

EVALUATION OF OHMANN SCORE AND CORRELATION WITH ULTRASOUND FOR DIAGNOSING ACUTE APPENDICITIS

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Abstract

Acute appendicitis is a common surgical condition that requires prompt diagnosis. However a decision to operate based on the clinical suspicion alone can lead to removal of the normal appendix in 15-30% cases. Besides the modern imaging techniques, scoring systems, based on clinical signs and symptoms and routine laboratory assessments, have been used as a diagnostic aid. However, differences in sensitivities and specificities were observed if the scores were applied to various populations and clinical settings. The purpose of this paper is to assess the validity of the Ohmann score and the correlation of ultrasound in diagnosis of acute appendicitis. A total of 80 patients were enrolled in this study, 52 male patients and 28 females patients suspected of acute appendicitis that were admitted, investigated and treated. After detailed examination and investigations, the Ohmann score was applied to these patients. A cut off point of 9 was taken. Patients were divided into two groups, group I score of ≥ 9 and group 2 score of < 9 . This study was conducted at SDM College of Medical Sciences and Hospital Dharwad. Proportion of true positive for score ≥ 9 is 86.9%, Proportion of true negatives for score < 9 is 87.1%. Sensitivity and specificity of this study being 96% and 66.7%, positive predictive value and negative predictive value being 82.8 % and 90.9% respectively. Diagnostic odds ratio being 48 and P value of < 0.005 . The high scores in Ohmann scoring system is dependable aid in the early diagnosis of acute appendicitis. Combined with ultrasound, the Ohmann scoring system has high sensitivity and specificity, in the prediction of acute appendicitis.

Keywords: abdominal pain, acute Appendicitis, Ohmann Score, abdominal ultrasound

Introduction

Acute appendicitis is the most common abdominal emergency requiring surgery with an estimated lifetime prevalence of 7% [1]. The early and accurate diagnosis of acute appendicitis is still a difficult problem[2]. Despite the introduction of ultrasound and special laboratory investigations (e.g. C-reactive

protein), high diagnostic error rates are observed [3]. As a consequence, perforation rates and rates of appendectomy with normal findings of 15% and more occur [4]. In the last few years, several scoring systems have been developed for supporting the diagnosis of acute appendicitis [5-13]. Initial evaluation studies have reported excellent results, indicating that scoring systems would be ideal as diagnostic

aids because they have good performance and require no special equipment, being user-friendly and comprehensible to the clinician [2,8,11-13]. The Ohmann score (Table 1) includes seven clinical variables and a WBC count [14]. The score was developed in a group of 870 patients at German and Austrian hospitals and was validated four months later in a second group of patients at the same hospitals. In the prospective validation, the Ohmann score successfully identified patients at low, moderate, and high risk of appendicitis [14].

Sl. no	Sign / Symptom	Value
1	Pain on compression in the lower right quadrant	4.5
2	Rebound pain	2.5
3	Absence of urinary symptoms	2.0
4	Continuous pain	2.0
5	White blood cell count 10000/ml	1.5
6	Age under 50 years	1.5
7	Migration of pain to the right lower quadrant	1.0
8	Involuntary muscular tension (defense)	1.0

Table 1 - Ohmann Score

Materials and Method

The study was prospective and carried out by one general surgical unit over a period of one and half year from June 2014 to December 2015; a total of 80 patients age below 50 years presenting with pain abdomen to the emergency department of SDM College of Medical Sciences, Dharwad were enrolled into the study. The criteria as described by Ohmann (Table 1) were used for the diagnosis of acute appendicitis and the observed criteria were multiplied as described by Ohmann. Ultrasound was carried out on each patient by radiology residents, and a non-compressible blind loop equal to or greater than 6 mm in antero-posterior diameter indicated appendicitis. Appendectomy specimen were sent for histo-pathological examination. Exclusion criteria were appendicular abscess, phlegmon, evidence of generalized peritonitis and a palpable abdominal mass in the examination. A value of 9 was taken as a cut off point. Scores of ≥ 9 were assigned as Group - I and scores of <9 was assigned as group II.

Statistical analysis was performed using SPSS and sensitivity, specificity, positive predictive values and negative predictive value.

Results

A total of 80 patients were enrolled in this study, 52 male patients and 28 females patients. A cut off point of 9 was taken according to the Ohmann score. 58 Patients were in the first group [Group - I score ≥ 9] with clinical suspicion of high probability of acute appendicitis. They were subjected to ultrasound abdomen and if appendicitis was found they were operated and if they were found to have other pathology they were treated appropriately, 30 out of 34 males and 18 out of 21 females, had acute appendicitis proven with HPE. So the proportion of true positive in males and female is 88.23 and 85.71% respectively overall proportion of true positive is 86.97% (Table 2). 22 Patients were in the second group [Group – II score < 9] less likely to have appendicitis. Patients were subjected to ultrasound abdomen and if appendicitis was found on ultrasound, abdomen patients were operated on.

Category of cases	Male* (n=35)	Female* (n=23)	Total (n=58)
No. of cases operated	34	21	55
No. of cases with HP Appendicitis	30	18	48
No. of cases without HP Appendicitis	4	3	7
Proportion of true positive	88.23%	85.71%	86.97%

* On ultrasound abdomen one male patient had urinary tract infection and one female had pelvic inflammatory disease and other had twisted ovarian cyst hence these patients were not operated upon and treated accordingly.

Table 2 - Distribution of patients in Group -I (Ohmann score ≥ 9)

The rest of the cases (17) were not operated, were observed and discharged after 3-4 days of stay in hospital and followed up every month for 6 months and none of them required surgery during the period of observation. Total no of patients in this group were 22, 17 were male and 5 were females, 2 cases out of 5 had acute appendicitis. Proportion of true negative was

94.11% and 80% in male and female respectively and overall true negative of 87.1% (Table 3).

Category of cases	Male (n=17)*	Female (n=5)*	Total (n=22)
No. of cases operated	3	2	5
No. of cases with HP Appendicitis	1	1	2
No. of cases without HP Appendicitis	2	1	3
Cases not operated	14	3	17
Proportion of true negatives	94.11%	80%	87.1%

*3 female patients on subjecting for Ultrasonography of abdomen had other pathology mimicking acute appendicitis and they didn't undergo appendectomy. Two patients had pelvic inflammatory diseases, one patient had twisted ovarian cyst.

Table 3 - Distribution of patients in Group - II (Ohmann score <9)

Age in years	16-25	26-35	36-45	Total
No. of cases with score(≥9)	27	24	7	58
No. of cases with score(<9)	13	6	3	22
Total	40	30	10	80
Percentage	50%	37.5%	12.5%	100%

Table 4 - Age Distribution

Sex	Male	Female	Total
No. of cases with score(≥9)	35	23	58
No. of cases with score(<9)	17	5	22
Total	52	28	80
Percentage	65%	35%	100%

Table 5 - Sex Distribution

In our study patients ranged in the age from 16-45 years. The mean age being 30.5 years. The highest occurrence (50%) was seen in the age group of 16-25 years. The next age group affected (37.5%) was 26-35 years. Overall 87.5% of the cases were seen in the age group 16-35 years (Table – 4). In our study there were 52 (65%) male patients, 28 (35%) female patients (Table – 5). The statistical analysis of our study showed Sensitivity of 96%, specificity 66.7%, positive predictive value 82.8% and negative predictive value of 90.9%

respectively. Diagnostic odds ratio 48 and p value of <0.005.

Discussions

Appendicitis is a relatively uncommon, but potentially serious, cause of abdominal pain in the primary care setting. An accurate diagnosis is important to prevent unnecessary surgery and avoid complications. The diagnosis of acute appendicitis still represents one of the most difficult problems in surgery [15]. It is generally accepted that the removal of a normal appendix is safer in questionable cases and that delaying surgery leads to an increased rate of perforation [16]. The Ohmann score system described by Ohmann [14] for reducing the negative appendectomy rate is clinically based, which can be combined with ultrasound, and both in the developed and the developing world, it is the junior surgeon who performs the bulk of the emergency surgery of the acute abdomen. The idea of improving the diagnostic accuracy simply by assigning numeric values to defined signs and symptoms has been the goal of some of the scores that were previously described [7,10,13,17,18].

For the scoring systems, sensitivity and specificity values higher than 80% are acceptable [19]. Our study showed Sensitivity of 96%, specificity 66.7%, positive predictive value 82.8% and negative predictive value of 90.9%. Similar studies done by others with various scoring systems such as the Alvarado scoring study done by Memon ZA.et.al has Sensitivity and specificity of 93.5% and 80.6%, positive and negative predictive values were 92.3% and 83.3% respectively[20]. The sensitivity and specificity of the RIPASA score were 96.2% and 90.5% respectively in a study conducted by Mohammed A.et.al. [21] The Ohmann score study done by Zielke A.et.al has overall sensitivity, specificity, positive predictive value and negative predictive value of the 63%, 93%, 77% and 86% respectively [22]. The results of the Eskelinen score done by Sitter H1 et.al has shown overall sensitivity, specificity, positive and negative predictive value of 72%, 91%, 76%, and 90% respectively [15].

Our study has slightly higher sensitivity, and negative predictive value and lower specificity and positive predictive value as compared to the Alvarado scoring by Memon ZA. et al. [20], the sensitivity is similar but the specificity of our study is lower as compared to the RIPASA scoring done by Mohammed A. et al. [21]. Our study has shown higher sensitivity positive predictive values, and negative predictive value and lower specificity and as compared to the Ohmann scoring study done by Zielke A. et al. [22] and as compared to the Eskelinen score done by Sitter H. et al., our study has shown a higher sensitivity and positive predictive value, lower specificity and the negative predictive value is similar [15].

Conclusions

From the present study it is concluded that the Ohmann scoring system in association with the ultrasound abdomen is as effective as many others studies described in literature. This score will aid clinicians and residents in diagnosing acute appendicitis and thus lowering the negative appendectomy rates.

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