

Tzanakis Score vs Alvarado Score in Acute Appendicitis

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ABSTRACT

Introduction: Acute appendicitis is a common surgical emergency. Accurate diagnosis and timely intervention reduces mortality and morbidity. This study compared the efficacy of Tzanakis and Alvarado score in diagnosis of acute appendicitis.

Methods: A prospective, non randomized study was conducted in 100 consecutive patients who had undergone emergency appendectomy from May 2008 to October 2008. Tzanakis and Alvarado scores were obtained at the time of admission. Final diagnosis of acute appendicitis was based on histological findings.

Results: The sensitivity, specificity and overall diagnostic accuracy of Tzanakis score was 91.48% and 66.66% and 90% respectively. The sensitivity, specificity and overall diagnostic accuracy of Alvarado score was 81.91% and 66.66% and 81 % respectively. Negative appendectomy rate was 6%.

Conclusions: Tzanakis score is an effective modality to establish the accurate diagnosis of acute appendicitis.

Key Words: acute appendicitis, Tzanakis score, Alvarado score

INTRODUCTION

Acute appendicitis (AA) has a lifetime risk of 8.6% and 6.7% for men and women respectively.¹⁻³ The accuracy of clinical examination in diagnosing AA is 70% to 87%.^{4,5} Approximately 20% to 33% of patients with suspected

AA have atypical findings making clinical diagnosis difficult.^{6,7} Diagnostic errors are common, resulting in median incidence of perforation of 20% and a negative laparotomy rate ranging from 2% to 30%.

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Alvarado score⁹ is widely used to diagnose AA; a score of 7 or more is considered diagnostic requiring surgery.⁹ Its sensitivity and specificity ranges from 73-90% and 87-92% respectively.^{10,11} Tzanakis score¹² is a combination of clinical evaluation, ultrasonography and inflammatory markers. There are altogether four variables and 15 points and a score of 8 or more diagnoses AA requiring surgery. Its sensitivity, specificity and accuracy are 95.4%, 97.4% and 96.5% respectively.¹² This study compares the efficacy of Tzanakis score with Alvarado score to diagnose AA.

METHODS

A prospective, non-randomized study was carried out in 100 consecutive patients with the clinical diagnosis of AA who underwent emergency appendectomy in Department of Surgery, Institute of Medicine (IOM) from May 2008 to October 2008. Informed consent was obtained from all participants. Ethical approval for the study was obtained from the institutional review board, IOM.

All patients with the clinical diagnosis of acute appendicitis underwent abdominal ultrasonography (USG), total and differential leukocyte count as part of their assessment. USG was done with a standard 5 MHz linear transducer. The radiologist was blinded to the results of physical examinations and blood tests, but not to the patient's symptoms. Well established ultrasonographic criteria were applied to discriminate an acutely inflamed appendix from a normal one.¹³ Those with generalized peritonitis, appendicular abscess, appendicular lump, alternative diagnosis with normal appearing appendix detected during operation and those who did not consent for the study were excluded from the study.

Alvarado and Tzanakis score were obtained at the time of admission. Even when the scores were below the cut off value, patients were subjected for appendectomy based on clinical judgment. Final diagnosis of AA was based on histological findings.

Statistical analysis was done by using Statistical Package for the Social Sciences Software (SPSS) Program for windows® version 11.5. Fischer's exact test was used as a test of significance between categorical data. Diagnostic power of the two scoring systems was assessed by calculating the area under the receiver-operator characteristic (ROC) curve. Statistical significance was accepted at the 5 percent level.

RESULTS

Between May 2008 and October 2008, 107 patients with the clinical diagnosis of AA were assessed for

eligibility; of these three refused to participate and four had an alternative diagnosis during operation (two salpingitis, one carcinoma caecum and one twisted right ovarian cyst). Finally a total of 100 patients underwent emergency appendectomy and were selected for this study. The most common position of the appendix was retrocecal (81%). Ninety four percent had histologically proven AA. Negative appendectomy rate was 6% (female 4% and male 2%). Negative appendectomy rate among female and male population was 14.2 % and 2.77 % respectively. The high negative appendectomy rate among female was not statistically significant ($P=0.05$).

Table 1. Demographic data

Total no of patients	100
Male : Female	2.6 : 1 (72 : 28)
Age in years*	27.5 ± 9.8 (15 – 68)
Duration of symptoms (hours)*	25.4 ± 19.5 (3 – 96)
* Mean ± S.D (range)	

AA was significantly high (Odd's ratio (OR) 21.5, confidence interval (CI) 95%, 3.40 to 136.13; $P=0.002$) in patients with Tzanakis score of 8 or more. The sensitivity and specificity of Tzanakis score in diagnosing AA was 91.48% and 66.66% respectively. The overall diagnostic accuracy was 90% with positive predictive value of 97.72% and negative predictive value of 33.33% (Table 2).

Table 2. Tzanakis score and histological diagnosis

Histological Diagnosis			
Tzanakis score	Acute appendicitis	Normal appendix	Total patients
≥ 8	86	2	88
< 8	8	4	12
Total patients	94	6	100

AA was significantly high (OR 9.06, CI 95 %, 1.53 to 53.54; $P = 0.017$) in patients with Alvarado score of 7 or more. The sensitivity and specificity of Alvarado score in diagnosing AA was 81.91% and 66.66% respectively. The overall diagnostic accuracy was 81% with positive predictive value of 97.46% and negative predictive value of 19.04% (Table 3).

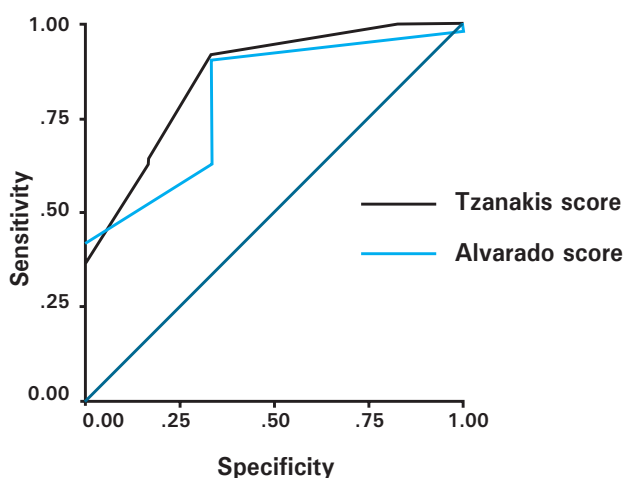
Table 3. Alvarado score and histological diagnosis

Histological Diagnosis			
Tzanakis score	Acute appendicitis	Normal appendix	Total patients
≥ 7	77	2	79
< 7	17	4	21
Total patients	94	6	100

Table 4. Comparison of Tzanakis score in patients with Alvarado score of < 7

Histological Diagnosis			
Tzanakis score	Acute appendicitis	Normal appendix	Total patients
≥ 8	12	1	13
< 8	5	3	8
Total patients	17	4	21

When the Tzanakis score and the Alvarado score were analyzed for their efficacy in diagnosis of AA, the area under the ROC curve was 0.857 and 0.801 respectively ($P = 0.003$ and 0.014) (Figure 1).

**Figure 1.** Receiver- operator characteristic (ROC) curve for the Tzanakis and Alvarado score in diagnosis of acute appendicitis

Among the 21 patients whose Alvarado score was below 7, 13 patients had Tzanakis score of 8 or more and 12 of them had histologically proven AA (Table 4). The sensitivity and specificity of Tzanakis score in this subset of patients was 70.58 % and 75 % respectively. However the ability to detect AA by Tzanakis score in patients with Alvarado score of less than 7 was not statistically significant ($P = 0.133$).

DISCUSSION

Diagnosis of AA is often a challenging job to the surgeon. Delayed diagnosis can lead to complications with high mortality and morbidity compared to non-perforated appendicitis. A high negative appendectomy rate of 15-25% has been accepted in the past in the cost of preventing appendicular perforation.^{6,14} Negative appendectomy is not without complications. Though the mortality is low, it can be associated with morbidity of 10- 15%.¹⁵ For these reasons negative appendectomy

should be minimized by improving diagnostic accuracy. Diagnosis of AA is primarily based on surgeon's clinical impression. Besides clinical evaluation, various laboratory parameters of inflammation (leukocytosis and raised C-reactive protein), radiological tools like ultrasonographic or computed tomographic evaluation of appendix and laparoscopy are used to establish an accurate diagnosis of acute appendicitis. These armamentarium has definitely increased the diagnostic accuracy and help to reduce negative appendectomy rate. However these techniques are not available universally.

Tzanakis et al¹² have reported the sensitivity, specificity and accuracy of 95.4%, 97.4% and 96.5%, respectively. The results of our study were comparable with that reported by Tzanakis et al. in terms of sensitivity, predictive value of positive test and overall diagnostic accuracy. The low specificity of Tzanakis score in this study was likely to be due to low sensitivity rate of USG (63.82%) in detecting AA which was far below as compared to the literature (85-96%).^{5,9-12}

Alvarado score has been validated in various studies with the sensitivity of 73-91% and specificity of 78-92%.^{9,11} The sensitivity of this score in the current study (81.91%) was comparable with the other reports. However, the specificity of Alvarado score in this study (66.66%) was quite low compared to other studies. Low specificity of Alvarado score was explained by the high rate of false positive (33.3%) result.

The current study aimed to compare the efficacy of Tzanakis score with the Alvarado score in the diagnosis of AA. Tzanakis score was superior in terms of its sensitivity, diagnostic accuracy and predictive value of negative test. The false negative rate of Alvarado score in the diagnosis of AA was 18.08%, whereas that of Tzanakis score was only 8.51%. Both the scoring systems yielded an equal and a low specificity rate of 66.66%.

This study has shown a negative appendectomy rate of 6%. Majority of our patients presented late (mean duration of symptoms 25.4 hours), which increases the rate of positive clinical findings as well as laboratory parameters for AA. This has probably led to a more accurate preoperative diagnosis and hence the lower rate of negative appendectomy in our setup. This study had some limitations. Both clinical and ultrasonographic evaluations were done by different persons, allowing place for inter-observer differences in findings.

CONCLUSIONS

In conclusion, a good clinical judgment aided by investigations and scoring system can help to reduce the

negative appendectomy rate. Tzanakis scoring system can be used as an effective modality to establish the

accurate diagnosis of acute appendicitis with reasonably low negative appendectomy rate.

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