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Research Article

Clinical correlates of positive and negative cases of appendicitis

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ABSTRACT

Background: The diagnosis of acute appendicitis is essentially clinical; however, a decision to operate based on clinical suspicion alone can lead to the removal of a normal appendix in 15-30% of cases. A number of clinical and laboratory based scoring system have been devised to assist diagnosis.
Methods: A detailed history as to the method of presentation, thorough clinical examination and all patients were investigation with routine blood tests, WBC count, DC, USG abdomen and Pelvis, X-ray, blood grouping and Rh typing, and histopathological study of the appendix were performed and reported by senior pathologist of the department.
Results: In the study population of 100 patients, 84 were histopathologically proved appendicitis. Among them 64 (76.2%) had raised leucocyte count and 20 (23.8%) had normal leucocyte count. Out of 16 histopathologically negative cases, 5 (31.3%) had raised leucocyte count and 11 (68.7%) had normal leucocyte count.
Conclusions: Negative appendectomy rate can be decreased, if appendectomy is avoided in cases where WBC count, neutrophil count and grade compression sonography (USG) abdomen normal.

Keywords: Appendicitis, USG, Correlates

INTRODUCTION

Although appendicitis is more common in younger age groups, it is still an important cause of abdominal pain in elderly. Perhaps due to a diminished inflammatory response, the elderly can present with less impressive symptoms and physical signs, longer duration of symptoms, and decreased leukocytosis compared to younger patients. Perforation is thus more common, occurring in as many as 50% of patients over age 65 years.

Gangrene and perforation occur much more frequently in elderly patients. Elderly patients with lax abdominal wall or obesity may harbour a gangrenous appendix with little evidence of it, and clinical picture may simulate subacute intestinal obstruction. Prompt CT scan is advocated when diagnosis is in question. Delay in diagnosis, a more rapid progression to perforation, and comorbid disease are all contributing factors.[1-3]

The diagnosis of acute appendicitis is essentially clinical; however, a decision to operate based on clinical suspicion alone can lead to the removal of a normal appendix in 15-30% of cases. A number of clinical and laboratory based scoring system have been devised to assist diagnosis. The most widely used is the Alvardo score.[4] A score of 7 or more is strongly predictive of acute appendicitis.[3]

White blood cell count (WBC) is perhaps the most useful laboratory test. Typically, the WBC is slightly elevated in non-perforated appendicitis, but may be quite elevated in the presence of perforation.[1]

The clinician must remember, however, that the WBC can be normal in patients with acute appendicitis, serial WBC measurements improve the diagnostic accuracy, with a rising value over time commonly seen in patients with appendicitis.[5]

The accuracy afforded by sonography should keep negative laparotomy rates at approximately 10%, clearly an improvement over the rate achieved by instinct alone. Jeffrey et al. concluded that size of the appendix can differentiate the normal from the acutely inflamed.[6,7]

The threshold levels for the diameter of the appendix, above which acute appendicitis is highly likely to be present have been set at either 6 or 7 mm, with resultant change of sensitivity and specificity.[7]

METHODS

The source of data for this study was patients admitted to various surgical units in department of surgery medical college and research institute. A period of four months has been given for follow up period to study the outcome of Surgery. These patients were diagnosed to have acute appendicitis and were operated on the same day.

During the study period, 100 cases with provisional diagnosis of acute appendicitis which were posted for surgery were selected using randomization. Patients were methodically enquired according to the proforma approved by the guide. A detailed history as to the method of presentation, thorough clinical examination and all patients were investigation with routine blood tests, WBC count, DC, USG abdomen and pelvis, X-ray, blood grouping and Rh typing, and histopathological study of the appendix were performed and reported by senior pathologist of the department.

Inclusion criteria

All the patients who were admitted to the K.R. Hospital during the study period with the diagnosis of acute appendicitis and posted for surgery were included in the study.

Diagnosis of acute appendicitis was made on the, history of right lower quadrant pain or periumbilical pain migrating to right lower quadrant, nausea, anorexia and/or vomiting, fever more than 38°C and or leukocytosis above 10,000 cells / cumm, right lower quadrant guarding and tenderness on physical examination.

Exclusion criteria

- Patients were excluded if the diagnosis of acute appendicitis was not clinically established.
- Patient had history of symptoms more than 5 days.
- Palpable mass in the right lower quadrant, suggesting an appendicitis abscess / mass.
- Patients with generalized peritonitis due to appendicular perforation.
- Acute appendicitis in pregnancy.
- Acute appendicitis in less than 12 year old patients.
- Inability to give informed consent due to mental disability.

Preoperative investigations were done which include WBC count and USG abdomen and pelvis. WBC count of more than 10,000 cells/mm^3 was considered positive and neutrophil cont of more than 75% was considered positive.

RESULTS

Out of 100 cases studied, 84% of the cases were histopathologically positive and 16% of cases were histopathologically negative, so the negative appendectomy rate in our study is 16%.

Table 1: Sex distribution in correlation to histopathologically positive and negative cases.

Type (HPE)	Number of cases	Male	Female
Positive	84 (84%)	49 (58.33%)	35 (41.67%)
Negative	16 (16%)	06 (37.5%)	10 (62.5%)
Total	100	55	45

58.33% of HPE positive patients were males and 41.67% HPE positive were females. Among HPE negative, patients 62.5% were females and 37.5% were males.

Table 2: Correlation of total leucocyte count or (WBC) with histopathologically positive and negative cases.

Total leucocyte count	HPE		Total
	Positive	Negative	
TLC raised	64 (TP) (76.2%)	5(FP) (31.3%)	69
TLC normal	20 (FN) (23.8%)	11 (TM) (68.7%)	31
Total	84	16	100

Sensitivity-76.19%, Specificity-68.75%, Predictive value of positive test-92.75%, Predictive value of Negative test-35.48%, 2=12.69, p-value=0.000.

In the study population of 100 patients, 84 were histopathologically proved appendicitis. Among them 64 (76.2%) had raised leucocyte count and 20 (23.8%) had normal leucocyte count. Out of 16 histopathologically negative cases, 5 (31.3%) had raised leucocyte count and 11 (68.7%) had normal leucocyte count. The result of p-value = 0.000, which is significant.

Table 3: Correlation of neutrophil count with histopathologically negative and positive cases.

Neutrophil count	HPE		Total
	Positive	Negative	
Raised	68 (80.95%)	6 (37.5%)	74
Normal	16 (19.05%)	10 (62.5%)	26
Total	84	16	100

Sensitivity-80.95%, Specificity-62.5%, Predictive value of positive test-91.98%, Predictive value of negative test-38.46%, $\chi 2$=13.189, The result of p-value = 0.000

Neutrophil count was raised in 68 patient (80.95%) of HPE positive cases and 6 patients (37.5%) of HPE negative cases. neutrophil count was normal in 16 patients (19.05%) of HPE positive cases and 10 patients (62.5%) of HPE negative cases. P-value is 0.000, which is significant.

Table 4: Correlation of USG with histopathologically positive and negative cases.

USG abdomen and pelvis	HPE		Total
	Positive	Negative	
USG positive	68 (80.95%)	2 (12.5%)	70
USG normal	16 (19.05%)	14 (87.5%)	30
Total	84	16	100

Sensitivity-80.95%, Specificity-87.5%, Predictive value of positive test-97.14, Predictive value of negative test=46.66, $\chi 2$=29.99, The result of p-value=0.000.

Ultrasonography (USG) had diagnosed acute appendicitis is 68 patients (80.95%) of HPE positive cases and 2 patient (12.5%) of HPE negative cases. USG was normal in 16 patients (19.05%) of HPE positive cases and 14 patients (87.5%) of HPE negative cases.

Table 5: Clinical and histopathological diagnosis.

Clinical diagnosis	HPE diagnosis		Total
	Positive	Negative	
Clinical	84	16	100

$\chi 2$ = 17.391, Result of p-value=0.000, Clinical diagnosis-100 patients, Histopathologically positive-84 patient, Histopathologically negative-16 patients

100 cases of clinical diagnosis of Acute appendicitis, 84 cases were histopathologically positive (84%) and 16 cases were histopathologically negative (16%). Negative appendectomy rate is 16%.

DISCUSSION

In this study, on correlating total leucocyte count with HPE positive and negative cases, it was found that the sensitivity was 76.19% and specificity was 68.75% indicating high sensitivity and low specificity. It was comparable with other studies done by Birchley D et al and Abdulbari Bener et al.[8,9]

Table 6: Total leucocyte count (WBC) and acute appendicitis.

Study	Sensitivity (%)	Specificity (%)	PPV (%)	PNV (%)
Birchley D[8]	78%	67%	89%	48%
Abdulbari Bener et al[9]	68.7%	63.3%	73.9%	57%
Present study	76.19%	68.75%	92.75%	35.48%

The result of p=0.000, high significant, indicating high association between WBC count and acute appendicitis. A raised WBC count is a sensitive test for acute appendicitis, but it is not diagnostic because of its relatively low specificity.

Neutrophil count and acute appendicitis

In this study, neutrophilia of more than 75% was seen in 74% of patients. It is comparable with other studies done by Verma (75%), Hoffman (78%), Marchand (81%) and Young (88%).[10-13]

Table 7: Neutrophil count and acute appendicitis.

Study	Sensitivity (%)	Specificity (%)	PPV (%)	PNV (%)
Birchley D[8]	86%	57%	88%	53%
Present study	80.95%	62.5%	91.89%	38.46%

The result of p=0.000, it is highly significant. This indicates that there was high association between raised neutrophil count and acute appendicitis. A raised neutrophil count is sensitive for acute appendicitis and is not diagnostic because of its relatively low specificity.

Ultrasonography (USG) and acute appendicitis

In this study, USG had diagnosed acute appendicitis in 68 patients (80.95%) of HPE positive cases and 2 patients (12.5%) of HPE negative cases, compared with other studies.

Table 8: Ultrasonography (USG) and acute appendicitis.

Study	Sensitivity (%)	Specificity (%)
Balthazar et al.[14]	76%	91%
Horton et al.[15]	76%	90%
Wise et al.[16]	62%	71%
Terasawa et al.[17] (meta-analysis)	86%	81%
Present study	80.95%	87.5%

The result of p=0.000, it is highly significant, this indicates that there was a high association between USG abdomen and acute appendicitis. Some studies have reported that sonography improved the diagnosis of appendicitis over clinical examination and decreasing negative appendectomy from 37% to 13%.[18]

Postoperative complications

In this study, 6 patients (6%) had wound infection, 4 patients (4%) had stitch abscess and paralytic ileus in 1 patient (1%). Most common complications was wound infection in 6%, which is comparable to Sauerland 19 (4.2%), Chung 112 (4.3%) and Golub 20 (4%). There was no mortality in present study.

CONCLUSION

Raised total leukocyte count (WBC) and raised neutrophil count are useful in diagnosis of acute appendicitis and ultrasonography (graded compression sonography) of abdomen is useful in the diagnosis of acute appendicitis.

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