



Research Paper

Significance of Neutrophil to Lymphocyte Ratio in Patients Undergoing Appendectomy

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Abstract

Background: Acute Appendicitis (AA) is one of the most common causes of acute abdomen in surgical practice. Patients presenting with appendicitis may vary in severity. Accurately diagnosing AA with complications like perforation/gangrene is mandatory to avoid patient related morbidity and mortality.

Objective: The present study aims to differentiate non perforated, simple appendicitis from complicated/perforated appendicitis on the basis of preoperative Neutrophil to Lymphocyte ratio (NLR).

Materials and Methods: This is a retrospective study of 127 patients who underwent appendectomy in DVVPF's medical college and hospital, Ahmednagar, during December 2016 to November 2018. The present study categorised patients on the basis of histopathological findings into either simple, non perforated AA or complicated and perforated AA. The clinical data and complete blood count with NLR was correlated with histopathological findings. Receiver Operating Characteristic (ROC) curve analysis was used for determining optimal cut-off value of NLR for complicated AA.

Results: Most of the patients with AA were in the age group of 21-30 years with M:F ratio of 1.8:1. Mean NLR of patients with complicated AA was raised (8.08 ± 4.04) compared to non-complicated. Optimal cut-off value of NLR for complicated AA was obtained as 5.52 by Receiver Operating Characteristic (ROC) curve analysis. This value has sensitivity of 71.4% and specificity of 74.7% with Area Under Curve (AUC) of 0.84 and p value of <0.001 which was statistically significant.

Conclusion: The Calculation of NLR from complete blood count is simple, cost effective and easily accessible parameter for determining complicated/perforated AA in resource poor settings.

Keywords: Non-perforated appendix, complicated perforated appendix, Neutrophil to Lymphocyte ratio.

Introduction

Acute appendicitis (AA) is one of the most frequently encountered entities in surgical practice. The possibility of occurrence of this

disease in an individual is approximately 7% and with perforation is 17-20% in a lifetime.^[1] The risk of mortality in general population is less than 1% but it can increase to 50% in the elderly

patients.^[2,3] In most of the cases appendicitis is uncomplicated. However 18.3 to 34% of appendicitis cases are complicated by perforation and the rate of postoperative complications also significantly increases with perforation.^[4,5]

Although a common surgical entity, diagnosis of AA becomes very challenging at times due to its atypical presentation or complications like suppuration and gangrene. Further delay in diagnosis and management leads to perforation and peritonitis causing high rates of morbidity and mortality.^[6] Emergency appendectomy is considered to be the gold standard treatment. This may be achieved by open appendectomy. However, in current surgical practice laparoscopic appendectomy is being implemented since 1983.^[7] Although emergency appendectomy is considered as gold standard, recent studies has shown that AA can be managed conservatively without surgery.^[8] However, conservative treatment merely works for AA with perforation. So any single investigation which predicts perforation early will help tremendously. The Neutrophil to Lymphocyte ratio (NLR) can be a good predictor of severity of AA.^[9]

So the present study was undertaken to determine complicated appendicitis by preoperative NLR and considering histopathology as gold standard.

Aims and Objectives

The present study aims to differentiate non perforated, simple appendicitis from complicated / perforated appendicitis on the basis of preoperative NLR.

Materials and Methods

The retrospective study of the patients, who had undergone an appendectomy, was conducted in the department of pathology, DVVPF's medical college and hospital, Ahmednagar, during December 2016 to November 2018. Patients of all age group and both genders presenting with acute abdomen with suspected appendicitis were included in the study. The present study excluded patients with acute abdomen other than

appendicitis, patients not having preoperative CBC reports, patients having significant comorbidities and malignancies and patients with non-inflamed appendix tissue on histopathology. Perforated or gangrenous appendix on histopathological study was referred to as complicated appendicitis.

A total of one twenty seven patients were included in the study after considering above mentioned criteria. An informed consent was obtained from all patients. Age, sex, clinical presentation and CBC including total leucocyte count, neutrophil count, lymphocyte count of patients were recorded. NLR was calculated in all patients with the help of absolute count.

All statistical analysis was done using SPSS 22.0 software version. Data obtained from the patient was expressed as mean, standard deviation and percentages where appropriate. A chi square and t test was performed for establishing the presence of statistically significant data. A p value of ≤ 0.05 was considered as statistically significant and results were evaluated within 95% confidence interval. The study also measured sensitivity, specificity, the optimal cut-off point for NLR, area under the curve (AUC) by using Receiver Operating Characteristic (ROC) analysis.

Results

The data of total 127 patients were analysed. The age distribution of patients was as follows:

Table 1: Age wise distribution of patients presenting with AA

Age group	No. of patients
≤ 10	6 (4.72%)
11-20	38 (29.92%)
21-30	44 (34.65%)
31-40	21 (16.54%)
41-50	6 (4.72%)
51-60	5 (3.94%)
61-70	5 (3.94%)
71-80	2 (1.57%)

Age ranged from 7 to 60 years and most of the patients in 21-30 years of age group with mean age of 28.13 ± 15 years.

Table 2: Sex distribution of patients presenting with AA

Male	82 (64.6%)
Female	45 (35.4%)

Among 127 patients in the study, 82 (64.6%) were male and 45 (35.4%) were female. M:F ratio was 1.8:1.

Table 3: Appendix histopathology of patients presenting with AA

Complicated	21 (16.54%)
Non- Complicated	106 (83.46%)

Out of 127 appendectomy specimens studied 21 cases showed complicated (perforated/gangrenous) appendicitis.

The recommended cut-off value of NLR for complicated appendicitis was determined by using ROC curve analysis. This value was based on most prominent point on the ROC curve by considering the sensitivity (71.4%) and specificity (74.7%). The cut-off value of NLR was obtained as 5.520. The Area under the Curve (AUC) obtained was 0.84. AUC with 95% Confidence Interval showed Lower Bound 0.766 and Upper Bound 0.913. p value is <0.001. [Figure 1]

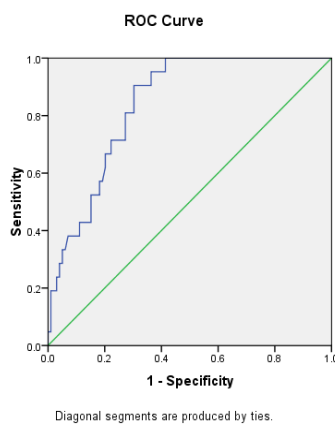


Figure 1

Table 4: Distribution of patients according to the NLR cut-off value

Cut-off value of NLR	Complicated AA	Non-complicated AA	p value* 0.000016
	No of patients (%)	No of patients (%)	
<5.520	6 (28.57%)	81 (76.42%)	
>5.520	15 (71.43%)	25 (23.58%)	
Total	21 (100%)	106 (100%)	

*p value calculated by chi square test.

Among 21 patients with complicated AA, 15 patients had high NLR level above the cut-off point with range of 5.52-20.42. Among 106 patients with non-complicated AA, 25 patients had high NLR level above the cut-off point with range of 5.52-15.88.

Table 5: Mean NLR values of patients

Patients	Mean NLR	SD (±)	Cut-off value	P value*
Complicated AA	8.08	4.04	5.520	<0.001
Non-complicated AA	3.68	2.89		

*p value calculated by t Test.

Preoperative mean NLR levels in complicated AA are significantly raised.

Discussion

Appendicitis is defined as inflammation of the worm-like structure called as vermiform appendix. Anatomically, appendix arises from the postero-medial aspect of the caecal wall with varying positions.^[10] The principle symptom of acute appendicitis is abdominal pain. Classically, it starts around the umbilicus as dull pain and then migrating to the right iliac fossa, within 4 to 6 hours. This localisation of pain to the right iliac fossa is the most reliable diagnostic sign of appendicitis.^[11] Rebound tenderness in the right iliac fossa is one of the cardinal signs, and can be sufficient on its own for the diagnosis AA, especially in the male patients. In addition to all above symptoms, the complicated/perforated appendicitis might also present with fever and rectal fullness.^[12]

Confirmatory and early diagnosis of AA is not always an easy task. It is further challenging to distinguish clinically between acute, non-perforated appendix from a complicated perforated appendix, especially in older adults and children. Early surgical intervention may lead to removal of normal appendix posing small risk of morbidity. In contrast, a delayed diagnosis and surgical intervention of patients with appendicitis results in increased risk of complications such as perforation and gangrene.^[13,14]

Multiple diagnostic imaging modalities can be helpful in diagnosing AA. Ultrasound is

comparatively less expensive than other methods with accuracy rate of 71-97%. Computed tomography is considered as a gold standard imaging method to diagnose suspected appendicitis due to its high sensitivity, specificity and accuracy rate of 95%. Magnetic resonance imaging has precise diagnostic accuracy in the assessment of acute appendicitis in pregnancy and paediatric patients.^[15,16,17] However, these radiological investigations are unavailable and cost effective in rural areas, small centers and resource poor settings.

For this purpose, several biomarkers are being investigated to aid in the diagnosis of acute appendicitis. There are only few studies in the literature but all of them were stating the NLR as sensitive marker. The studies also proposed that NLR was having better diagnostic accuracy for acute appendicitis than C-reactive protein, leucocyte or neutrophil count alone.^[18,19] The significant rise in NLR in cases without complicated appendicitis may be explained by relative neutrophilia in the beginning of the acute phase of acute inflammation.

There are many examples in the literature stating the NLR as an independent prognostic marker of morbidity and mortality in several conditions, such as cancers and cardiovascular diseases. NLR is also important in prediction and detection of inflammatory and infectious diseases, and their postoperative complications.^[6,20] Recently, it has been stated that NLR can provide diagnostic and prognostic clue in differentiation between the perforated appendix and the non-perforated acute appendix.

Different authors have stated different cut-off values of NLR. Kahramanca et al^[6] suggested the cut-off value of 5.74, with sensitivity of 70.8% and specificity of 48.5%. Ishizuka M et al^[20] in their study stated that NLR value of >8 shows a significant correlation with gangrenous appendicitis in patients undergoing an appendectomy. In the study by Makki A et al^[21] stated NLR cut-off value of 5.74 with a sensitivity of 85.70% and specificity of 61.60%. The

common age group, sex ratio and mean NLR levels of our study were comparable with other studies.

But in our study cut-off values of NLR is 5.52 for complicated AA which is somewhat lesser than most of the studies, with a better sensitivity and specificity of 71.4% and 74.7% respectively.

Conclusion

To conclude, calculation of NLR from complete blood count is simple, cost effective and easily accessible parameter which can be employed for differentiating complicated/perforated AA from simple AA in combination with clinical findings. However, normal value of NLR does not exclude the diagnosis. To find the optimal NLR and to test its accuracy, further prospective multicentered studies are needed

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