A PROSPECTIVE STUDY OF EFFICACY OF COMBINED CUM COMPARATIVE STUDY USING CLINICAL SCORING SYSTEM AND RADIOLOGICAL EVALUATION IN DIAGNOSIS OF ACUTE APPENDICITIS

Sabrena¹, Raghupathy², Alex Franklin³, Arikrishnan Vaithiswaran⁴, Sathish Kailasam⁵

¹Assistant Professor, Department of General Surgery, Chengalpattu Medical College and Hospital (CMCH).

²Professor, Department of General Surgery, Chengalpattu Medical College and Hospital (CMCH).

³Junior Resident, Department of General Surgery, Chengalpattu Medical College and Hospital (CMCH).

⁴Junior Resident, Department of General Surgery, Chengalpattu Medical College and Hospital (CMCH).

⁵Junior Resident, Department of General Surgery, Chengalpattu Medical College and Hospital (CMCH).

ABSTRACT

BACKGROUND

Acute appendicitis is one of the most common cause of acute abdomen and surgical emergencies. Failure to make an early diagnosis converts acute appendicitis to perforated appendicitis, a disease with potential complications including wound infection, pelvic abscess, portal pyaemia, septicaemia, and death. Our objective of the study is whether proper clinical examination along with clinical scoring pattern coupled with cost-effective radiological investigations help to improve the diagnosis as confirmed later by operative and histopathological examination to recognise patients without appendicitis to have an alternative diagnosis in these patients with right lower quadrant of abdomen.

MATERIALS AND METHODS

All patients admitted to the General Surgery ward at Chengalpattu Medical College and Hospital, Chengalpattu with right lower quadrant abdominal pain during the period from May 2014 to September 2016 were included. All 200 consenting patients underwent both clinical and radiological evaluation within few hours of presentation to mass casualty. All appendicitis diagnosed patients were subjected to surgery cum HPE correlation to know its efficacy.

RESULTS

In this prospective study, out of 200 patients with right lower abdominal pain, 176 patients were diagnosed and underwent appendectomy (male 113, female 63; mean age 43 years, range 16-72 years). And 171 of them were HPE proven appendicitis, the negative appendectomy rate was 5%.

CONCLUSION

Our attempts to systematically improve accuracy in the evaluation of patients with suspected appendicitis is possible with strategies for inclusion of clinical scoring system and advanced imaging modalities such as ultrasonogram and computed tomography abdomen.

KEYWORDS

Acute Appendicitis, Modified Alvarado Score, Appendectomy.

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BACKGROUND

Acute appendicitis is the most common cause of acute surgical abdomen with an estimated lifelong risk of 8.6% in men and 6.7% in women. The rational approach is to decrease the negative appendectomy as well as appendiceal rupture rates. A decrease in appendectomies should not lead to an increase in perforation rates or other complications.¹⁻⁷

For this reason, a number of diagnostic modalities have been proposed including clinical scoring systems, ultrasonography and CT scan imaging techniques individually are fairly accurate. Ultrasonography is an

inexpensive, fast and noninvasive method with an accuracy rate of 71%-90% for the diagnosis of acute appendicitis. On USG, main feature to establish the diagnosis of acute appendicitis was direct visualisation of the inflamed thickened appendix, incompressible appendix with a diameter of >6 mm with distended lumen and echogenic incompressible periappendicular inflamed fat with or without appendicolith. Furthermore, clinical judgement should not be abandoned because of the lack of ultrasound findings in patients with a high probability of acute appendicitis.⁸⁻¹¹

Computed tomography has been frequently used as an imaging modality in the evaluation of acute appendicitis and has improved the diagnostic ability leading to a significant reduction in the number of negative appendectomies, with a reported sensitivity of up to 96.5% and specificity 98%. CT evaluation of the appendix was based on four criteria; diameter of the appendix, periappendiceal inflammation; presence of extraluminal fluid collection around the appendix and appendicolith.

A number of clinical and laboratory based scoring systems have been devised to assist diagnosis. The most commonly used is the modified Alvarado score. This consists of three

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Corresponding Author:

Dr. Sabrena,

Assistant Professor,

Department of General Surgery,

Chengalpattu Medical College and Hospital,
Chengalpattu.

E-mail: dr.traghupathy@gmail.com

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symptoms, three signs, and laboratory findings modified by Kalan et al. Reports have shown that preoperative diagnostic imaging has helped to decrease negative appendectomy rate from 20% to as low as 5%.

The goal of this study was to evaluate combined modified Alvarado scoring, USG, and CT abdomen in diagnosis of acute appendicitis. Incorrectly diagnosing a patient although not catastrophic often subjects the patient to an unnecessary operation.¹²⁻¹⁴

Review of Literature

Historical background: Claudius Amyand (1660-1740), a French surgeon at St. George's and Westminster Hospital in London, performed the first successful appendectomy in an 11-year-old boy who presented with an inflamed perforated appendix in inguinal hernia sac in 1773. He successfully removed the appendix and repaired the hernia.

In 1824, a report on two autopsy cases of appendicitis emphasised the importance of the condition. Reginald Fitz, a professor of pathologic anatomy at Harvard coined the term 'appendicitis'.

In 1889, Charles McBurney described McBurney's point of maximum tenderness when one examines with the finger tips in adults one half to two inches inside the right spinoumbilical line. Semm is widely credited with performing the first successful laparoscopic appendectomy in 1982.

Gupthah et al reported that ultrasonography is appropriate in patients in which the diagnosis is equivocal by history and physical examination. It is especially well suited in evaluating right lower quadrant or pelvic pain in paediatric and female patients. A normal appendix (6 mm or less in diameter) must be identified to rule out appendicitis. An inflamed appendix usually measuring greater than 6 mm diameter is non-compressible and tender with focal compression. Other right lower quadrant conditions such as inflammatory bowel disease, caecal diverticulitis, Meckel's diverticulitis, endometriosis and pelvic inflammatory disease can cause false positive ultrasonography results.

Gallindo Gallego et al (1998) reported ultrasonography combined with clinical diagnosis scoring increases the diagnostic accuracy in patients with suspected appendicitis. The high specificity of ultrasonography is useful for differential diagnosis of associated pathology such as mucocoele of appendix, mesenteric lymphadenitis, ileitis, Crohn's disease or gynaecological disorders.

Clinical Diagnosis

The diagnosis of appendicitis rests more on thorough clinical examination of the abdomen than on any aspect of the history or laboratory investigation. A number of clinical and laboratory based scoring systems have been described to assist diagnosis. The most commonly used is the modified Alvarado score. This consists of three symptoms, three signs, and laboratory findings modified by Kalan et al.

Symptoms	Score
Migratory right iliac fossa pain	1
Anorexia	1
Nausea/Vomiting	1
Signs	
Tenderness in right iliac fossa	2
Rebound tenderness	1

Elevated temperature	1
Laboratory Findings	
Leucocytosis	2
Shift to the left of neutrophils	1
Total Score	10
Table 1. Modified Alvarado Score	

- 1-4 Appendicitis unlikely.
- 5-6 Appendicitis possible.
- 7-9 Appendicitis probable.
- 9- Appendicitis definitive.

Ultrasound Abdomen

Abdominal ultrasound examination is more useful in children and thin adults, with sensitivity between 55 and 98% and specificity of 98-100% in the literature. Specific radiological features were recorded such as infiltration of mesenteric fat, free fluid, abscess, pneumoperitoneum and fistulas. The sonographic diagnosis of acute appendicitis is based on identification of a tubular, non-compressible, a peristaltic bowel loop, which demonstrates a connection with the cecum and a distal blind end, with a diameter greater than 6 mm.⁽¹²⁾ A calcified appendicolith may be present, which may assist in differentiating dilated appendix from adjacent bowel loops. A calcified appendicolith appears sonographically as a curved, echogenic structure with posterior acoustic shadowing. Air or inspissated faeces within the bowel lumen may produce posterior acoustic shadowing mimicking a calcified appendicolith.¹⁵⁻¹⁸ However, the posterior acoustic shadow found in association with air tends to be "dirtier" than that associated with calcification.

Computed Tomography

CT is more widely used in the workup of suspected appendicitis and there is extensive literature on the subject. In addition to their assessment of ultrasound, Dolia et al also performed a meta-analysis for CT scan. The results showed a notable improvement in sensitivity for CT over us. For adults, pooled sensitivity and specificity of CT were both 94%. For children, sensitivity was 94% and specificity 95%. In a systematic review of CT scan in adults, Neumar and Kennedy et al found that sensitivity ranged from 77% to 100% and that specificity ranged from 83% to 100%.¹⁹⁻²² The results reported in this systemic review were derived from studies with diverse patient populations and in which different CT protocols were used. CT abdomen plain is most useful in whom there is diagnostic uncertainty, particularly elderly patients. There was correlation between CT criteria of periappendiceal fat stranding, appendicolith and inflamed appendix.²³⁻²⁷

MATERIALS AND METHODS

All patients admitted to the General Surgery ward at Chengalpattu Medical College and Hospital, Chengalpattu with right lower quadrant abdominal pain during the period from May 2014 to September 2016. All consenting 200 patients randomly stratified into 4 groups 50 members in each, Group 1 underwent only clinical evaluation using MAS. Group 2 underwent evaluation using both MAS and USG-Abdomen. Group 3 underwent evaluation using clinical MAS and CT-Abdomen. Group 4 underwent both clinical MAS and radiological evaluation. All done within few hours of presentation to mass casualty. All appendicitis diagnosed

patients were subjected to surgery cum HPE correlation to know its efficacy. Over 2 years & 4 months period (May 2014–September 2016), a total of 200 patients were enrolled in our prospective study. All patients were subjected to our protocol developed for our study. All statistically significant data about patients were collected.

Data Collection Technique

Data were collected as modified Alvarado score, ultrasonographic findings, CT abdomen findings and histopathological findings. Modified Alvarado score of greater or equal to 6 were taken to be positive and <6 as negative. Histopathology showing inflamed appendix were taken as positive, a normal appendix as negative. Sonographically showing features suggestive of appendicitis, CT abdomen findings suggestive of appendicitis were registered.

RESULTS

In our study with 200 patients with right lower abdominal pain, 176 patients were suspected and underwent appendectomy with 5 negative appendectomies (with the help of HPE). Others were excluded from our study as the nature of the disease is different. Among 176 patients, 113 were male and 63 were female. The mean age of the patients affected - 43 years (16 to 70 years).

Modified Alvarado Score System Results: Group 1

For a group of 50 patients with right iliac fossa tenderness, only clinical scoring system was followed in which 46 were suspected and underwent appendectomy with negative appendectomy in 3 patients.

MAS and Ultrasound Results: Group 2

For a group of 50 patients with right iliac fossa tenderness, both clinical and USG abdomen as diagnostic tools were followed in which 40 were suspected and underwent appendectomy with negative appendectomy in 2 patients.

MAS and Computed Tomography Results: Group 3

For a group of 50 patients with right iliac fossa tenderness, both clinical and CT abdomen as diagnostic tools were followed in which 47 were suspected and underwent appendectomy with negative appendectomy in 1 patient.

Combined clinical MAS, USG-Abdomen, CT-Abdomen Results: Group 4

For a group of 50 patients with right iliac fossa tenderness, all clinical and both USG-Abdomen with CT abdomen as diagnostic tools were followed in which 43 were suspected and underwent appendectomy with no negative appendectomies.

DISCUSSION

Alvarado score can be used effectively in our setup to reduce the incidence of negative appendectomies. However, its role in females was not satisfactory and needs to be supplemented by other means. USG is a valued tool for clinically suspected appendicitis and it enhances the diagnostic accuracy in cases with pain in the RIF and reduces the number of negative appendectomies. Computed tomography (CT) is frequently used as a diagnostic tool among patients with abdominal pain, particularly when a patient is clinically suspected of having

appendicitis. For the diagnosis of acute appendicitis, CT has high sensitivity and specificity, with values in the range of 87%–100% and 83%–100%, respectively. There is an extensive body of literature documenting the effect of CT on surgical practice patterns in patients who are suspected of having appendicitis. Currently, of patients who are suspected of having appendicitis, relatively few directly undergo surgery without preoperative imaging evaluation, with use of preoperative CT most recently reported in the range of 85%–95%. Before the use of CT, surgeons accepted a false positive rate (or negative appendectomy rate) of 20% to avoid missing cases of appendicitis. Among some groups, particularly women, the negative appendectomy rate has been even higher, reportedly as high as 42%. However, the negative appendectomy rate among patients with preoperative CT is much lower, in the range of 3%–6% in some studies. In previous studies, the false positive rate of CT for appendicitis was based on a pathologic reference standard: a normal appendectomy specimen in patients who undergo surgery. An unknown number of potential false positive results have been observed among patients in whom the clinical suspicion of appendicitis is raised and who subsequently receive a diagnosis of appendicitis on CT but do not undergo appendectomy after evaluation by a surgeon. Occasionally, we have encountered such patients at CT with typical findings of acute appendicitis (enlargement in combination with secondary signs of inflammation) for whom treatment was deferred after surgical evaluation because of discordant clinical findings. To our knowledge, there are no prior studies in which this subgroup of patients has been evaluated. Therefore, we performed this study to investigate the clinical outcome in patients with a diagnosis of appendicitis at CT in whom treatment was deemed unnecessary after surgical evaluation.

CONCLUSION

Acute appendicitis is the most common acute abdominal condition, necessitating emergency surgery. When the clinical signs and the symptoms are combined with USG findings, and CT finding the diagnostic accuracy is significantly high. USG and CT abdomen helps in diagnosing other causes of RIF pain which helps in excluding appendicular pathology. It should be emphasised that USG and CT does not replace clinical diagnosis, but is a useful adjunct in the diagnosis of acute appendicitis. We recommend combined USG and CT of the abdomen as a valuable tool in diagnosing acute appendicitis in spite of sophisticated investigations like MRI and laparoscopy; thus, reducing the cost of treatment and preventing negative laparotomies.

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