

Study on Correlation between Ultrasonographic and Surgical Findings in Acute Appendicitis

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Abstract

Introduction: Acute appendicitis is an acute inflammation of the vermiform appendix, which is a blind-ended tube arising from the cecum. It is a vestigial organ but it can become diseased. Appendicitis is a surgical emergency, and if it is left untreated, the appendix may perforate and cause potentially fatal complications, especially in children and the elderly. This is a study on correlation between ultrasonographic and surgical findings in acute appendicitis.

Materials and Methods: A prospective study was conducted for a period of 1 year from 2018 to 2019. A total of 60 cases were taken for detailed study from Government Headquarters Hospital, Tirupur.

Results: Out of 60 total cases, 48 cases were acute appendicitis histopathologically, out of them, 39 (81.25%) were male and 09 (18.75%) were female. An increased leukocyte count was found in 65% of cases of histopathologically diagnosed acute appendicitis. Self-localization was found to be useful in diagnosis by ultrasound in our study. About 80% (48 cases) showed ultrasound findings suggestive of acute appendicitis.

Conclusion: Ultrasonography has a definite role in acute appendicitis. It is more useful in female patients whenever there is associated pelvic pathology and in children and also in obese patients where acute appendicitis is in dilemma.

Key words: Appendicitis, Histopathology, Ultrasonography

INTRODUCTION

Acute appendicitis refers to acute inflammation of the vermiform appendix, which is a blind-ended tube arising from the cecum. It is a vestigial organ but it can become diseased. Appendicitis is a surgical emergency, and if it is left untreated, the appendix may perforate and cause potentially fatal complications, especially in children and the elderly. One of the most frequent causes of surgical emergencies and abdominal pain is acute appendicitis. Patients with appendicitis present with a wide variety of clinical manifestations, which may mimic symptoms of other diseases.^[1] If not diagnosed early, it can rapidly develop severe acute abdominal complications such as perforation, abscess formation, sepsis, bowel obstruction,

and general peritonitis. Prompt diagnosis is essential to minimize morbidity and mortality. Therefore, surgeons have been performing appendectomy, in cases where the diagnosis was only probable, thus elevating the rate of removal of normal appendices. The classic presentation of a patient with appendicitis has a typical sequence of symptoms (poorly localized periumbilical pain). This classic presentation occurs in only 50–60% of patients, and the diagnosis may be missed or delayed when atypical patterns of disease are encountered.^[2]

Patients with acute appendicitis typically present with central abdominal pain shifting to the right lower quadrant (RLQ) or may present with generalized abdominal pain. Vomiting is common in children. Clinical examination reveals signs of acute intra-abdominal process, for example, local and rebound tenderness, muscle guarding, rigidity, cutaneous hyperesthesia, and tenderness on rectal examination. About one third of patients with acute appendicitis present with atypical symptoms.^[3] Differential diagnosis is diverse and includes gastroenteritis, mesenteric lymphadenitis, ovarian and tubal disorder, renal colic, peptic ulcer, and acute cholecystitis.

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Ultrasonographic criteria of acute appendicitis include blind-ended, non-compressible, aperistaltic tube, with diameter more than 6 mm, arising from the tip of cecum with a gut signature. Visualization of an appendix with an appendicolith, regardless of appendiceal diameter, is also regarded as a positive test. However, a normal appendix can also be visible on ultrasound. Normal appendix is compressible with wall thickness of ≤ 3 mm. The size of the appendix can differentiate normal from acutely inflamed appendix. The threshold level for the diameter of the appendix above which acute appendicitis is very likely 6 mm.^[4]

Appendicitis represents one of the most common causes of abdominal pain of adult patients referred to the emergency department. To prevent high morbidity and mortality, most of the surgical authorities have advocated timely surgical intervention (early appendectomy), accepting that a significant number of normal appendices will be removed.^[3,5] The diagnosis of appendiceal inflammation cannot be accurately made, based on a single symptom, sign, or diagnostic test in all cases. The diagnosis of acute appendicitis can be established accurately in over 80% of the cases by some experienced senior surgeons.^[6,7] Abdominal ultrasonography (USG) has a definitive role in the diagnosis of acute appendicitis, establishes an alternative diagnosis in patients with acute right lower abdominal pain, and reduces the number of negative laparotomies.^[8-10]

MATERIALS AND METHODS

It is a prospective study. Material for this study was obtained from the patients admitted in the Department of General Surgery, at Government Headquarters Hospital, Tirupur, who were suspected of having appendicitis. The study was conducted for a period of 1 year, from 2018 to 2019. A total of 60 cases were taken for detailed study.

Inclusion Criteria

1. Patients admitted with acute abdomen with clinical diagnosis suggestive of acute appendicitis irrespective of age and sex
2. Patients who underwent surgery were only taken for the study.

Exclusion Criteria

1. Patients admitted with hollow viscus perforation with peritonitis
2. Patients proved to have other causes of pain in the right iliac fossa such as renal colic, pelvic inflammatory disease (PID), ovarian cyst, appendicular abscess, and appendicular mass.

A detailed history was taken from all patients regarding presenting complaints, their duration, severity, sequence of onset of symptoms, mode of onset, progression, change in pattern at the time of presentation, etc. Each patient was examined regarding built, nourishment, hydration, general appearance, and presence of any systemic illness. Vital signs were recorded in each case. CVS and RS were examined as routine special attention was paid to abdominal examination and per rectal examination.

In this study, the diagnosis of appendicitis was mainly clinical depending on history and physical examination. All patients underwent ultrasound examinations of the abdomen. Relevant investigations which were done in this study included blood – hemoglobin percentage, total count, differential count, RBS, urea, S. creatinine, blood grouping and Rh typing, urine examination, and gynecological opinion in some female patients. Routine investigations were performed to know the fitness for anesthesia in elective cases. Ultrasonographic examination was performed, initially with a handheld 3.5 MHZ sector probe, in which the entire abdomen was scanned to exclude possible differential diagnosis of acute appendicitis. A 5 MHZ sector probe scan of the RLQ using graded compression technique was followed.

Operative Treatment

Most of the cases of acute appendicitis were treated with:

- a. Emergency appendectomy
- b. Laparoscopic appendectomy
- c. Conservative management followed by interval appendectomy – either laparoscopic or open.

Data Analysis

The analysis of the 60 cases of acute appendicitis who underwent surgery was studied, clinical diagnosis was correlated with USG abdomen and histopathology between 90% and 92% is presented here.

RESULTS

Table 1 shows spectrum of complaints. Out of 60 patients, 55 (91.66%) had RLQ tenderness, 31 (51.66%) had rebound tenderness, 12 (20%) had fever, and 43 (71.66%) suffered from loss of appetite. About 80% ($n = 48$) of the patients had complaints of nausea and vomiting. About 36.66% ($n = 22$) of patients had shift in pain, 39 (65%) patients suffered from leukocytosis, and 26 (41.66%) patients had left shift.

Table 2 shows a spectrum of diseases mimicking acute appendicitis. Appendicular masses were found in three patients. One female and five males had RT. acute

pyelonephritis and RT. ureteric calculus, respectively. One patient each suffered from twisted ovarian cyst and ILEO-cecal TB. Three patients had CA cecum and five with NAD. A total of 39 patients were diagnosed with acute appendicitis, out of which 31 patients were male and eight females.

Table 3 shows sex incidence of acute appendicitis and appendicular mass. A total of 39 patients were diagnosed with acute appendicitis, out of which 31 patients were male and eight were female. Appendicular mass was found in two males and a female.

Table 4 shows a spectrum of appendicitis and diseases mimicking acute appendicitis. Sonographic diagnosis showed 48 positive results and 12 negative reports in patients with disease.

Table 5 shows the percentage of position of appendix in the present study. Thirty-eight (79.16%) cases had appendix in retrocecal position, 6 (12.5%) cases in pelvic position. Each patient had appendix in subcecal, pre-ileal, post-ileal, and subhepatic positions.

DISCUSSION

In our study, out of 60 total cases, 48 cases were acute appendicitis histopathologically, out of them, 39 (81.25%) were male and 09 (18.75%) were female, male-female ratio

was 4.3:1 and mean age was 29.64 years. The most common age group was 18–30 years followed by 31–40 years. In a study by Sigdel *et al.*^[11] done in Kathmandu, mean age was 27.5 years and male-to-female ratio was 2.6. In most other studies too, there is male preponderance.^[12] Our study was supported by Berry and Malt.^[13] In his study of 246 cases, there was male predominance with 60.2% of males and 39.5% of females. In a study by Khattak *et al.*,^[14] out of 663 cases, 447 were male and 216 were female with male-female ratio of 2:1. Peak incidence was in the 2nd and 3rd decade which is also comparable to our study. In another study by Omran *et al.*,^[15] 58% of patients were male and age-specific incidence of acute appendicitis followed a similar pattern for male and female which is also comparable to our study. In our study, increased leukocyte was found in 65% of cases of histopathologically diagnosed acute appendicitis. However, increased leukocytosis is not a reliable indicator. Our study was supported by several other studies.^[16-18]

For ultrasound examination, graded compression, as described by Puylaert,^[19] 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. The cecum and the external iliac vessels were found to be useful anatomic landmarks. Graded compression was, surprisingly, well tolerated by patients, in contrast to the extreme pain of sudden compression. Jeffrey *et al.*^[8] could perform a successful ultrasound examination on 95% of their patients. Sonographic

Table 1: Spectrum of complaints

Complaints	n	Percentage
RLQ tenderness	55	91.66
Rebound tenderness	31	51.66
Fever	12	20
Loss of appetite	43	71.66
Nausea, vomiting	48	80
Shift in pain	22	36.66
Leukocytosis	39	65
Left shift	26	41.66

RLQ: Right lower quadrant

Table 2: Spectrum of diseases mimicking acute appendicitis in our study

Disease	Males	Females	Total
Acute appendicitis	31	08	39
Appendicular mass	2	1	3
RT. acute pyelonephritis	–	1	1
RT. ureteric calculus	5	–	5
PID	–	1	1
Twisted ovarian cyst	–	1	1
ILEO–Cecal TB	2	–	2
CA cecum	3	–	3
NAD	5	–	5
Total	48	12	60

PID: Pelvic inflammatory disease

Table 3: Sex incidence of acute appendicitis and appendicular mass in our study

Disease	Males	Females	Total
Acute appendicitis	31	08	39
Appendicular mass	2	1	3

Table 4: Spectrum of appendicitis and diseases mimicking acute appendicitis in our study

Sonographic diagnosis	Patients with disease	Patients without disease
Positive	48	–
Negative	12	–

Table 5: Percentage of position of appendix in our study

Position of appendix	No. of cases	Percentage
Retrocecal	38	79.16
Pelvic	6	12.5
Subcecal	1	2.08
Pre-ileal	1	2.08
Post-ileal	1	2.08
Subhepatic	1	2.08
Total	48	100

self-localization of the exact site of pain has been reported by Chesbrough *et al.*^[20] as a valuable adjunct to diagnosis. They found self-localization to be possible in 85% of patients with acute appendicitis in contrast to 15% of the patients with some other intra-abdominal pathology. Self-localization and elicitation of a “Sonographic Mc. Burney’s sign reduce the time of examination and are lost in perforation of the appendix.”

Although self-localization was not independently studied, it was found to be useful in diagnosis by ultrasound in our study. About 80% (48 cases) showed U/S finding suggestive of acute appendicitis. Non-compressibility had an accuracy of 96% Fakhry *et al.*^[21] who had described a target lesion to be characteristic of lesions of the bowel and the stomach. Puylaert^[19] had found a non-compressible target lesion, which could be elongated to a blind end to be specific for appendicitis. Kang *et al.*^[22] had found 100% specificity for periappendiceal collection while Puylaert^[19] reported a diagnostic accuracy of 89% for appendicular abscess. John *et al.*^[23] found ultrasound to be particularly useful in detecting peri-appendiceal collection, with all four cases in their series being diagnosed by ultrasound. In our study Retro-caecal was found in 38 cases and pelvic position appendix in 6 cases.

CONCLUSION

USG has a definite role and best non-invasive method in acute appendicitis in adjuvant to clinical findings. It is more useful in female patients whenever there is associated pelvic pathology, children and also in obese patients where acute appendicitis is in dilemma.

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