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TZANAKIS SCORE AS A TOOL TO DIAGNOSE ACUTE APPENDICITIS.

General Surgery

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ABSTRACT

Background: Appendicitis presents with pain in the right lower quadrant of the abdomen which radiates to other parts which varies with degree of inflammation.1 It is one of the most common emergencies in surgery. The accurate diagnosis of acute appendicitis is approximately 70 to 87% and misdiagnosis are common which may result in occurrence of perforation 20% and negative appendectomy 2% to 30%.2 For diagnosis of acute appendicitis it depends on clinical history, presentation, examination and laboratory investigations along with early appendectomy can avoid complications arising from perforation, mass formation, peritonitis. Along with this Ultra sonogram is also tagged with the clinical examination in this condition3. Appendectomy is one of the most commonly performed surgical emergency operations which can mimic other acute conditions of the abdomen in the right iliac fossa pain mainly among the young, the elderly and females. Appendicitis is a common surgical condition in department of surgery, its diagnosis always doubtful and is mainly diagnosed with clinical presentation and laboratory investigation such as total leukocyte count, CRP etc. USG and CT Abdomen and Pelvis also have high sensitivity and specificity but is not cost effective hence results in delay of treatment leading to complication. To reduce such circumstances and to reduce the cost many scorings systems are introduced based on blood investigations, clinical presentation and radiological findings are performed to diagnose this condition4. Raja IsteriPengiranAnakSaleha Appendicitis (RIPASA) 5, Alvarado6, Tzanakis 1 are most commonly used scoring systems to diagnose acute appendicitis. The aim of this study is to determine the accuracy of three scores in accurate diagnose of acute appendicitis by correlating them with the gold standard of histopathological confirmed appendicitis. **Objectives:** The objective was to compare the TZANAKIS,Raja IsteriPengiranAnakSaleha Appendicitis (RIPASA), Alvarado, scores in patients with right iliac fossa pain to diagnose acute appendicitis and obtain best scoring system out of these in RL jalappa hospital in cost effective way. **Materials And Methods:** A.Retrospective descriptive B.Total number of study subjects-135 All patients treated at the RLJalappa Hospital for acute appendicitis between January 2021 and April 2022 were identified through a computer-generated search through the Medical Records Department. Data were extracted retrospectively from hospital records. All patients were evaluated and graded using TZANAKIS, Raja IsteriPengiranAnakSaleha Appendicitis (RIPASA), Alvarado score. **Conclusion** TZANAKIS score was better in predicting appendicitis in RL Jalappa Hospital compared to other RIPASA and ALVARADO scoring system. It had better sensitivity and specificity than the other two scoring system. It overall reduced negative appendectomy rate and is cost effective with limited characteristics.

KEYWORDS

TZANAKIS score RIPASA score, ALVARADO score and acute appendicitis

INTRODUCTION

Tzanakis and coworkers published a appendicitis scoring system to simplify and to make it easy to diagnose acute appendicitis with four variables and total score of 15. It is comprised of clinical evaluation, ultrasonography and laboratory marker of inflammatory response.[1]Acute abdomen is still box of Pandora with different pathology and of which acute appendicitis is most common pathology and is most commonly performed operation worldwide and the risk in male is about 12% and female is about 25%. Even with current technology the mortality rate is 1-5%. One out of five acute abdomen diagnosed as appendicitis has negative appendectomy rate as high as 15-40%. Effectiveness of Tzanakis score to diagnose acute appendicitis in RL jalappa was conducted as no study was conducted before.[2]

The most common cause which leads to emergency laparotomy in developing countries and in developing countries due to resource poor setting and financial constraints the diagnosis is purely dependent on clinical presentation and minimal investigation. It is difficult to diagnose acute appendicitis in elderly and reproductive age group women which might lead to negative laparotomy. What is negative appendectomy? It is nothing but clinically suspected appendicitis but histopathological examination shows normal appendix. To avoid such circumstances scoring systems are being introduced. In spite of all the measures there is no specific investigation which is cost friendly and accurate to diagnose acute appendicitis.[7]

Scoring systems to diagnose appendicitis are like appendicitis inflammatory response (AIR) score,Alvarado,TZANAKIS , RIPASA, pediatric appendicitis score etc with variation in sensitivity and specificity. A negative appendectomy rate almost 17.5% in India following appendectomy.[8] all scores has some drawbacks. CRP is found to be increased in acute appendicitis in many studies. The tzanakis score was used in our setting which has limited variables to arrive at the diagnosis and reduce the negative laparotomy rate in cost effective way.

Appendicitis diagnosis is still a challenge to surgeons all over the world. With introduction of scoring system negative appendectomy has reduced to certain extent.[9]In this study the different scoring system has been compared with each other to derive the best out of these scoring system to diagnose the appendicitis in cost effective way and reduce the negative appendectomy rate as unnecessary negative appendectomy may lead to mortality and morbidity and reduce unnecessary exposure to radiation.

2. Objectives of Study

The objective was to compare the TZANAKIS,Raja Isteri Pengiran AnakSaleha Appendicitis (RIPASA), Alvarado, scores in patients with right iliac fossa pain to diagnose acute appendicitis and obtain best scoring system out of these in RL jalappa hospital in cost effective way.

3. MATERIALS AND METHODS

a. Retrospective descriptive
b. Total number of study subjects-135

All patients treated at the RLJalappa Hospital for acute appendicitis between January 2021 and April 2022 was identified through a computer-generated search through the Medical Records Department. Data were extracted retrospectively from hospital records. All patients were evaluated and graded using TZANAKIS, Raja Isteri Pengiran AnakSaleha Appendicitis (RIPASA), Alvarado score. Patients who underwent laparoscopy or open appendectomy are evaluated using TZANAKIS score(TABLE 1), ALVARADO SCORE(TABLE 3), RIPASA SCORE(TABLE 2) and were graded.

Table 1:Tzanakis Score

characteristics	score
Right lower abdomen tenderness	4
Rebound tenderness	3
WBCs >12000 in blood	2
Positive usg findings of appendicitis	6
total	15

Table 2: Ripasa Score

Characteristics	Score
Female	0.5
Male	1
Age <39.9	1
Age >40yrs	0.5
Rif Pain	0.5
Pain migration to RIF	0.5
Anorexia	1
Nausea and vomiting	1
Duration of symptoms < 48 hours	1
Duration of symptoms > 48 hours	0.5
RIF tenderness	1
RIF guarding	2
Rebound tenderness	1
Rovsing Sign	2
Fever >37 0C < 390 C	1
Raised WBC	1
Negative urine analysis	1
Foreign nationality	1
Total Score	17.5

Table 3: Alvarado Score

Clinical symptoms signs/ blood tests	Score
Migration of Pain	1
Anorexia	1
Nausea and vomiting	1
Tenderness at the right iliac fossa	2
Rebound tenderness	1
Raised temperature >37.50C	1
Leukocytosis (>10x 109 /L)	2
Presence of neutrophils > 70%	1
Total	10

Inclusion Criteria:
All patients who underwent emergency appendectomy with complaints of right iliac fossa pain with diagnosis of appendicitis. All the patients who presented with following complaints pain associated with nausea, fever, anorexia and vomiting along with signs of tenderness and rebound tenderness in right iliac fossa with suspicion of acute appendicitis with or without ultrasound findings.

Exclusion Criteria:
Those with clinical features of appendicular mass and features of peritonitis, patients with a previous history of renal calculi and pelvic pathology were excluded from the study.

4. Analysis & Statistical Methods
Statistical analysis:
Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. **Chi-square test** was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation.

- Sensitivity = a/(a+c) x 100 = True positive / True positive + False Negative
- Specificity = d/(b+d) x 100 = True Negative / True Negative + False Postive
- Positive predictive value = a/ (a+b) x 100 = True Postive / True positive + False Postive
- Negative predictive value = d/ (c+d) x 100 = True Negative / True Negative + False Negative
- Diagnostic accuracy = a + d / a + b + c + d = True postive + True Negative / Total

Comparison of all three score was done using Receiver operating characteristic curves (ROCs) in predicting appendicitis. Receiver operating characteristic (ROC) and optimal cut-off points will be chosen for the calculation of sensitivity, specificity, positive and negative predictive values. A test that predicts an outcome no better than chance has an area under the ROC curve of 0.5. An area under the ROC curve above 0.8 indicated fairly good prediction.

Graphical representation of data:
MS Excel and MS word was used to obtain various types of graphs such as bar diagram, Pie diagram.

P value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Statistical software:
MS Excel**,** SPSS version 22 **(**IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

5. RESULTS
Table 4:- Distribution Of Subjects According To Sex And Histopatholgy Report

	Histopathology		Total
	Negative	Positive	
Female	4	38	42
	9.5%	90.5%	100.0%
Male	9	84	93
	9.7%	90.3%	100.0%
Total	13	122	135
	9.6%	90.4%	100.0%

P value 1.00, there was no statistcially significantt difference found between sex and the diagnosis. Total number of female were 42 and males 93 out of 135 with majority males.

Table 5:- Comparison Of Mean Age Among Subjects With And Without Appendicitis

	Histopathology		
ALVARADO	Negative	Positive	Total
<8	8	92	100
>8	5	30	35
Total	13	122	135

	Mean	Std. Deviation	P Value
No appendicitis	23.608	12.1368	0.253
With appendicitis	28.369	14.3919	

Appendictis mean age second decade of life but statistically not significant as p value is 0.2

Table 6: RIPASA and Histopathology

	Histopathology		
RIPASA	Negative	Positive	Total
<7.5	4	57	61
>7.5	9	65	74
Total	13	122	135

RIPASA	Value	95% CI
Sensitivity	53.28%	44.03% to 62.36%
Specificity	30.77%	9.09% to 61.43%
Positive Predictive Value	87.84%	82.90% to 91.50%
Negative Predictive Value	6.56%	2.95% to 13.95%
Accuracy	51.11%	42.37% to 59.81%

Using RIPASA SCORE patient were categorized into two groups <7.5 and >7.5 and was compared with histopathology report out of which in <7.5 group out of 61 patient 4 had negative appendectomy and in >7.5 group out of 74 patient 9 had negative appendectomy. The positive predictive value was 87.84% with sensitivity 53.28% and specificity 30.77% with accuracy of 51.11%.(table 6)

Table 7: ALVARADO and Histopathology

ALVARADO	Value	95% CI
Sensitivity	24.59%	17.25% to 33.21%
Specificity	61.54%	31.58% to 86.14%
Positive Predictive Value	85.71%	73.83% to 92.73%
Negative Predictive Value	8.00%	5.30% to 11.91%
Accuracy	28.15%	20.75% to 36.53%

Using ALVARADO SCORE patient were categorized into two groups <8and >8 and was compared with histopathology report out of which in <8 group out of 100 patient 8 had negative appendectomy and in >8 group out of 35 patient 5 had negative appendectomy. The positive

predictive value was 85.71% with sensitivity 24.59% and specificity 61.54% with accuracy of 28.15%.(table 7)

Table 8: TZANAKIS and Histopathology

TZANAKIS	Value	95% CI
Sensitivity	99.18%	95.52% to 99.98%
Specificity	92.31%	63.97% to 99.81%
Positive Predictive Value	99.18%	94.85% to 99.87%
Negative Predictive Value	92.31%	62.87% to 98.84%
Accuracy	98.52%	94.75% to 99.82%

	Histopathology		
TZANAKIS	Negative	Positive	Total
<8	12	1	13
>8	1	121	122
Total	13	122	135

Using TZANAKIS SCORE patient were categorized into two groups <8 and >8 and was compared with histopathology report out of which in <8 group out of 13 patient 12 had negative appendectomy and in >8 group out of 122 patient 1 had negative appendectomy. The positive predictive value was 99.18% with sensitivity 99.18% and specificity 92.31% with accuracy of 98.72%.(table 8)

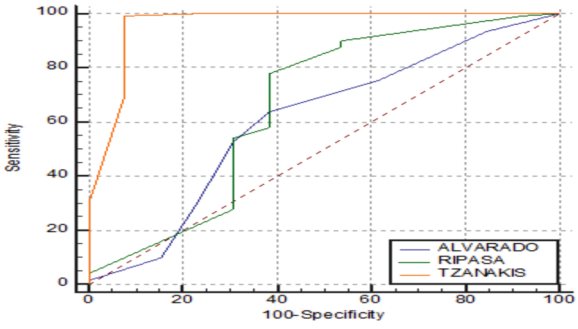

Figure 1:- ROC curve showing Comparison of ALVARA DO, RIPASA, TZANAKIS in predicting appendicitis

Table 9: AUC FOR TZANAKIS, RIPASA AND ALVARADO SCORE

	AUC	SE a	95% CI b
ALVARADO	0.605	0.0927	0.518 to 0.688
RIPASA	0.660	0.102	0.574 to 0.740
TZANAKIS	0.961	0.0385	0.913 to 0.987

Tzanakis AUC has highest value of 0.9 which is significant (table 9). TZANAKIS was best among the three in predicting appendicitis followed by RIPASA followed by ALVARADO.

Table 10: New Cut Off

	Cut off	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
TZANAKIS	>8	99.18	92.31	99.2	92.3
RIPASA	>9.5	77.8	61.5	95	22.9
ALVARADO	>7	63.93	61.54	94.0	15.4

After conducting above study new cut off was derived for the above scoring system to increase sensitivity and specificity and positive predictive value with TZANAKIS same cut off of >8 and RIPASA with new cutoff >9.5 and ALVARADO >7 to diagnose acute appendicitis.

6. DISCUSSION

Appendicitis is common surgical emergency and most commonly operated condition all over the world.3 usually patient presents as surgical emergency with pain abdomen nausea and vomiting which is most common presentation in all the other acute abdomen too.

Appendicitis is usually diagnosed on clinical history, laboratory and radiological findings. However, due to many other conditions which also present in similar manner the correct and apt diagnosis is not possible. Many pelvic pathology also presents in similar fashion and it becomes really tiresome to diagnose acute appendicitis in pregnant women. Hence radiological imaging helps in the diagnosis of acute appendicitis. The CT scan is gold standard for apt diagnosis but it has its own disadvantages such as cost burden and teratogenicity. To reduce such circumstances many scoring systems has been developed to diagnose acute appendicitis. Using these many negative appendectomies can be avoided. Undiagnosed or improper diagnosis can lead to serious complications like mass formation, perforation sepsis and mortality too. TZANAKIS,RIPASA, Alvarado are commonly applied scoring systems in general setup 1 4 6.

In this study, we used the above mentioned scores and compared it with the histopathological reports and diagnosed acute appendicitis. The results from the study show that, the TZANAKIS score had the highest predictive value, followed by the RIPASA and ALVARADO. The TZANAKIS score helped in diagnosing the acute appendicitis with minimal variables and helped in reduction of negative appendectomy rate and is cost effective too.

7. CONCLUSION

TZANAKIS score was better in predicting appendicitis in our setting compared to other RIPASA and ALVARADO scoring system. It had better sensitivity and specificity than the other two scoring system. It overall reduced negative appendectomy rate and is cost effective with limited characteristics.

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