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Original Article

Comparison of the use of neutrophil: lymphocyte count ratio (NLCR) to total leukocyte count in diagnosing appendicitis in adults with right iliac fossa pain

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Abstract

Introduction: Diagnosis of acute appendicitis (AA) is purely based on history, examination and few laboratory investigations. However, it is often a perplexing diagnostic problem during the early stages of the disease.Failure to make an early diagnosis is a primary reason for morbidity and mortality. Elevated leukocyte count is one of the indicators of appendiceal inflammation in patients with right iliac fossa pain and most of the patients with acute appendicitis present with leucocytosis. Recently, it has been seen that the neutrophil: lymphocyte count ratio (NLCR) is a more sensitive marker than leukocytosis in patients with acute appendicitis.

Method: This is a prospective observational study conducted over a period of one year in the department of surgery at the Tribhuvan University Teaching Hospital, from September 2013 to August 2014. The clinical diagnosis of Acute appendicitis was made by history and clinical examinations and laboratory investigations. Total leukocyte count (TLC) and NLCR of patients diagnosed as AA were measured and recorded in the pro forma. Histological diagnosis was taken as the final diagnosis.

Results: A total of 106 patients were included in the study. Two third of the patients were male. Right iliac fossa tenderness was the most common sign. Ultrasound was able to diagnose acute appendicitis in 40.65% of the cases. NLCR> 3.5 was observed in 90.56% of patients with acute appendicitis, whereas 78.3% of patients had leukocytosis only. High NLCR (5.60) is associated with complicated AA.

Conclusion: NLCR is a more sensitive laboratory parameter than TLC in patients with RIF pain to diagnose acute appendicitis. A high NLCR ratio has a high likelihood of a complicated AA.

Keywords: Appendicitis, TLC, NLCR

Introduction

Acute appendicitis is one of the most common causes of an acute abdomen requiring surgery.[1, 2] Lifetime risk of having acute appendicitis is 8.6% and 6.7% for men and women respectively.[2]

Many times, symptoms of acute appendicitis overlap with a number of other conditions, making diagnosis a challenge, particularly in very young, elderly patients and females of reproductive age[3]. The classical clinical picture of AA is encountered in less than 50% of patients. [4]Delayed diagnosis of appendicitis is associated, increased the incidence of

perforation and later wound infection andpelvic abscess formation. Most frequently perforation is seen in children less than 5 years and in patients over 65 years.[5,6]Commonly used Scoring system to diagnose AA uses leukocytosis as a laboratory parameter, but its sensitivity in patients with AA is 78.6% and specificity of 54.8%.[7,8]

It is a well-known fact that bacteremia is the main sequela of AA[9]. Leukocytosis and increased NLCR are the early indicators of bloodstream infection. [10]

It has been seen that a high level of NLCR>3.5 is more sensitive markers of bacteremia in patients with AA and has more diagnostic accuracy as compared to leucocytosis with high sensitivity and specificity.[11]

Methods

This is a prospective observational study was carried over a period of one year, from September 2013 to August 2014 in the Department of Surgery, Tribhuvan University Teaching Hospital Nepal. All patients with a clinical diagnosis of acute appendicitis undergoing emergency appendectomy were included in the study. Patient undergoing interval appendectomy; lacking histopathology report, age less than 16 yrs, post chemotherapy and other immunosuppressive status were excluded.

Initial evaluation of patients was done by surgery residents. The diagnosis of acute appendicitis was based on history, clinical examination, and investigation of the patients. Total leucocyte count (TLC) and NLCR of patients diagnosed as AA were measured and recorded in the proforma. The per-operative findings were recorded. Histological diagnosis was taken as the final diagnosis.

Statistical analysis was done by using Statistical Package for the Social Sciences Software (SPSS) programme for Windows® version 20. A p-value of 0.05 was taken as statistically significant. The study was approved by the Institutional Review Board of the Institute of Medicine.

Results

Out of 106 patients included in the study, 66.9% of patients were male and 33.1% of patients were female with Male to Female ratio 2:1. The mean age of the patients was 29.63 (range16-82) years. Most of the patients were in the age group of 20 to 30 years (Figure 1)

Right iliac fossa (RIF) tenderness was present in all cases, whereas rebound tenderness and anorexia were seen in 82% and 80% respectively. Leucocytosis (TlC>10500/cumm) seen in 78.3% cases and neutrophilia (neutrophil > 75%) is seen in 71.7%. Neutrophil-lymphocyte ratio (NLCR) more than 3.5 is seen in 90.56% of the patients with leucocytosis and about 9.44% of the patients with NLCR more than 3.5 had normal leucocyte count. Ultrasound was able to diagnose acute appendicitis in 40.65% of the cases.

The final diagnosis of AA was based on a histopathological report. Among 106 cases, 11.32% were uncomplicated appendicitis and 65.09% were gangrenous AA. Remaining 23.58% were suppurative AA. NLCR is above 4.0 in patients with acute suppurative appendicitis, whereas in patients with acute gangrenous appendicitis it is 5.60.

Figure 1: Age distribution of patients (in years)

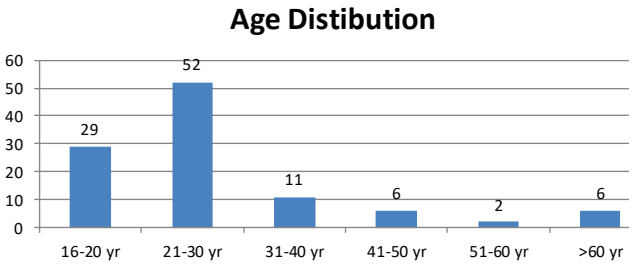

Table 1: The clinical features of the patients

Clinical feature	No of patients	Percentage(%)
Right iliac fossa tenderness	106	100
Rebound tenderness	87	82.07
Anorexia	85	80.18
Leukocytosis	83	78.3
Nausea/Vomiting	79	74.5
Migratory pain	68	64.15
Fever	24	22.6

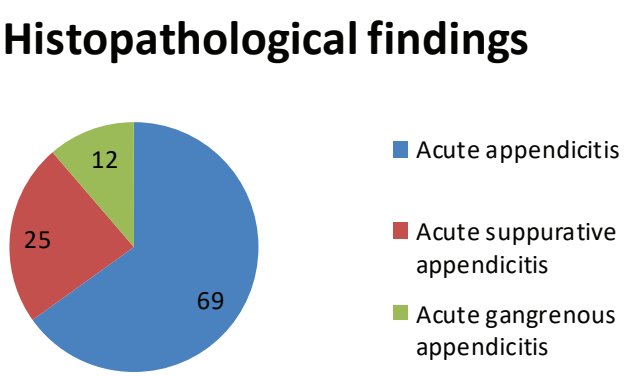

Figure 2: Histopathological findings

Discussion

Clinical examination is still the mainstay in the diagnosis of AA.[12] Different scoring system has been developed and practiced in a different part of the world to improve the diagnostic accuracy of AA. AA was found to be more common in 2nd to 3rd decade of life[13]. The exact cause of this high incidence of acute appendicitis in the young age group is still unknown but it is believed that the amount of lymphoid tissue in the submucosa of appendix increase in size and number with increasing age could be responsible for the development of AA in younger age groups.[14] In this study, about 80% of patients were between age group 16-30 which declines with age in adults, which is comparable with other studies also. However, some studies showed the slight increased in the incidence of AA after the 6th decade in both genders, suggesting that there is still a risk of having an AA in older age group, which is associated with increased risk of perforation morbidity and mortality.[15]

There is a range of variation in the incidence of AA among male and female sex. Some literature showed that AA was found to be more common in males whereas some others showed it is more common in female patients. This variation is similar in different part of the world. The exact cause of the incidence of this gender difference still unknown.[15-18] More research is needed to better understand the gender differences in AA and molecular basis for this.

Since the last 30 years, ultrasound (USG) of the abdomen has been an important tool used in the diagnosis of appendicitis and to ruled out other differentials in patients with acute abdomen. The sensitivity and specificity of USG to diagnose AA are 69%- 88%, and 81%-92% respectively[18, 19], which is very high as compared to our result. In an emergency, for acute abdomen, resident on duty performs USG could be the reason for the low detection rates in our hospital.

Leukocytosis is considered as an important component in most of the scoring system. High leucocyte count is suggestive of initial body response towards infection

Neutrophils are the first cells of the immune system to respond in response to acute bacterial infection. As first responders, they also send out signals to other cells in the immune system to respond to infection. A change in neutrophil to lymphocyte ratio in acute infection reflects the severity of the inflammatory response in the body.

Eighty to –85% of the patients with acute appendicitis will have leucocytosis.[20, 21] In this study, Leucocytosis (TlC>10500/cumm) seen in 78.3% cases and neutrophilia (neutrophil > 75%) is seen in 71.7%.

Cutoff limit of NLCR is not universal. Some study showed NLCR of 4.3 for the diagnosis of acute appendicitis, some other reported cutoff limit of 6.84 whereas, some study reported 3.5 also to distinguish acute appendicitis from normal ones[22-26]. In this present study, NLCR was above 3.5 in patients with AA.

In many studies, high NLCR is suggestive of complicated AA. For this also cutoff limit is not universal. This is probably genetic factors, environmental factors also play a role in body response towards infection. Ishizuka et al. showed a cut-off value of 8.0 for NLCR to differentiate gangrenous appendicitis from catarrhal appendicitis[27]. Whereas Khan A.et.al. showed NLCR of >6.36 associated with complicated acute appendicitis.[28] In this present study, NLCR of 5.60 was associated with gangrenous appendicitis suggesting that positive and strong correlation between high NLCR ratio have a high likelihood of perforation.

Conclusion

NLCR is a more sensitive laboratory parameter than TLC in patients with RIF pain to diagnose acute appendicitis. A high NLCR ratio has a high likelihood of a complicated AA.

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