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**Original Research Article**

# Comparative analysis between role of USG and biochemical markers in the diagnosis of complicated and uncomplicated appendicitis.

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**ABSTRACT**

**BACKGROUND:** Diagnostic work-up of acute appendicitis remains challenging. While some guidelines advise to use a risk stratification based on clinical parameters, others use standard imaging in all patients. As non-operative management of uncomplicated appendicitis has been identified as feasible and safe, differentiation between uncomplicated and complicated appendicitis is of paramount importance. We reviewed the literature to describe the optimal strategy for diagnosis of acute appendicitis.

**AIMS AND OBJECTIVE:** To Compare analysis between role of USG and biochemical markers in the diagnosis of complicated and uncomplicated appendicitis

**METHODS AND MATERIALS:** The clinical, demographic and laboratory data of patients aged over 65 years were extracted and retrospectively analyzed. Data items included patient sex, age, time from symptom onset to admission, comorbidities, preoperative blood results**.** Approval was obtained from the Ethics Committee of G.S Medical College and Hospital, Hapur, U.P. The period of study was between 15$^{th}$ May 2022 to 30$^{th}$ Nov 2022.

**RESULTS:** Seventy-one patients had appendicitis, 11 (12.12%) of which were perforated upon histological examination. All biochemical markers were significantly higher in perforation ($P < 0.001$). The greatest sum of sensitivity and specificity of CRP was at 34.6 mg/L (sensitivity 78.57%, specificity 63.01%), and for bilirubin was at 21.5 mmol/L (sensitivity 62.96%, specificity 88.31%). Combining CRP and bilirubin improved sensitivity and specificity, but this was reduced by further incorporating WCC and neutrophils.

**CONCLUSION:** The USG modalities used for diagnosis have almost the same, or sometimes even lower sensitivity and specificity values compared to the laboratory parameters examined here. Preoperative WBC, neutrophil count, NLR, MPV, CRP, and direct and TB levels appear to have utility in the diagnosis of AA in elderly patients.

**Key Words:** Acute appendicitis, imaging, adults, complicated appendicitis.

## 1. INTRODUCTION:

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Appendicitis is the most common infectious disease in the abdomen. With a lifetime risk of almost 1 in 11 persons, appendicitis has been diagnosed in innumerable patients worldwide (1). Still, there is a lot to learn about the diagnostic approach. Guidelines vary in their advice for standard diagnostics (2,3). Multiple clinical prediction rules have been described during the past decades (4). Most scores provide some evidence for a risk stratification without including imaging features. For practicing such clinical scores, selective imaging has been proposed; a score result in the low-risk category may end further investigation for the diagnosis of acute appendicitis, an intermediate risk score may lead to imaging, and a high-risk score may result in direct surgical exploration (3). While some guidelines advise the use of clinical scoring systems, others recommend standard imaging in all patients with suspected appendicitis (5).

Besides reliable diagnosis of acute appendicitis instead of alternative explanations of abdominal pain, discriminating uncomplicated from complicated appendicitis becomes more and more relevant as evidence is growing for the feasibility of treatment with antibiotics compared to surgery in uncomplicated appendicitis (6,7). This discrimination is based on the principle that uncomplicated and complicated appendicitis are two different entities (8–10). Simple or uncomplicated appendicitis is defined as a phlegmonous inflamed appendix without signs of necrosis or perforation, whereas complex or complicated appendicitis has focal or transmural necrosis, which eventually may lead to perforation. Differentiation between both entities is important, as uncomplicated appendicitis may be treated conservatively with antibiotics without the need for surgery (6,7), or may even resolve spontaneously without the need for antibiotic treatment (9,11,12). In contrast, patients with complicated appendicitis require emergency appendectomy with the exception of patients presenting with a peri appendicular abscess (3,13).

**AIMS AND OBJECTIVE:**

To Compare analysis between role of USG and biochemical markers in the diagnosis of complicated and uncomplicated appendicitis

## 2. MATERIAL AND METHODS

Approval was obtained from the Ethics Committee of G.S Medical College and Hospital, Hapur, U.P and study period was between 15$^{th}$ May 2022 to 30$^{th}$ Nov 2022. A total of 71 adult patients aged over 18 years were operated for the diagnosis of AA. The clinical, demographic and laboratory data of patients aged over 65 years were extracted and retrospectively analyzed. Data items included patient sex, age, time from symptom onset to admission, comorbidities, preoperative blood results, preoperative images, type of anesthesia, type of surgery and length of hospital stay.

### Diagnostic Work-Up for Acute Appendicitis

Several guidelines, international and national, give advice about the diagnostic work-up for suspected acute appendicitis (2,3). Guidelines for scoring systems, clinical assessment, standardized imaging were used to diagnose acute appendicitis in all patients.

### Clinical View

Based on clinical assessment, history taking and physical examination combined with laboratory findings are used for diagnosing acute appendicitis and have a high intra-observer variability. The clinical diagnosis with acute abdominal pain, based on medical history, physical examination findings, and routine laboratory tests, with imaging were done for the

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diagnosis of acute appendicitis. Therefore, patients cannot be accurately ruled in or ruled out based on clinical assessment only.

**Laboratory Tests**

In addition to clinical examination, laboratory tests such as white blood cell (WBC) count or C-reactive protein (CRP) are widely used as a next step in diagnosing acute appendicitis. Individually, these inflammatory markers are weak discriminators, but when combined they achieve a higher discriminatory power in diagnosing acute appendicitis versus no appendicitis Nevertheless, according to a study patient presenting with clinical suspicion of acute appendicitis, this combination is not able to sufficiently rule in or rule out appendicitis.

**Inclusion criteria:** Patients having aged over 18 years and suspected appendicitis clinically.
**Exclusion criteria**: Patients in whom blood parameters were affected by causes other than AA, including blood results not available, malignancy, multiple comorbid diseases and other surgical pathology. Cases that had gangrenous, necrotic, phlegmenous or minor inflammatory changes were not included in this group unless these changes were in the setting of a perforation. Intraoperative findings were not considered unless they were clearly documented in the published histology report

**STATISTICAL ANALYSIS:**

After data collection, each questionnaire was checked. Data was entered and analyzed by SPSS version 20 statistical packages. Descriptive statistics were done to summarize the data.

## 3. RESULT:

The number of patients undergoing an appendicectomy who had histologically confirmed appendicitis was 71 and of these patients, 11were found to have a perforation (12.12%). The mean values for the blood tests for these patients were obtained. The number of patients with raised values on their blood tests and the differences between the mean blood plasma levels in each blood test were collected. The statistical analysis shows that the differences in the white cell count, differentiated neutrophil count, bilirubin levels and CRP between perforated and non-perforated cases are statistically significant, with all levels higher in the setting of perforation. The combination of both CRP and bilirubin values to predict a perforation is significantly more accurate ($P < 0.001$) than using any single test alone, but combining the WCC and neutrophil count to these results reduce the diagnostic accuracy because of their negative impact on the sensitivity of the results. The P-values and odds ratios (one-unit increase) with 95% confidence interval of the logistic regression analyzed. The highest sum of sensitivity and specificity for each of bilirubin, CRP, WCC and neutrophils is shown. There were 18 patients who were operated on and were found to have appendicitis (14.64%). Of these patients, 5.26% were found to have hyper bilirubinemia versus 15.11% in those with appendicitis ($P < 0.001$); 23 patients (28.9%) had raised CRP compared with 58.22% in those with appendicitis ($P = 0.068$); 30 patients (48.67%) had a raised WCC, compared with 65.46% in those with appendicitis ($P = 0.013$); and 61.2% had a raised neutrophil count, compared with 72.54% in those with appendicitis ($P = 0.036$).

## 4. DISCUSSION:

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The results of this study mirror previous studies in that they reveal that CRP, bilirubin, white cell count and differentiated neutrophil count are not reliable enough to be used alone in predicting a perforation in patients presenting with clinical acute appendicitis. Despite the limitations of the results individually, combining the results can improve the sensitivity of the tests, but adding all tests together, while impacting positively on the specificity, reduces the sensitivity too much. Despite this research base, the definitive diagnosis of perforated appendicitis still requires an operative and histological diagnosis.

The perforation rate in the setting of acute appendicitis was 12.12%, which is similar to other studies published in Western Europe.12 The main difference in demographics was the increased rate of perforation in men (14.64%) compared with females (9.52%). The ratio of acute appendicitis patients between genders was approximately 1:1. CRP has a higher sensitivity than other blood test results, mainly because of the relatively low normal value cut-off. Bilirubin outperforms any of the other biochemical markers investigated in terms of specificity. Combining the results of CRP and bilirubin improves the specificity without significantly reducing the sensitivity of the tests. The white cell count and neutrophil count can be useful in predicting a perforated appendix if they are both raised, but the low sensitivity means that if they are normal, it cannot be assumed that the appendix is not perforated. Although the results do not confidently show the blood tests to be diagnostic tools, they can be useful in prioritizing patients and, if considered together with the clinical picture, whether a patient is suitable for conservative management, such as ‘watch and-wait’.

## 5. CONCLUSION:

The USG modalities used for diagnosis have almost the same, or sometimes even lower sensitivity and specificity values compared to the laboratory parameters examined here. Preoperative WBC, neutrophil count, NLR, MPV, CRP, and direct and TB levels appear to have utility in the diagnosis of AA in elderly patients. Again, NLR, PLR, RDW, CRP, and direct and TB levels can be used to identify elderly patients with complications when AA has been diagnosed.

## 6. REFERENCES:

1. Addiss DG: The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol 1990;132(5):910–925.
2. Gorter RR, Eker HH, Gorter-Stam MA. et al.: Diagnosis and management of acute appendicitis. EAES Consensus Development Conference 2015. Surg Endosc 2016;30(11):4668–4690.
3. Di Saverio S, Podda M, De Simone B. et al.: Diagnosis and treatment of acute appendicitis:2020 update of the WSES Jerusalem guidelines. World J Emerg Surg 2020;15(1):27.
4. Kularatna M, Lauti M, Haran C. et al.: Clinical prediction rules for appendicitis in adults: Which is best. World J Surg 2017;41(7):1769–1781.
5. NVvH: Richtlijn Acute Appendicitis (Dutch Guideline Acute Appendicitis), https://richtlijnendatabase.nl/richtlijn/acute_appendicitis/startpagina_-_acute_appendicitis.html
6. Sallinen V, Akl EA, You JJ. et al.: Meta-analysis of antibiotics versus appendicectomy for non-perforated acute appendicitis. Br J Surg 2016;103(6):656–667.
7. Flum DR, Davidson GH, Monsell SE. et al.: A randomized trial comparing antibiotics with appendectomy for appendicitis. N Engl J Med 2020;383(20):1907–1919.

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8. Bhangu A. Acute appendicitis: Modern understanding of pathogenesis, diagnosis, and management. Lancet 2015;386:1278–1287.
9. Andersson RE. The natural history and traditional management of appendicitis revisited: Spontaneous resolution and predominance of prehospital perforations imply that a correct diagnosis is more important than an early diagnosis. World J Surg 2007;31(1):86–92.
10. Livingston EH, Fomby TB, Woodward WA. et al.: Epidemiological similarities between appendicitis and diverticulitis suggesting a common underlying pathogenesis. Archives of Surgery 2011;146(3):308–314.
11. Cobben LP, de Van Otterloo AM, Puylaert JB. Spontaneously resolving appendicitis: Frequency and natural history in 60 patients. Radiology 2000;215(2):349–352.
12. Park HC, Kim MJ, Lee BH. Randomized clinical trial of antibiotic therapy for uncomplicated appendicitis. Brit J Surg 2017;104(13):1785–1790.
13. van Dijk ST, van Dijk AH, Dijkgraaf MG. et al.: Meta-analysis of in-hospital delay before surgery as a risk factor for complications in patients with acute appendicitis. Br J Surg 2018;105(8):933–945.
14. Acute Abdominal Pain (AAP) Study group: Diagnostic accuracy of surgeons and trainees in assessment of patients with acute abdominal pain. Br J Surg 2016;103(10):1343–1349.
15. Andersson RE: Meta-analysis of the clinical and laboratory diagnosis of appendicitis. Br J Surg 2004;91(1):28–37.
16. Atema JJ, Gans SL, Beenen LF. et al.: Accuracy of white blood cell count and C-reactive protein levels related to duration of symptoms in patients suspected of acute appendicitis. Acad Emerg Med 2015;22(9):1015–1024.
17. van Rossem CC, Bolmers MD, Schreinemacher MH. et al.: Diagnosing acute appendicitis: Surgery or imaging? Colorectal Dis 2016;18(12):1129–1132.
18. Expert Panel on Gastrointestinal I, Garcia EM, Camacho MA. et al.: ACR appropriateness Criteria((R)) right lower quadrant pain-suspected appendicitis. J Am Coll Radiol 2018;15(11S):S373–S387.