ORIGINAL ARTICLE

Prospective Evaluation of the Bengezi and Al-Fallouji Modified Alvarado Score for Presumptive Accurate Diagnosis of Acute Appendicitis in University Of Port Harcourt Teaching Hospital, Port Harcourt

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Abstract

Background: *The accurate diagnosis of acute appendicitis (AP) in a patient is valuable to the busy clinician. Decision making in cases of AP poses a clinical challenge especially in developing countries where advanced radiological investigations are not readily available and do not appear cost effective, clinical parameters remain the mainstay of diagnosis. Time and resources wasted on surgical intervention, with the added risks of surgery and anaesthesia, only to discover that this was unnecessary remains a big challenge. This prospective study was carried out to assess the accuracy of the Bengezi and Al-Fallouji modified Alvarado score in presumptive diagnosis of AP and its effect on the negative appendicectomy rate (NAR) at the University of Port Harcourt Teaching Hospital.*

Methods: *A retrospective study of the NAR of this hospital between June 2000 and May 2002 was carried out. All consecutive patients (128) who presented with presumptive diagnosis of AP between June 2003 and May 2004 were scored using the Bengezi and Al-Fallouji modified Alvarado scoring system and correlated with histological diagnosis. Patients discharged without surgery based on score, were reviewed in the outpatient's clinic for one month to ascertain that they did not need surgical intervention. The NAR for all appendicectomies performed by surgeons for presumptive diagnosis of AP without scoring between June 2004 and May 2005 was determined as control. Validity of the scoring system was assessed by calculating sensitivity, specificity, positive and negative predictive values.*

Results: *A total of 128 patients were scored. Forty patients with scores less than 4 after eight hours observations and re-evaluation at the Accident and Emergency were discharged without surgery. Eighty eight patients had appendicectomies as treatment for scores 5-10. There were 39 males and 49 females. In eighty patients, the appendix was histologically inflammed and 8 were normal, giving a NAR of 9.09%. High sensitivity of 92.93% and specificity of 92.93% were recorded in the study. The NAR of the retrospective study was 26.4% and 19.05% for the control group operated without scoring.*

Conclusion: *The Bengezi and Al-Fallouji modified Alvarado score is a simple, safe and cost effective aid in diagnosis of acute appendicitis and decreases NAR.*

Keywords: Acute appendicitis, Scoring system, Negative appedicectomy rate.

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Introduction

Acute appendicitis (AP) remains the most frequent indication for emergency surgery in general surgical units, accounting for between 33% and 40% of emergency operations in most surgical centres [1,2,3,4.] .The diagnosis of AP can sometimes challenge the acumen of the astute clinician in peculiar cases.

Despite the use of special investigations like ultrasonography, computerized axial tomography scanning, radio-isotope scanning and acute phase proteins level, the reported negative appendicectomy rates (NAR) is between 20-40% [4,5] .Most of these techniques are either complex or not readily available in developing countries [5,6,7] .These investigations are expensive with the added risk of radiation and are operator dependent[5,6,7].

Several diagnostic scoring systems using various clinical and laboratory parameters have been devised as aids in the diagnosis of AP in order to reduce the NAR. [8,9,10,11]

Alvarado [9] described a practical scoring system for the diagnosis of AP in 1986 based on 3 symptoms, 3 signs and 2 laboratory parameters, which was modified by Bengezi and Al-Fallouji[10] in 1997 based on 3 symptoms, 4 signs and 1 laboratory parameter.

The aim of this study is to assess the accuracy of the Bengezi and Al-Fallouji modification in the diagnosis of AP and its effect on the NAR, at the University of Port Harcourt Teaching Hospital, Port Harcourt (UPTH).

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Materials and Methods

A retrospective study of the NAR of this hospital (UPTH) between June 2000 and May 2002 was carried out.

The Bengezi and Al-Fallouji modified Alvarado score[10] (Table I) was used to score all the 128 consecutive patients that presented to the Accident and Emergency Department with presumptive diagnosis of AP between June 2003 and May 2004 by the lead author only, for all ages and sexes. The score was computed and summed up for each patient and the evaluation was as follows:

(1) Patients with a score of 1-4 were considered not likely to have AP. They were discharged home if no other medical conditions were identified, for weekly out-patient observation for a month.
(2) Patients with initial score of 5-7 were observed for eight hours, rescored and operated if the score remained the same or increased.
(3) Patients with a score of 8-10 were considered to have almost definite AP and surgery was performed without further rescoring.

One hundred and five appendicectomies performed for presumptive AP without scoring by various surgeons between June 2004 and May 2005 were used as a control group. All appendix specimens were examined histopathologically. For this study, a negative appendicectomy was defined as when the appendix was found to be uninflammed histopathologically.

Data analysis was performed manually as well as with the use of the sigma stat statistical software.

Results

Sixty-four out of the 242 appendicectomies in the retrospective study were histologically normal; NAR of 26.4%. A total of 128 patients were scored. Forty patients with score 1-4 were discharged and reviewed weekly in the out-patient clinic for one month; none required appendicectomy during the study. Eighty- eight patients had appendicectomy for presumed AP based on their scores. Eight were histological normal; NAR of 9.09% (Table II).

NAR of 62.5% (5 out of 8) (Table II) was more among patients with initial score of 4 that were operated on due to increase in score during observation and rescoring. All patients with score of 8-10 had AP, while 63 out of 66 (95.45%) of the patients with score of 5-7 had AP. The validities of all symptoms (Table III) and signs (Table IV) which were diagnostic indices of AP, showed high sensitivity and accuracy in this study. The score sensitivity and specificity were respectively 92.93% and 92.93% in predicting the diagnosis of AP in this study. The relative frequency of the symptoms/signs of the scored 88 patients with AP is shown in Figure 1.
Of the 105 appendicectomies performed in the control group without scoring, 20 were histopathologically normal; NAR of 19.05%.

Table I. Bengezi And Al-fallouji Modified Alvarado Score (mnemonic Mantreel)

PARAMETER		SCORE
SYMPTOMS		
"	Migrating RIF pain	1
"	Anorexia	1
"	Nausea/vomiting	1
SIGNS		
"	Tenderness RIF	2
"	Rigidity and/or Rebound tenderness	1
"	Extra signs(cough test, Rovsings, rectal tenderness, Psoas signs, obturator sign)	1
"	Elevation of temperature>37.3oc	1
LABARATORY		
"	Leukocytosis	2
Total score		**10**

INTERPRETATION	
Score 1-4	Acute appendicitis very unlikely, discharge home with instructions
Score5-7	Acute appendicitis probable, admit for close observation and rescoring
Score 8-10	Acute appendicitis definite, operate immediately

Table II. Modified Alvarado Score; Histological Distribution of Patients, Sensitivity and Specificity.

Modified Alvarado Score	Inflamed	Not Inflamed	Sensitivity (%)	Specificity (%)
4 5	1	5	83.33	88.33
5 7	63	3	95.45	90.90
8 10	16	0	100	100
Total	80	8	92.93	92.93

Table III. Single validities of all symptoms diagnostic indices (criteria) of appendicitis

Criteria	Test Validities							
	Sensitivity	Specificity	FPr	FNr	PV^+	PV^-	Accuracy	X^2(P>0.05)
1. Migrating Pain	72.5	37.5	62.5	27.5	92.1	12.0	69.3	0.0008
2. Anorexia	72.5	50.0	50.0	27.5	93.5	15.4	70.5	0.0010
3. Nausea	73.8	25.0	75.0	26.3	90.8	8.7	69.3	0.0002
4. Vomiting	52.5	50.0	50.0	47.5	91.3	9.5	52.3	0.9776
5. Fever	53.8	87.5	12.5	46.3	97.7	15.9	56.8	0.1755

Table IV: Single validities of all signs/ diagnostic indices (criteria) of Appendicitis

Criteria	Test Validities							
	Sensitivity	Specificity	FPr	FNr	PV^+	PV^-	Accuracy	X^2(P>0.05)
1. Cough	68.8	12.5	87.5	31.3	88.7	3.8	63.6	0.0013
2. Psoas	61.3	0.0	100.0	38.8	86.0	0.0	55.7	0.0072
3. Obturator Sign	31.3	0.0	100.0	68.8	75.8	0.0	28.4	0.0002
4. Rovsings Sign	70.0	12.5	87.5	30.0	88.9	4.0	64.8	0.0006
5. Tenderness	100.0	100.0	0.0	0.0	100.0	100.0	100.0	5.88E-19
6. Gua rding and/or Rigidity	70.0	0.0	100.0	30.0	87.5	0.0	63.6	0.0001
7. Rebound Tenderness	97.5	12.5	87.5	2.5	91.8	33.3	89.8	1.56E-16
8. Anterior Rectal Tenderness	6.3	0.0	100.0	93.8	38.5	0.0	5.7	6.18E-15
9. Rectal Tenderness	12.5	0.0	100.0	87.5	55.6	0.0	11.4	1.83E-11

FPr=False Positive Rate, PV =Negative Predictive Value
FNr=False Negative Rate, PV^+=Positive Predictive Value,

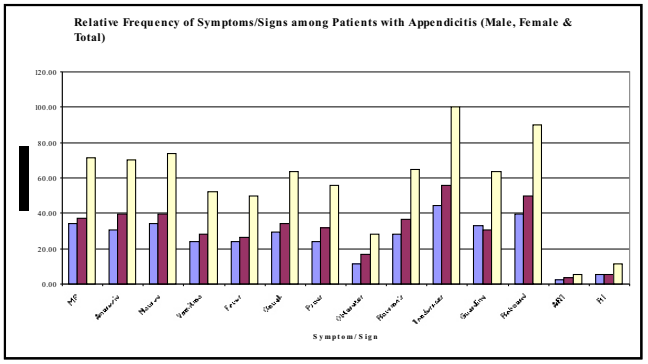

Figure 1. Relative Frequency of Symptoms/Signs Among Patients with Appendicitis

Discussion

AP is the commonest surgical abdominal emergency but its diagnosis from the numerous associated differential diagnosis, can sometimes be difficult and confuse junior surgeons who are in the front line in making diagnosis in the emergency unit [1,2,3,4] .This determines the NAR at various centres [12,13,14,15,19] .Decision making in cases of AP poses a clinical challenge especially in developing countries where advanced radiological investigations are not readily available and do not appear cost effective; so clinical parameters remain the mainstay of diagnosis.

The principal objective of the clinical evaluation process is to make with maximum economy of resources and as rapidly as possible a correct diagnosis of AP, decrease NAR without increase of mortality and morbidity. In fact, the Alvarado[9] scoring system modified by Bengezi and Al-Fallouji, was introduced initially as an adjunct to diagnosis in order to correct a previous high NAR.

The Bengezi and Al-Fallouji [10] modified Alvarado score of 1997, is a simple scoring system that incorporates 3 symptoms, 4 signs and 1 easily available blood investigation. It is a simple non-invasive diagnostic procedure, which is reliable, safe, repeatable, economical and can be used easily in settings without expensive and complex modern supportive diagnostic tools.[11,12,13,14,15,16,17,18,19]

Previous reports stated,[11,12,13,14,15,16,17,18,19] "when the symptoms and signs used in the score are combined, they augment the diagnostic accuracy of AP". The high sensitivity, specificity, accuracy and positive predictive values of the symptoms (Table III) and signs (Table IV) in this study is in conformity with reports[11,12,13,14,15,16] .

The NAR of our retrospective study of 26.4%, control group of 19.09% were reduced by this scoring system to 9.09% in this study. Its effectiveness in the diagnosis of AP as reported[13,14.15,16,17,18] was so in this study with no mortality and morbidity did not increase as patients were all discharged within 6-8 days post surgery. The risks of radiation exposure is avoided and lack of 24 hours availability of modern diagnostic investigations is of no hindrance, using this scoring system [12-16] . These investigations have been reported to delay diagnosis and do not improve diagnostic accuracy of AP.[7,8,12-18]

The Bengezi and Al-Fallouji modified Alvarado score is a helpful guide to the admitting physician at the Accident and Emergency Unit [12,14,19] .This scoring system is said to be most useful at both ends of the scale [13,14,16,19] . It was same in this study as none of the patients with score of 1-4 had AP within the one month of reviews while all those with score of 8-10 (Table II) had AP. The improved diagnostic accuracy of AP by this scoring system prevents unnecessary surgery and its risks. With the predictive value for score of 5-7 as 95.45%, careful observation of patients in this group is advised before surgical intervention is instituted if score remains same or increases during period of observation.[19]

Conclusion

Clinical findings and experience remains of major importance in diagnosing AP. The Bengezi and Al-Fallouji modified Alvarado score is highly sensitive and specific in predicting the diagnosis of AP in UPTH. Its use decreases the NAR and forms the same criteria for all surgeons in the diagnosis of AP. It can be widely used to avoid expensive, time consuming and not readily available modern investigations with their added risks. It is user friendly, no extra costs, saves unnecessary surgeries with associated complications and costs. It is a good tool for teaching junior surgeons to make accurate diagnosis of AP.

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References

1. Naaeder SB. The Appendix. In: Badoe EA, Archampong EQ, da Rocha-Afodu JT,eds. Principles and Practice of surgery including Pathology in the Tropics. Third Edition. Accra: Assemblies of God Literature Centre Ltd., 2000 ; 518528.
2. Ellis H. Appendicitis. Postgraduate Doctor (Africa) 1988; 10 : 122125.
3. O' Connell PR. The Vermiform Appendix. In : Russell RC, Williams NS , Bulstrode CJ,eds. Bailey and Love's Short Practice of Surgery, 23rd Edition .London : Arnold Publishers, 2000; 10761083.
4. Kevin P, Lally S, Cox Charles Jnr, Richard JA. Appendicitis. In : Townsend C M Jnr , ed. Sabiston Text Book of Surgery: The Biological Basis of Modern Surgical Practice ,16th Edition. Philadelphia: W. B. Saunders and Co., 2001; 917920.
5. Hoffmann J, Rasmussen OO. Aids in the diagnosis of acute appendicitis. Br J Surg 1989; 76:774-9.
6. Lee SL, Walsh AJ, Ho HS. Computed Tomography and Ultrasonography Do not improve and may delay the diagnosis and treatment of acute appendicitis. Arch Surg 2001; 136: 556562.
7. Praxis MD. Ultrasonography should not override clinical diagnosis of acute appendicitis. MDNews, Newsarchive, October 16, 2000 (Praxis Press).
8. Chan MY, Teo BS, Ng BL. The Alvarado score and Acute Appendicitis. Ann Acad Med Singapore 2001; 30:510512.
9. Alvarado A. A Practical Score for the early diagnosis of acute appendicitis. Ann Emerg Med 1986; 15:55764.
10. Bengezi OA, AL-Fallouji MA. Modified Alvarado score in diagnosis of acute appendicitis. Br J Surg 1997; 84:80.
11. Kamran AM, Asadullah K, Itshad W. Evaluation of the Alvarado Score in diagnosis of Acute Appendicitis .JCPSP 2000; 10;10: 3924.
12. 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 Engl 1994; 76: 41819.
13. Malik AA, Wani NA. Continuing diagnostic challenge of acute appendicitis: evaluation through modified Alvarado score. Aust N Z J Surg 1998;68: 504-505.
14. Bhattacharjee PK, Chowdhury T, Roy D. Prospective evaluation of modified Alvarado score for diagnosis of acute appendicitis. J Indian Med Assoc 2002; 100: 310 -14.
15. Owen TD, Williams H, Stiff G, Jenkinson LR, Rees BI. Evaluation of the Alvarado score in acute appendicitis. J R Soc Med 1992; 85 : 87-8.
16. Crnogorac S, Lovrenski J.[Validation of the Alvarado score in the diagnosis of acute appendicitis]. Med. Pregl 2001;54 :557-61.
17. Wilcox RT, Traverso LW. Have the evaluation and treatment of acute appendicitis changed with new technology. Surg Clin North Am 1997; 77 :135570.
18. Douglas CD, Macpherson NE, Davidson PM, Gani JS. Randomised Controlled Trial of Ultrasonography in diagnosis of acute appendicitis, incorporating the Alvarado Score. Br Med J 2000; 321:919-22 .
19. Fente BG. Evaluation of the diagnostic accuracy of acute appendicitis using a modified Alvarado score in University of Port Harcourt Teaching Hospital. FMCS Dissertation. National Postgraduate Medical College of Nigeria. November 2008.