

A HOSPITAL BASED PROSPECTIVE STUDY TO EVALUATE THE CLINIC-PATHOLOGICAL OF ACUTE APPENDICITIS AND THE ROLE OF ULTRASOUND IN DIAGNOSIS AT NEWLY ESTABLISHED TERTIARY CARE CENTRE

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ABSTRACT

Background: Acute appendicitis is the most common acute surgical condition of the abdomen. Delay in treatment of acute appendicitis causes lot of complication. Study was done with the objective to study the clinical and pathological presentations of acute appendicitis, to evaluate the role of ultrasound in early diagnosis of acute appendicitis and to reduce negative appendicectomy in patients. **Methods:** This is a prospective study done on 40 patients with acute right lower abdominal pain clinically presumed to be of appendicular origin. A thorough history, clinical examination and ultrasound scan, was done for all cases. All ultrasound positive cases were subjected to surgery and some negative cases were also taken for surgery based on clinical suspicion. The ultrasound diagnosis was compared with clinical findings, operative findings and histopathological examination reports. **Results:** Our study showed that there was a preponderance of young patients with incidence being more common in 3rd and 2nd decade with 42.5% (17 cases out of 40) and Men out-numbered women by 24 to 16 (3:2). About 50% of patients presented with pain around umbilicus, of which 47.5% later shifted to right iliac fossa. Majority of the patients had aching type of pain. Nausea or vomiting was the common symptom noted in 82.5% of patients. The overall accuracy of clinical diagnosis (Alvarado scoring system) with histopathology findings was 72.5%. The overall accuracy of ultrasound with histopathology report was 92.5%. **Conclusions:** The Alvarado scoring system combined with ultrasound can therefore be used as a cheap and inexpensive way of confirming acute appendicitis thus reducing negative appendicectomy rate (NAR).

INTRODUCTION

Acute appendicitis is the most common acute surgical condition of the abdomen.^[1] Approximately 7 percent of the population will have appendicitis in their life time^[2], with the peak incidence occurring between 10 and 30 years.^[3] The risk of incidence is more in males compared to females (1.1:1).^[2] Appendicitis is an inflammatory process which may results in perforation, abscess formation, generalised peritonitis, bowel obstruction and rarely death with a mortality rate of 0.08%, rising to 0.5% in the event of a perforated appendix.^[4] The diagnosis of appendicitis in early stages still remains a challenge. Despite technological advances the diagnosis of

appendicitis is still based primarily on the patient's history and the physical examination, prompt diagnosis and surgical referral may reduce the risk of perforation and prevent complications.^[5] When appendicitis manifests in its classic form, it is easily diagnosed and treated. Unfortunately, these classic symptoms occur in just over half of patients, therefore an accurate and timely diagnosis of atypical appendicitis remains clinically challenging and is one of the most commonly missed problems in the emergency department. Furthermore, the consequence of missing appendicitis, leading to Perforation, significantly increases morbidity and prolongs hospital stay. The mortality rate in non-perforated appendicitis is less than 1 percent, but it

may be as high as 5 percent or more in young and elderly patients in whom the diagnosis may often be delayed thus making perforation more likely. Delay in diagnosis will lead to complication, which increases morbidity whereas overzealous diagnosis may lead to negative appendectomy rate.^[6] Therefore, an accurate and timely diagnosis of atypical appendicitis remains clinically challenging and is one of the most commonly missed problems in the emergency department. Delayed diagnosis may lead to necrosis and perforation of inflamed appendix causing an increased mortality and morbidity. During the past two decades, appendiceal computed tomography and graded compression ultrasonography have gained widespread use.^[7] Alvarado score (AS) for clinical assessment of Acute Appendicitis is simple, effective and can be easily applied. It is a reasonably consistent triage tool for ruling out appendicitis and identifying those at higher risk. However, diagnostic accuracy of clinical scoring systems like Alvarado scoring system remains modest with sensitivity ranging from 56.8% to 93.5%.^[8,9]

Ultrasound is an important tool to diagnose acute appendicitis. The main advantages of ultrasound where it is non-invasive, cheap and easy to perform to diagnose the condition.^[10] Scoring systems were also developed to aid the diagnosis by estimating the probability scores in individual patients. The best among them is Alvarado scale.^[11]

It comprises of 8 weighted clinical indicators - three symptoms, three signs and two laboratory findings; migratory pain, anorexia, nausea and/or vomiting, right lower quadrant tenderness, rebound tenderness, pyrexia, leucocytosis ($>10 \times 10^9/L$) and a neutrophilic shift to the left >75 . The diagnostic accuracy of the Alvarado score has been reported as 90.9% for a score of 7- 10 and 100% for a score of 0- 4.

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 a diagnostic aid in doubtful cases is recognized. Ultrasound has been proposed as an ideal non-invasive adjunct to diagnosis in suspected appendicitis cases. This study involves the clinical and pathological evaluation acute appendicitis and the role of ultrasound in early diagnosis of acute appendicitis and to reduce negative appendectomy at newly established tertiary care centre.

MATERIALS AND METHODS

This prospective single-center study was conducted on patients with right lower abdominal pain, admitted in newly established tertiary care teaching hospital, Dausa, Rajasthan, India during one-year period.

Patients reporting to the OPD as well those reporting to emergency department were included in this study. Patients of age group above 12 years

with acute right lower abdominal pain clinically presumed to be of appendicular origin were included in the study. Patients less than 12 years of age with other pre-existing ileocecal pathologies like tuberculosis or malignancies and who were not willing for appendectomy were excluded. Pregnant women and those who had presented with clinically palpable appendicular lump were also excluded.

A pretested proforma was used to collect relevant information (patient data, presenting complaints, clinical findings, lab investigations, sonological findings, HPR etc.) from all the selected patients. Particular attention was paid to the history of previous illness, past history of similar complaints, diet and bowel habits and essential investigations especially total white cell count and ultrasonography of abdomen were done for all patients. Modified Alvarado score was applied on these patients. The sonographic findings were recorded as positive and negative for acute appendicitis. All USG positive cases were taken were for surgery. All USG negative cases were retained for 48 hours under observation and decision to operate was made depending on progress in their clinical course and surgeon's decision.

Ultrasound Protocol Result was considered sonologically "Positive for Appendicitis" if any of the following were present:

- Non-compressible aperistaltic blind-ending tubular structure in right lower quadrant with antero-posterior outer wall to outer wall measuring 6 mm or more of abdomen in longitudinal axis.
- Appendicolith of any size (bright echogenic foci with distal acoustic shadow) found within appendix lumen
- "Target sign" in axial section associated with 'Probe tenderness'
- Peri-appendicular fluid collection.
- Increased echogenicity of the peri-appendicular fat
- Distinct appendicular wall layers (laminated walls)

Result was considered sonologically "Negative for Appendicitis" if appendix was not visualized or/and even one of the above criteria was not met.

The cases subjected to surgery were adequately prepared by IV fluids, electrolyte supplementation, administration of broad-spectrum antibiotics intravenously (usually combination of IV Cephalosporins + Amikacin + Metronidazole) etc. Surgery (open/laparoscopic) was done under spinal/general anesthesia. The operative findings were noted, with special reference to appendicular position, peri-appendicular collection, and presence of perforation or fecolith. All the specimens of appendix were sent for histopathological confirmation. Cases were watched for any postoperative complications and treated wherever needed. Post operatively sutures were removed on

7-9 days and the patient's histopathological reports were collected by that time.

Statistical Analysis:

Data collected were entered and analyzed using Microsoft Excel and Epi-Info software package. Chi square test were used wherever necessary. The data were collected in pretested proforma, which includes the general information and clinical details of the patients.

RESULTS

In this study 40 patients with right lower abdominal pain, admitted in SRK Hospital Dausa, in whom acute appendicitis was suspected were taken. Table 1 presents the Clinical characteristics of study participants. There was a preponderance of young patients in our study, with incidence being more common in 3rd and 2nd decade with 42.5% (17 cases out of 40) and 5% (10 cases) respectively, next common in 4th decade of life. Men outnumbered women by 24 to 16 (3:2). About 50% of patients presented with pain around umbilicus, of which 47.5% later shifted to right iliac fossa. Majority of the patients had aching type of pain. Nausea or vomiting was the common symptom noted in 82.5% of patients followed by anorexia (80%). Majority of subjects had diet habit of mixed type (75%) and 25% of patients were vegetarians. In our study, 67.5% had pulse > 90 /min and 37.5% had low grade fever. On clinical examination,

tenderness in RIF was the most consistent feature (100%). Rebound tenderness was present in 47.5% of the cases. 70% patients had total leucocyte of more than 10,000 cells/cumm. Alvarado Score was 7 or more in 25 cases, 5-6 in 6 cases, less than 5 in 9 cases. All 40 cases were subjected to ultrasonography and high frequency probe was used in some cases. In our study 34 cases were positive for appendicitis. Out of these 30 cases was uncomplicated acute appendicitis. Perforated acute appendicitis was diagnosed in 2 cases and 2 cases were diagnosed as chronic appendicitis (table 2).

In our study 36 appendectomy specimen were sent for histopathological study, 18 cases were diagnosed as acute appendicitis, 11 cases diagnosed as chronic appendicitis, 3 cases diagnosed as acute suppurative appendicitis, 1 case diagnosed as acute gangrenous appendicitis and one case is diagnosed as acute eosinophilic appendicitis. Out of 36 appendectomy specimen 2 were found as normal after histopathological examination (Table 3).

Table 4 presents the comparison of Alvarado score and ultrasound reports with histopathology report (HPR). Out of 25 cases with score >7 histopathology reports were positive for appendicitis in 24 cases and negative in 1 case. Patients with score <7 showed positive HPR in 10 cases and negative in 5 cases. On ultrasonography (USG), 34 cases were diagnosed with acute appendicitis. Among them, 33 histopathology reports were positive and 1 were negative.

Table 1: Clinical characteristics of study participants

Variables	No. of patients (N=40)	Percentage
Age (in years)		
11-20	10	25%
21-30	17	42.5%
31-40	8	20%
41-50	2	5%
51-60	2	5%
61-70	1	2.5%
Sex		
Male	24	60%
Female	16	40%
Site of pain		
Right iliacfossa	40	100%
Umbilical	20	50%
Epigastric	1	2.5%
Lumbar	2	5%
Hypogastric	1	2%
Migration of pain		
Present	21	52.5%
Absent	19	47.5%
Symptoms		
Nausea or vomiting	33	82.5%
Fever	17	42.5%
Anorexia	32	80%
Constipation	5	12.5%
Diarrhoea	3	7.5%
Urinary complaints	7	17.5%
Type of diet		
Vegetarian	10	25%
Mixed	30	75%
Clinical signs		
Pulse rate>90	27	67.5%
Elevated temperature	15	37.5%
Right iliac fossa tenderness	40	100%

Rebound tenderness	19	47.5%
Guarding	13	32.5%
Total leukocyte count distribution		
<10000 cells/mm ³	12	30%
>10000 cells/mm ³	28	70%
Alvarado score		
7 or more	25	62.5%
5 or 6	6	15%
Less than 5	9	22.5%

Table 2: Distribution of USG abdomen diagnosis

USG Diagnosis	No. of patients (N=40)	Percentage
Acute appendicitis	30	75%
Appendicular perforation	2	5%
Chronic appendicitis	2	5%
Colitis	1	2.5%
Ureteric calculi	1	2.5%
Cystitis	1	2.5%
Normal	3	7.5%

Table 3: Distribution of various HPR reports

Histopathology reports	No. of patients (N=36)	%
Normal	2	5.5%
Acute appendicitis	18	50%
Acute suppurative appendicitis	3	8.33%
Acute gangrenous appendicitis	1	2.77%
Acute eosinophilic appendicitis	1	2.77%
Chronic appendicitis	11	30.5%
Total	36	100%

Table 4: Comparison of Alvarado score and ultrasound reports with histopathology

	HPR+VE (n=34)	HPR-VE (n=6)	Total (n=40)
Alvarado score			
>7	24	1	25
<7	10	5	15
Ultrasound reports			
USG +ve	33	1	34
USG -ve	1	5	6

DISCUSSION

Appendicitis is defined as the presence of inflammatory cells (polymorphonuclear leucocytes, lymphocytes or plasma cells) in the appendix.^[12] Accurate definitive diagnosis of acute appendicitis, the most common abdominal emergency surgery, has been always challenging because of its nonspecific symptoms, signs and laboratory findings which can mimic several other pathologies (from a viral gastroenteritis to a complicated ovarian pathology), especially in young women, children and elder patients.^[13] Accurate diagnosis using clinical methods alone is known to be associated with high NAR.^[12] Diagnostic accuracy of Alvarado scoring system, the most prevalently used clinical scoring system, has its sensitivity ranging from 56.8%^[8], to 93.5% in different studies.^[9] But in combination with Ultrasound the sensitivity of Alvarado scoring system has been known to increase to 68.4% and diagnostic accuracy to 71.9%.^[8] Our study found appendicitis to be more common in the third decade, with 42.5% patients being between 21 to 30 years of age. The average mean age of presentation was 28.3 years, with a standard deviation of 10.9 years. This finding is in

concordance with the other series reported. Male to female ratio was 3:2. Men are believed to suffer from appendicitis more often because, probably, the male is being subjected to more stress and strain. These observations were in accordance with the findings of Addis et al.^[2]

In our series, pain in abdomen was the predominant symptom (100%) followed by anorexia (80%). According to Hardin study, anorexia was present in 100%, 85% according to study conducted by Kallan et al.^[14] Nausea and vomiting was present in 82.5% of cases in present series. This was mainly seen in acute appendicitis. In study conducted by Owen et al, 84% of patients presented with nausea or vomiting.^[15]

In the current study, right lower quadrant tenderness was the most commonly elicited sign, being found in all patients studied (100%). It was about 95% in study conducted by Kallan et al and 99% in study by George et al.^[14,16] Rebound tenderness was found in 47.5% patients, maximum association being with perforated appendicitis and gangrenous appendicitis. According to study conducted by Owen et al rebound tenderness was seen in 60% of patients.^[15] Alvarado score of 7 or more which confirms the diagnosis of acute appendicitis proved both intra

operatively and histopathologically. In this series 62.5% had a score of 7 or more. The percentage of incidence in males was higher in as study done by Bhattacharjeet al.^[17]

For ultrasound examination, graded compression, as described by Puylaert et al was used in our study to displace bowel loops from the right iliac fossa, the aim being to oppose the external abdominal musculature with the psoas muscle.^[18] The caecum and the external iliac vessels were found to be useful anatomic landmarks.

Out of 40 cases studied 37 cases got operated. Appendectomy was done in 36 cases. One case was diagnosed as acute pancreatitis based on intraoperative findings and appendectomy was not done for that patient. In this study 2 specimens were normal appendix. This negative rate (5.5%) was within the acceptable rate of 15-20%. The 2 cases, which were found to be negative on biopsy, were analyzed separately. Ultrasound had accurately reported 1 of the 6 cases as negative. Ultrasound was found to be negative in 6 cases.

According to Korner et al the negative appendectomy rate for males is 9.3% and for females is 22.2%.^[19] In study conducted by Mohanty et al negative appendectomy rate for male is 4.8% and females is 6.7%.^[20] The present study shows negative appendectomy rate of 5.5%. In females, negative appendectomy rate is high. This is probably due to pelvic inflammatory diseases, ruptured follicular cysts etc. These conditions are not properly diagnosed on ultrasound and can mimic acute appendicitis.

Lately, there have been numerous studies proposing Non-operative management of Acute Appendicitis. But with recurrence rates reported to be as high as 38% leading to repeated admissions^[21], prolonged hospital stays for parenteral antibiotic therapy and closer monitoring to rule out complicated Appendicitis and missing out on histology of a probable appendiceal tumour especially in elderly patients^[22], surgical management of Acute Appendicitis continues to be the Gold Standard.

CONCLUSION

Acute appendicitis is the commonest cause of acute abdomen in young adults. Surgery continues to be the mainstay of treatment for Acute Appendicitis. A significant portion of Acute Appendicitis cases pose a diagnostic challenge. Excessive aggressiveness in surgical management creates an additional burden on the healthcare system and can increase the cost of treatment manifold. Delay in treatment increases the chances of perforation leading to an increase in morbidity for the patient apart from prolonging the hospital stay. Diagnosis of acute appendicitis can be made by combining clinical signs and symptoms with USG reports. Addition of one diagnostic tool in form of Ultrasound for screening of patients scoring low on clinical diagnostic tools, can help in

reduction of morbidity as well as Negative Appendectomy rates.

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