Original Article

Comparison between Modified Alvarado Score and Tzanakis Score in Diagnosing Acute Appendicitis in Erbil City

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Abstract

Background: The problem of negative appendectomies is an obstacle in medicine because the physicians face difficulties in diagnosing this disease. Therefore, the inclusion of ultrasonography which is a cheap diagnostic tool may enhance the diagnostic dexterity of physicians in acute appendicitis (AA). **Objective:** This study evaluates and compares the Modified Alvarado Score (MAS) with Tzanakis Score (TZS) in diagnosing AA. **Materials and Methods:** A prospective study involved 100 patients who were admitted to Rozhhalat hospital in Erbil, following a diagnosis of AA, they had undergone appendectomy during the period from May 2017 to February 2018. All the patients were inquired, examined, and investigated according to MAS and TZS at the same time preoperatively, while the final decision was confirmed by the result of histopathology. **Results:** Retrocecal appendix was found in 73.15% of patients. Males were 66 cases, while females had 34 cases in a ratio (Male:Female = 1.9:1). The patient's mean of age was 22.667 years (standard deviation of ± 8.03 years). Histological result of 86% of cases was proven to be AA. The accuracy of MAS in diagnosing acute appendicitis was calculated by its sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) which were 0.941, 0.928, 0.987, and 0.723 respectively. While the results of the TZS found that the sensitivity: 0.977, the specificity: 0.928, the PPV: 0.988, and the NPV: 0.867. Results also found that the overall negative appendectomies were 14%. **Conclusion:** TZS is a cheap, easy, and more practical tool for detecting AA in comparison to MAS.

Keywords: Acute appendicitis, modified Alvarado score, Tzanakis score

Introduction

The appendix is a narrow blind-ended muscular tube or diverticulum containing lymphoid tissue. Its length is ranging from 6 cm to 9 cm. Its base is attached to the cecum and its tip is free; its base opens into the posteromedial wall of the cecum below the ileocecal valve. The base of the appendix lies in the right iliac fossa and in relation to the anterior abdominal wall. This point is called the McBurney or Spinoumbilical point, which is referred to as the meeting point of the medial 2/3 and the lateral 1/3 of a line drawn from the anterior superior iliac spine to the umbilicus. The position of its base is not changed in regard to the cecum, while the appendix (the free portion and the tip) has different positions in relation to the cecum.[1-3]

During surgical operations, the base of the appendix can be found by tracing the teniae coli of the cecum and following these to the base of the appendix, as they converge.[3] Its completely covered by visceral peritoneum and is attached to the mesentery of the terminal ileum by a mesentery which is called mesoappendix, which bears the appendicular vessels and nerves.[3]

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The tip of the appendix is having a free movement and could be found in one of the positions: in the pelvis (right wall), posterior to the cecum, projects superiorly to the right paracecal region, and anterior or posterior to the terminal part of the ileum. The first and second positions are the most commons sites.[3]

Acute appendicitis (AA) is the most common diseases of the appendix (in humans); appendix cancer is the rarest of all gastrointestinal malignancies. Adenomas may also rarely present.

AA is the most common emergency in the general surgical practice, and early surgical interference has better prognosis.[4] Nearly 8% of cases of AA in the west may have appendicitis any time in their life but with high incidence rate in between 10- and 30-year-old patients.[5]

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The early diagnosis of appendicitis can be highly estimated, and a high sensitivity and specificity of diagnostic measures are crucial to prevent hazards of complications. Internationally, the perforated appendicitis is the leading cause of death in general surgery;[4] this disease is rare in infants, but incidence increases with age, especially among children and young adults.[6]

The clinical diagnosis of AA classically depends on the history and clinical examination of the patients. The classical symptoms include a central (para-umbilical) pain or colic which will shift to the right iliac fossa, accompanied with anorexia and nausea, while the signs of clinical examination include mild fever, tenderness localized in the right iliac fossa, guarding of the abdominal muscles, and rebound tenderness.[6]

The clinical diagnosis is demanding for the laboratory and radiological investigations to increase the suspicion of the disease; the laboratory information is mostly taken from the white blood cell count which is showing a range of 10,000–18,000 cells/mm^3 polymorphic nucleocytes predomination in acute noncomplicated cases appendicitis, while if the white cells shown >18,000 cells/mm^3, it indicated a higher suspicion of complicated AA.[7]

The general analysis of blood does not carry specific information, which would specify the presence of AA. Hence, the shift to the left in leukocytosis may refer in some extent to existence of inflammation in the majority of patients.

Abdominal ultrasonography is beneficial in the diagnosis of AA by the identification of the target lesion of thickened walled noncompressible luminated structure in the right iliac fossa. In severe cases, may show a fluid in the peritoneal cavity, even an abscess could be seen.[8]

The abdominopelvic computerized tomography appears to be more specific than abdominal ultrasound. Both ultrasonography and computerized tomography are more helpful, the other nonappendicitis causes of pain in the right lower quadrant, decreasing the false-positive errors.[8] In the process of decreasing the negative appendectomies, which may range between 15% and 30% depending on clinical examination alone,[6] problems arise in reproductive-aged females and extremities of age who show atypical signs and symptoms undifferentiated from AA.[9]

Clinical and laboratory scores have been adapted to increase positive appendectomies and to simplify the process of diagnosis. One of these scores was the Alvarado (MANTRELS) scale,[10] which was invented to improve the diagnosis of appendicitis, so its scores were designed to increase the suspicion of AA in diagnosis.

The Alvarado score nowadays is an old system for scoring the signs and symptoms of the AA, far more its regarded as a nonpopular scoring system by the most surgeons, that is why the Modified Alvarado score (MAS) shows to be easier, simpler, and cheaper diagnostic tool for making right decisions of laparotomies in AA. A score of 7 or more is highly indicative for AA.[6]

Tzanakis score (TZS)[11] is a triple evaluation scale depending on the of two clinical examinations, an abdominal ultrasound examination, and laboratory results of white blood cells. The true AA that must be removed by appendicectomy has scores of 8 or more. This study will compare the accuracy of MAS and TZS in reaching diagnosis of AA.

The aim of this study is to decrease the false-positive diagnosis for cases of AA, which in turn will have a positive support for both the patients and the surgeons, by decreasing the subjection of the patient to a unindicated appendicectomies, all this will be economically beneficial for both the patient and the government.

Materials and Methods

In this prospective study, all the cases suspected to have AA have been admitted to the Rozhhalat Emergency Hospital in Erbil city, to which all surgical emergencies are referred in the city, all the cases were subjected thoroughly to history taking, clinical examination, laboratory investigations (white blood cell "total and differential") and abdominal ultrasound examination, appendicectomy (if needed and decided by the general surgeon), and sending the removed appendix specimens to histopathology.

The collection of these data was achieved from May 2017 to February 2018. During this research, all the cases who were admitted being suspected AA, but their symptoms were relieved medically, (without surgery) were not included in the study. Patients who were diagnosed and operated on for pathology other than AA, then intraoperative findings pointed to inflamed appendix, were discarded from the study. The sample, randomly size was 100 cases. All the suspected cases were subjected to a questionnaire which was derived from both MAS system and the TZS system simultaneously.

The ultrasound device was of 5 MHz linear transducers. The radiologist was not informed about results of physical examination and leukocyte count of the cases. The ultrasound criteria only subjected to differentiate the AA from normal cases (or to diagnose other pathology which must be excluded).

All the appendicectomized specimens were labeled by the patient's name with a brief clinical history, fixed in 10% formaldehyde.[12] Analysis of the statistics achieved using Statistical analysis was done by using Statistical Package for the Social Sciences Software, version 2015 (IBM SPSS Statistics, IBM Company, USA). The power of diagnosis of the MAS system and the TZS system was estimated by calculating the sensitivity, specificity, positive predictive value (PPV), and negative predictive values (NPVs). Statistical significance for the difference between the two scoring systems was accepted at the 5% level ($P < 0.05$).

This study was approved by Rozhhalat Emergency Hospital, the Department of Surgery and the Ethical Committee in the medical college of Hawler Medical University. An informed form of consent and agreement from all patients has been taken

verbally and in written, those patient disagree the consent are excluded from the study. The form of consent will reserve the confidentiality of the patients.

Results

Results of this study revealed that retrocecal appendix was found in 73.15% of patients. Males were 66 cases, while females had 34 cases in a ratio (Male: Female = 1.9:1). The patient's mean of age was 22.667 years (standard deviation of ± 8.03 years). The histological result of 86% of cases was proven to be AA. Overall negative laparotomies were14%. Negative appendectomy rate among females was higher than in males (8% vs. 6%). There was no difference in the significance of MAS and TZS in diagnosing AA, in which the $P < 0.00001$ for both in diagnosing the disease.

Scoring of acute appendicitis according to MAS and TZS is shown in the Tables 1 and 2 respectively, while Comparing between both MAS and TZS criteria regarding sensitivity, specificity, PPV and NPV are shown in the Table 3.

Table 1: Scoring of acute appendicitis according to modified Alvarado score

MAS Scores	Acute appendicitis	Normal	Patients
≥7	81	1	82
<7	5	13	18
Patients	86	14	100

MAS: Modified Alvarado Score

Table 2: Scoring of acute appendicitis according to Tzanakis score

TZS Scores	Acute appendicitis	Normal	Patients
≥8	84	1	85
<8	2	13	15
Patients	86	14	100

TZS: Tzanakis Score

Table 3: Comparing both modified Alvarado score and Tzanakis score criteria

Criteria	MAS (%)	TZS (%)
Sensitivity	94.1	97.7
Specificity	92.8	92.8
PPV	98.7	98.8
NPV	72.3	86.7

MAS: Modified Alvarado Score, TZS: Tzanakis Score, PPV: Positive predictive value, NPV: Negative predictive value

Discussion

The AA is the most common emergency in the surgical departments; this makes it the focusing center of researchers (physician and surgeons) to increase the efficacy of the diagnostic tools in this disease to minimize the bulk of the negative appendectomies.

In doubtful cases, the surgeons had invented clinic-laboratory scoring systems or tools such as Alvarado and RIPASA Tzanakis scores to help them in making accurate decisions in diagnosing AA.

In atypical presentations of suspected cases of AA, the use of imaging modalities (such as ultrasonography, magnetic resonance imaging, and computerized tomography) should complement but not replace, clinical assessment, and judgment.

In this study, the TZS shown sensitivity and specificity of 97.7% and 92.8%, respectively, which was better than MAS that has sensitivity and specificity of 94.1% and 92.8%, respectively.

These results were compatible with the international records regarding sensitivity of TZS which was ranging between 85% and 98.32%[11,12] and specificity which was between 86.5% and 97.4%[11,13]

The results of the study regarding sensitivity and specificity of MAS were also agreeing with the global researches, which were ranging between 61%–95.8%[14,15] and 80%–100%,[14] respectively.

Regarding positive predicting PPV value and NPV of the TZS were 98.8% and 86.7%, respectively, that was better than MAS which shown 98.7% and 72.3%, respectively, these results were agreeing with worldwide researches about TZS which shown PPV (86.6%–99%)[12,16] and NPV (33.33%–92.83%),[11,12] while in MAS the results of PPV showed a bit higher than international records which were 89.3%–98.26, while NPV was less than expected internationally which was between 80.64% and 88.4%, but these differences were not so far from the international records.[14]

Overall, both TZS and MAS were shown equal rate of significance regarding the diagnosis of AA, with a $P < 0.00001$. This equality in significance value was due to the relative small number of cases that were included in the study, which may surely be changed for the profit of the TZS over the MAS if sample size increased.

Overall, the negative laparotomy was 14%, which was less than the international accepted limit, which was between 15% and 20%,[12] this again may equalize the worldwide record in increasing the sample size. The females were having higher levels of negative appendectomies in comparison with males, which were 8% and 7%, respectively. This difference between 7% and 8% was not significant. This difference is known worldwide, as there is a lot of misdiagnosis between AA and other gynecological conditions such as ruptured ovarian cysts and ectopic pregnancies.

Conclusion

TZS is a cheap, easy, and more practical tool (as it needs only two clinical signs) for detecting AA in comparison to MAS. The extra fees of ultrasonography in TZS will be neglected when

compared with extra fees of higher rates negative laparotomy in MAS.

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Conflicts of interest

There are no conflicts of interest.

References

1. Sinnatamby CS. Abdomen. Lasts Anatomy Regional and Applied. 11th ed., Chapter 5 Elsevier Limited; 2006. p. 265-6.
2. Moore KL, Agur AM. Abdomen. Essential Clinical Anatomy. 3rd ed., Chapter 2, Lippincott Williams & Wilkins, 2007. p. 155-8.
3. Snell RS. Clinical Anatomy by Regions. Part II-The Abdominal Cavity. 8th ed., Vol. 5. Lippincott Williams & Wilkins; 2008. p. 230-2.
4. Maa J, Kirwood KS. The Appendix. In: Townsend CM, Beauchamp RD, Evers BM, editors. Mattox Sabiston Textbook of Surgery: The Biological Basis of Modern Surgical Practice. 19th ed., Saunders, An Imprint of Elsevier Inc.; 2012. p. 1279-89.
5. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol 1990;132:910-25.
6. Williams NS, Bulstrode CJ, O'Connell PR. Bailey and Love's Short Practice of Surgery. 26th ed., CRC Press; 2013. p. 1201.
7. Brunicard SI. Schwartz's Principles of Surgery: ABSITE and Board Review. 9th ed., New York: McGraw-Hill Medical; 2010. p. 2049.
8. Mulholland MW, Lillemoe KD, Doherty GM. Greenfield's Surgery: Scientific Principles and Practice. 5th ed., Vol. 72. Philadelphia : Wolters Kluwer/Lippincott Williams & Wilkins; 2011. p. 1207.
9. Gilmore OJ, Browett JP, Griffin PH, Ross IK, Brodribb AJ, Cooke TJ, *et al.* Appendicitis and mimicking conditions. A prospective study. Lancet 1975;2:421-4.
10. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med 1986;15:557-64.
11. Tzanakis NE, Efstathiou SP, Danulidis K, Rallis GE, Tsioulos DI, Chatzivasiliou A, *et al.* A new approach to accurate diagnosis of acute appendicitis. World J Surg 2005;29:1151-6.
12. Malla BR, Batajoo H. Comparison of Tzanakis score vs. Alvarado score in the effective diagnosis of acute appendicitis. Kathmandu Univ Med J (KUMJ) 2014;12:48-50.
13. Malik AA, Mir MF, Khurshid SU. Modified Alvarado score versus Tzanakis score for diagnosing acute appendicitis in changing clinical practice. Int J Clin Exper Med Sci 2016;2:90-3.
14. Yegane R, Peyvandi H, Hajinasrollah E. Evaluation of the modified Alvarado score in acute appendicitis among Iranian patients. Acta Med Iran 2008;46:501-6.
15. 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 Surg 2011;11:4.
16. Shashikala V, Hegde H, Victor AJ. Comparative study of Tzanakis score vs. Alvarado score in the effective diagnosis of acute appendicitis. Int J Biomed Adv Res 2016;7:418-20.