

## ACUTE APPENDICITIS : CORRELATION BETWEEN RADIOLOGICAL AND SURGICAL FINDINGS

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**Abstract**

**Background:** Acute appendicitis is a common surgical emergency presenting with abdominal pain. Patients with this condition can exhibit wide range of clinical symptoms resembling other illnesses. The aim is to determine the sensitivity and specificity of Ultrasonography in detecting acute appendicitis in patients experiencing symptoms of right iliac fossa pain. **Materials and Methods:** The Present study, examined 100 patients from surgical outpatient department with complaints of right iliac fossa pain. These patients underwent ultrasonography and subsequent appendicectomy, with histopathological analysis of the specimens. Ultrasonography was performed in both supine and left lateral oblique positions, utilizing the graded compression technique. **Result:** Out of the 100 patients included in the study, 64 were male and 36 were female, with the majority falling within the 11-20 years age group. Among the male patients, 49 were diagnosed with acute appendicitis, while 25 of the female patients were found to have the condition on ultrasonography. Additionally, 2 males and 2 females were identified to have an appendicular mass on ultrasonography. Ultrasonography diagnosed acute appendicitis in 74 patients, with 73 cases confirmed by histopathology. Sensitivity of ultrasonography in diagnosing acute appendicitis in our study was 96.05%, while specificity was 95.83%. **Conclusion:** Ultrasound is highly sensitive and specific in diagnosing appendicitis, making it the preferred imaging modality when the appendix is visualized. Histopathology should continue to be considered the gold standard.

## INTRODUCTION

Acute appendicitis is one of the leading causes of surgical emergencies and abdominal discomfort. Patients experiencing appendicitis exhibit a diverse range of clinical symptoms, which can often resemble those of other medical conditions. If not identified promptly, the condition can escalate quickly, leading to serious acute abdominal issues such as perforation, abscesses, sepsis, bowel obstruction, and widespread peritonitis. Timely diagnosis is crucial to reduce both morbidity and mortality rates. Consequently, surgeons have resorted to performing appendectomies even when the diagnosis is only suspected, resulting in an increased incidence of normal appendices being removed. The classic symptomatology associated with appendicitis typically begins with vague periumbilical pain, followed by nausea and vomiting, and then the pain shifts to the right lower quadrant. However, this classic presentation is only observed in 50% to 60% of cases, and the diagnosis may be overlooked or delayed when atypical symptoms are

present. Adopting a wait-and-see strategy can heighten the risk of complications.<sup>[1-5]</sup>

Graded compression ultrasonography is a reliable, non-invasive imaging technique that is readily accessible for diagnosing acute appendicitis, and it does not involve the use of ionizing radiation. The appendix can be positioned in various locations, including retrocecal, subcecal, retroileal, preileal, or pelvic areas. This variability in anatomical placement can significantly affect the clinical presentation of appendicitis in patients. The primary objective of our study is to assess the sensitivity and specificity of ultrasonography in detecting acute appendicitis and to evaluate its impact on therapeutic management.<sup>[6-8]</sup>

## MATERIALS AND METHODS

This prospective study was conducted within the departments of Radiodiagnosis at Vardhman Institute of Medical Sciences, Pawapuri. Approval for the study was obtained from the institutional research and ethics committee. The research spanned one year, from October 2019 to October 2020, involving a total

of 100 patients who visited the surgical outpatient department with symptoms indicative of acute appendicitis. These patients underwent ultrasonography and subsequent appendectomy, followed by histopathological analysis of the excised specimens. Inclusion criteria: Patients who had appendectomy and histopathological evaluation of the specimens. Exclusion criteria: Individuals with obesity that hindered imaging. Conditions that obstructed imaging, particularly those necessitating emergency surgery. Ultrasound examinations were performed with patients in the supine position, which is optimal for evaluating the appendix, as well as in the left lateral oblique position, utilizing the graded compression technique. Acute appendicitis was diagnosed via ultrasound if at least one of the following abnormalities was identified:

The appendix was found to be non-compressible, with a parietal thickness exceeding 3 mm and an outer-to-outer diameter greater than 7 mm. There was a noted loss of the typical parietal stratification. Additionally, hyperechoic periappendiceal fat was observed, indicating periappendiceal fat stranding. An abscess collection was present within the appendix, along with a periappendiceal fluid collection. The Alvarado score was calculated based on the collected data.

## RESULTS

Our study involved a selection of one hundred patients exhibiting symptoms indicative of acute appendicitis. Among them, 64 were male, with 49

receiving a diagnosis of acute appendicitis via ultrasound. The group also included 36 female patients, 25 of whom were diagnosed with acute appendicitis based on ultrasound findings. Additionally, 2 males and 2 females were identified as having an appendicular mass through ultrasound. The age range of the patients varied, with the oldest being 67 years and the youngest 3 years. The majority of patients fell within the 11-20 year age bracket. The Alvarado score was computed using the methodology outlined in the methods section, yielding a maximum score of 9 and a minimum of 0. Patients with an Alvarado score exceeding 5 were considered likely to have appendicitis, while those scoring below 5 were deemed at low risk. Consequently, 73% of the patients were assessed as likely to have appendicitis. The study comprised a total of 100 cases. Among these, 74 were identified as having acute appendicitis through sonography, while 26 were found to be negative. There was 1 false positive and 3 false negatives recorded. The sensitivity of the ultrasound was determined to be 96.05%, with a specificity of 95.83%. The positive predictive value stood at 98.64%, and the negative predictive value was 88.46%. Of the 74 patients diagnosed with acute appendicitis via ultrasound, 73 had their diagnosis confirmed through histopathological analysis. In total, 76 specimens from removed appendices were identified as acute appendicitis upon histopathological examination. The study noted 3 false negatives and 1 false positive case. The most frequently observed position of the appendix was retro-caecal at 78.20%, followed by pelvic at 16.66%.

**Table 1: Spectrum of Complaints.**

Complaints	n	%
Right lower quadrant tenderness	85	85
Rebound tenderness	41	41
Fever	22	22
Loss of appetite	53	53
Nausea, vomiting	78	78
Shift in pain	42	42
Leukocytosis	79	79
Left shift	76	76

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

Disease	Males	Females	Total
Acute Appendicitis	49	25	74
Appendicular Mass	2	2	4
RT. Acute Pyelonephritis	-	1	1
RT. Ureteric Calculus	3	-	3
PID	-	2	2
Twisted Ovarian Cyst	-	2	2
ILEO-CaecalTB	1	2	3
CA Caecum	3	-	3
NAD	6	2	8
Total	64	36	100

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

Disease	Males	Females	Total
Acute Appendicitis	49	25	74
Appendicular Mass	2	2	4

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

Sonographic Diagnosis	Patients With Disease	Patients Without Disease
Positive	73	1
Negative	23	3

**Table 5: Comparative results of different studies**

References	Transducer Frequency (MHz)	Accuracy (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Puylaert et al (1986)	5/7.5	-	75	100	-	-
Kastrup et al (1986)	5	87	83	94	96	76
Monzer et al (1987)	5	90	80	95	91	89
RB Jeffrey et al (1987)	5	93.9	89.9	96.2	93	94.3
Wolf et al (1989)	5	95.7	88.5	98	94.5	96.3
Harshada M. Joshi et al (1996)	6.5/10	95	96	93	98	88
Present study			96.05	95.83	98.64	88.46

**Table 6: Position of appendix in a study by Wakeley in 10,000 patients**

Position of Appendix	Percentage%
Retro-caecal & retro colic	65.28
pelvic	31.01
Subcaecal	2.26
Pre ileal	1
Post ileal	0.4

**Table 7: Percentage of position of appendix in our study**

Position of Appendix	No. of Cases	Percentage%
Retro-caecal	61	78.20
pelvic	13	16.66
Subcaecal	1	1.28
Pre ileal	1	1.28
Post ileal	1	1.28
subhepatic	1	1.28
Total	78	100

## DISCUSSION

Our study included a cohort of one hundred patients who exhibited symptoms indicative of appendicitis. Each patient underwent an ultrasound examination followed by an appendectomy, with subsequent histopathological analysis of the excised appendiceal tissue. The Alvarado score was computed based on the data collected, yielding a maximum score of 9 and a minimum of 0. According to this scoring system, 73% of the patients were suspected to have appendicitis. The ultrasound was performed using a graded compression technique. In our findings, 74 cases were identified as acute appendicitis via ultrasound, with 73 cases confirmed through histopathological evaluation. There were 3 false negatives and 1 false positive identified in the ultrasound results. The sensitivity of ultrasound in diagnosing acute appendicitis in our study was 96.05%, aligning closely with the findings of Harshada M. Joshi et al. (1996) and RB Jeffrey et al. (1987). The specificity was recorded at 95.83%, which is comparable to the results of RB Jeffrey et al. (1987) and Monzer et al. (1987). The positive predictive value was determined to be 98.64%, while the negative predictive value stood at 88.46%. The predominant anatomical position of the appendix in our study was retro-caecal (78.20%), a percentage that exceeds that reported by Wakeley, followed by

pelvic positioning (16.66%), which is lower than Wakeley's findings.<sup>[9-11]</sup>

## CONCLUSION

Ultrasound demonstrates excellent sensitivity and specificity for diagnosing appendicitis and should be the preferred imaging technique when the appendix is visualized. The choice between performing an appendectomy or opting for conservative management should be guided by clinical findings. Computed tomography should be utilized primarily for complex cases where the appendix is not visualized or when ultrasound cannot conclusively determine the presence or absence of perforation, with histopathology serving as the definitive standard.

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