% and 82% respectively. This study also suggested that if patients with scores >7 been managed directly by appendectomy without CT evaluation, this would have caused a 27% reduction in CT scanning. Owen et al prospectively evaluated 215 patients and found the sensitivity and specificity of Alvarado scoring were 93% and 81%.[16] Patients with less than 7 Alvarado score were compared with Tzanakis score which revealed that 17 patients (37%) in 45 patients were having greater than 8 Tzanakis score which is having evidence of appendicitis in the histopathological examination. 37 (82.2%) patients out of 45 patients with Alvarado score less than 7 where having the sign of appendicitis in the Histopathological examination. Comparing positive histopathological results of Alvarado score less than 7 patients with 20 (44.4%) patients where have Tzanakis scored less than 8 which determine negative appendicectomy rates.

Along with clinical examination, various laboratory parameters of inflammation (TLC, CRP), USG, CT, and laparoscopy are used to establish an accurate diagnosis of acute appendicitis. Numerous scoring systems have been developed to aid in the preoperative diagnosis of acute appendicitis viz. Alvarado and modified Alvarado score are being used worldwide. Here we compared the Tzanakis score with Alvarado score in predicting appendicitis, Tzanakis score performed well in prediction than Alvarado score. Tzanakis scoring system is a combination of clinical examination, ultrasonography, and inflammatory markers.

CONCLUSION

In conclusion, the Tzanakis score is currently a much better diagnostic scoring system for acute appendicitis compared to the Alvarado score. Acute appendicitis is a common surgical emergency. Good clinical judgment aided by investigation scoring system can help to reduce the negative appendectomy rate. Tzanakis had significantly higher sensitivity, negative predictive value and diagnostic accuracy in our study group. In remote settings or emergency, a quick decision can be made with regards to referral to an operating surgeon or observation.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Anupriya R, Ganesh Babu CP. Rajan KV. A comparison of Tzanakis and Alvarado scoring system in the diagnosis of acute appendicitis. Int Surg J 2019;6:2080-3.