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A comparative study of clinical, radiological and operative findings in acute appendicitis

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Abstract---Background- Acute appendicitis is most common cause of an 'acute abdomen' in young adults and as such the associated symptoms and signs have become a paradigm for clinical teaching. Though extraordinary advances in modern diagnostic investigations have been achieved, the diagnosis of acute appendicitis remains essentially clinical, requiring a mixture of observation, clinical acumen and surgical knowledge. Objectives- To assess the association between clinical, radiological and operative findings and thus evaluate clinical diagnostic accuracy and radiological diagnostic accuracy. Materials And Methods- It is a prospective study, conducted in a group of 400 cases admitted with suspected appendicitis to Department of General Surgery, KIMS Hospital, Bangalore after satisfying inclusion and exclusion criterias. The study involved application of modified Alvarado scoring system for clinical diagnosis and ultrasound examination for radiological diagnosis, at the end of study, sensitivity, specificity was calculated for Modified Alvarado scoring system and ultrasound examination. Results- Appendicitis more commonly found in 3rd decade (42%) followed 4th decade (23.7%). Appendicitis is more common in males (61%) against females (39%) clinical diagnosis by using Modified Alvarado score has sensitivity of 94, specificity 34 in diagnosing acute appendicitis. Radiological diagnosis by USG has sensitivity 80, specificity 68, in diagnosing acute appendicitis. Conclusion- In our study, we found that the use of modified alvarado score had high sensitivity but low specificity, therefore there was a higher risk of negative appendectomy. We found that with the addition

of the use of pre operative ultrasound, the specificity and the diagnostic accuracy increased exponentially. The use of high sensitivity Alvarado scoring system combined with high specificity ultrasound can therefore be used as a cheap and inexpensive way of confirming acute appendicitis thus reducing negative appendectomy rate.

Keywords--acute appendicitis, modified alvarado score, ultrasonogram abdomen.

Introduction

Acute appendicitis is most common cause of an 'acute abdomen' in young adults and as such the associated symptoms and signs have become a paradigm for clinical teaching. Though extraordinary advances in modern diagnostic investigations have been achieved, the diagnosis of acute appendicitis remains essentially clinical, requiring a mixture of observation, clinical acumen and surgical knowledge.[1]. Sir Heneage Ogilvie[2] said "Acute appendicitis is one of the commonest conditions which the surgeon is called upon to treat as an emergency", which requires utmost skill and care of the attending surgeon, besides good clinical evaluation. Despite the advances in diagnostic medicine and therapeutics over the past forty years, the accurate diagnosis of appendicitis and pain in the right iliac fossa remains a clinical challenge. Even after years of tremendous progress, it is difficult to predict which patient will develop appendicitis. Till today, we don't have any means of preventing appendicitis, though one can definitely prevent dangerous complications by timely surgical intervention.[3,4,5]. To decide between the lesser of the two evils, that is a negative appendectomy or an appendicular perforation can often be a vexing problem. The need for diagnostic aid in doubtful cases is recognized. Ultrasound has been proposed as an ideal noninvasive adjunct to diagnosis in suspected appendicitis cases.[6] Our study included clinical study of acute appendicitis and the use of ultrasound, which has emerged as a useful investigation in improving the accuracy in diagnosis of acute appendicitis and thereby reducing negative appendectomies.

Material and Methods

This is a time bound prospective study in which patients presenting with clinical suspicion of Acute Appendicitis in Kempegowda Institute of Medical Sciences and Research Centre, will be taken into study. The period of study was from December 2012 to May 2014. 400 cases were taken up for the study. All patients admitted to the surgery wards at KIMS Hospital, BANGALORE, with signs and symptoms of appendicitis. Only patients undergoing surgery will be included. Excluded-Patient age group (18 years and below). Patients admitted for interval appendectomy following recurrent appendicitis, appendicular mass previously treated conservatively.

Methodology

After admission to the ward, a detailed history was taken and careful, detailed examination was made in each patient. Patients underwent necessary investigation like Blood counts, biochemical analysis and urine analysis. All patients were subjected to USG examination, findings were recorded. All patients were underwent appendicectomy, intraoperative findings were recorded. Appendicectomy specimens sent for histopathological examination, findings were recorded in proforma. Clinical diagnosis was made using modified Alvarado score, the patients score more than 5 were taken as appendicitis. Radiological diagnosis was made using USG. Specific features of acute appendicitis on ultrasound, namely, the target lesion, non-compressibility, peri-appendiceal collection, a diameter of >6mm, presence of appendicoliths or of hypoperistaltic loops of bowel in the right iliac fossa, were recorded.

Data Analysis

Data were analyzed using SPSS version 20 for windows. Frequencies and proportions were analyzed between independent and dependent variables using Chi square test for proportions. Sensitivity and specificity of clinical and imaging diagnosis with final diagnosis was performed.

Results

The mean age of study population was 31.7 ± 13.1 years. The number of patients was highest in the age group 20 to 29 years (42%). Followed by 30 to 39 years (23.75%). Out of the 400 patients, 244 were male (61%) and 156 were female (39%). The male to female ratio was 1.5:1. All 400 patients presented with pain abdomen, in that 210 (52.5%) patients gave history of migration of pain to RIF, 185 (46.3) patients had anorexia, 268 (67) patients had nausea and vomiting.

Table 1
Alvarado Score

ALVARADO SCORE	NUMBER OF PATIENTS	PERCENTAGE
3	0	0
4	30	7.5
5	23	5.8
6	5	1.3
7	315	78.8
8	27	6.8
9	0	0

As per table 1 Alvarado score of 5 and more than it is taken as clinically proven case of Appendicitis. 370(92%) patient had Alvarado score 5 or more than 5. 30(8%) patients had Alvarado score of less than 5.

Table 2
USG findings

USG FEATURES	NUMBER OF PATIENTS
VISUALIZATION OF THE APPENDIX	303
TARGET LESIONS	91
DIAMETER >6MM	123
LOCAL ADYNAMIC ILEUS	322
APPENDICULAR ABSCESS	23
GRADED TENDERNESS OVER RIF	323

As per table 2 Out of 400 patients, in 303 patients appendix is visualized in USG, in that 91 patients had target lesion, 123 patients had diameter more than 6mm.\

Table 3
Operative Procedure

PROCEDURE	NUMBER OF PATIENTS	PERCENTAGE
LAPAROSCOPIC APPENDICECTOMY	212	53
OPEN APPENDICECTOMY	188	47

As per table 3 212(53%) patients underwent Laparoscopic Appendicectomy, 188(47%) patients underwent open Appendicectomy.

Table 4
Intra-Operative Findings

INTRA OPERATIVE FINDINGS	NUMBER OF PATIENTS	PERCENTAGE
Inflammation	365	91
Gangrene	27	6.8
Perforation	24	6
Fecolith	2	5
Abscess	27	5.3

As per table 4 Intra operatively 365 patients had inflamed appendix, in which 27 were Gangrenous, 24 were perforated, 21 with abscess formation, 2 had fecolith.

Table 5
Comparison of Clinical diagnosis with Histopathologic diagnosis of Appendicitis

Alvarado score	No Appendicitis	Appendicitis
<5	12(38.7)	19(61.3)
>5	23(6.2)	346(93.8)

As per table 5 all appendicectomy specimens were subjected to Histopathology examination, 365 were positive for appendicitis. 93.8% with alvarado score >5 were positive for diagnosis of appendicitis on histopathology. Also 61.3% with Alvarado score <5 were also significantly positive for appendicitis on histopathology ($p < 0.001$).

Table 6
Comparison of Radiological Diagnosis with Histopathologic Diagnosis of Appendicitis

	No Appendicitis	Appendicitis
No visualization of appendix	24(24.7)	73(75.3)
Visualization of appendix	11(3.6)	292(96.4)

As per table 6 96.47% with visualization of appendix on imaging were positive for pathological diagnosis of appendicitis. Also 75.3% with no visualization of appendix were significantly positive for appendicitis on histopathology ($p < 0.001$).

Table 7
Sensitivity and Specificity of Clinical diagnosis and Radiological diagnosis when compared with Histopathology

	CLINICAL DIAGNOSIS	RADIOLOGICAL DIAGNOSIS
SENSITIVITY	94	80
SPECIFICITY	34	68

As per table 7 Sensitivity of Alvarado score with pathological diagnosis was high (94%), specificity was low at (34%). While sensitivity of visualization of appendix on ultrasound imaging with pathological diagnosis was 80% specificity was 68%.

Discussion

Incidence of appendicitis is lower in India compared to the West, and there is a difference between North and South India, being more in Northern states. Although surgeons have been confronting acute appendicitis as a clinical entity for over a hundred years, an accurate preoperative diagnosis remains a challenge. Till now an early surgical intervention has always been regarded as an urgency to prevent its dreaded complications. However in the light of the increasing numbers of negative appendicectomies the need for a simple, inexpensive yet reliable diagnostic aid to clinical acumen in clinically equivocal or 'suspected appendicitis' is felt strongly. 'Active observation' of suspected cases has been shown by White et al[7] to reduce the negative appendectomy rate from 15% to 1.9%, but it may not be practical in a busy emergency ward.[8] Clinical scoring, ultrasound, colour doppler, laparoscopy and are some of the methods used to confirm the diagnosis in cases of 'suspected appendicitis', with varying results.

The number of patients were highest in the age group 20 to 29 years (42%) followed by 30 to 39 years (23.75%). The least was in the age group of more than 70 years (1.5%). In Lewis et al[9] study found out the second and third decades were the most common age groups for acute appendicitis. Addis et al[10] reported a male: female ratio of 1.6:1. However, Adams et al[11] studied 44 patients with “suspected” appendicitis and found the incidence of women to be almost twice as high (29 women and 15 men). Pain was a complaint in all the cases in this study. The initial location of pain in most cases (52.2%) presented with pain around umbilicus followed by (47.5%) in the right lower quadrant and 100% of the patients lately presented with pain in the right iliac fossa, which adds a diagnostic point of acute Appendicitis study done by GallindoGallego et al[12] shows 49% 32% 96.4%. In this series 92% cases had score of 5 or more than 5. Study done by Sudhir KM [13] showed 83%. In the present study USG findings showed 80% sensitivity and 68% specificity in diagnosing acute appendicitis. The studies done by Jefferey[14] showed 96% and 84%, while Adams [15] showed 86% sensitivity and 89% specificity. In the present series 91% of the patients are histopathologically confirmed.

Conclusion

In our study, we found that the use of modified alvarado score had high sensitivity but low specificity, therefore, there was a higher risk of negative appendicectomy. We found that with the addition of the use of pre operative ultrasound, the specificity and the diagnostic accuracy increased exponentially. The use of high sensitivity Alvarado scoring system combined with high specificity ultrasound can therefore be used as a cheap and inexpensive way of confirming acute appendicitis thus reducing negative appendicectomy rate. This study shows along with clinical examination and in doubtful cases to rule out other conditions causing pain, ultrasound proves to be a valuable tool.

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Conflict of Interest- None declared.

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