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Accuracy in Routine Inflammatory Markers in Diagnosis of Acute Appendicitis Compare with Surgeon's Clinical Decision

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ABSTRACT

The clinical assessment override the use of laboratory investigation in diagnosis of acute appendicitis. However WBC count, Neutrophil percentage are frequently done in patient suspected acute appendicitis. The aim of the study is to analyze the role of WBC count, Neutrophil percentage and CRP in improving the accuracy of diagnosis of acute appendicitis.

108 patient who underwent appendectomy were reviewed between 01/01/2000 to 30/11/2000. The diagnosis was confirm with histopathalogical reports. The correlation between pre-operative clinical diagnosis in histologically proven appendicitis was assessed with routine inflammatory markers including White Blood Cell count(WBC), Neutrophil Percentage(NP) And C- Reactive Protein(CRP).

Out of 108 patients of study group 52 were male and 48 were female with the age range from 7 years to 72 years. High WBC count, Neutrophil Percentage and CRP were seen in 82 ,71and 78 of patients respectively. In those with positive appendicitis WBC count, Neutrophil Percentage and CRP were seen in 70 (88.60%), 69 (86.07%) and 71 (89.87%) respectively. High WBC count, neutrophil count and CRP were seen in 12(41.37%), 10 (34.48%) and 7 (24.18%) in histologically negative group.

Conclusion-The raised value of WBC count, Neutrophil Percentage and CRP enhance the diagnosis of acute appendicitis. There are specific in diagnosis in acute appendicitis and all three parameters are equally important. However these parameters are not specific for acute appendicitis.

Keywords: Acute appendicitis; Inflammatory markers; Sensitivity; Specificity

INTRODUCTION

Acute appendicitis is one of the most common causes of abdominal pain and is the most frequent cause of emergency abdominal surgery in young population[1]. The life time risk of appendicitis is estimated at 7% with peak incidence occurring between 10 and 30 years[2]. The diagnosis of acute appendicitis is mainly based on clinical assessment which include history and examination; aided by conventional laboratory investigation including white blood cell count (WBC) Neutrophil percentage (NP) and C reactive protein (CRP). Clinical diagnose of acute appendicitis in children is difficult compared to the clinical diagnose of adults due to incomplete history and atypical symptoms[3]. The laboratory investigation we perform; WBC and CRP are not constant. They are sensitive tests but not specific for acute appendicitis. Clinical diagnosis alone may not be accurate enough as symptoms of acute appendicitis overlap with a number of other diseases, especially in females. Other factors such as extreme age, late presentation, partially treated appendicitis may contribute to this difficulty. However it has been shown that combination of clinical assessment and routine lab investigations increase the specificity significantly[4]. Whereas, when WBC and CRP are negative the diagnosis again will be difficult[5]. The main aim of this retrospective study is to determine the usefulness of routine available investigation (WBC, percentage of Neutrophil and CRP) in the diagnosis of acute appendicitis.

MATERIAL AND METHOD

We retrospectively reviewed the medical record of 108 patients that underwent appendisectomy during the period from 1st of January to 30th of November 2020 at the surgical unit B in teaching hospital Kuliyapitiya. The preoperative diagnosis of appendicitis was established with the clinical history examination and the routine inflammatory markers (WBC, NP and CRP) and in some patients ultra sound scan was used as an imaging modality. All patients had been assessed by unit consultants and the decision of surgery has been taken by the same consultant. The data collected from the record room included patient age, gender, clinical symptoms and signs, details of inflammatory markers and operatory findings. Histopathological reports were traced from pathology lab. They were used to confirm the diagnosis of acute appendicitis. The negativity was defined based on the histological report when there is no inflammatory features histologically. WBC count was considered positive when the value was greater than $10x10^9$ whereas CRP was considered positive when the CRP level was greater than 5mg per liter. Having more than 70% of neutrophil was considered as a higher count.

RESULT

No exclusive criteria were applied. There were 108 patients in the study. Among those patients 51 were male and 59 were female with male to female ratio being 1: 1.12. The age distribution was 7 to 72 years with the median age being 31.5 years. Most of the patients were young. The higher rate of appendicitis were seen in the age group 11-20 years.

79 patients had histologically proven acute appendicitis and 29 had no features of acute appendicitis histologically (Table 1). Out of the 79 of histologically proven patients only 59 had uncomplicated acute appendicitis. Suppretive appendicitis was present in 20 patients. Among the negative patients 26 had reactive lymphoid hyperplasia and carcinoid tumor in 3 patients (Table 2). In this study group 82 patient had high white cell count and 71 had high neutrophil percentage. Positive CRP was seen in 78 patients. Interestingly all the patients that had high WBC, higher neutrophil percentage and positive CRP had no histologically proven appendicitis. Some of them had negative histology in spite of high inflammatory markers. Among the 79 patient of histologically proven appendicitis 70 (88.60%) patients had high WBC count. High neutrophil percentage and CRP were seen in 61(77.21%) and 71(89.87%) patients respectively (Table 3). 12(41.37%) patients had high WBC count though the histology was negative. 10 (34.48 %)and 7 (24.18%) (Table 4) patients had high neutrophil count and CRP in spite of having no histologically proven appendicitis. All 3 inflammatory markers were high among female compare to male in histologically negative group (Table 5).

Table 1: Histological outcome.

Histological outcome	Number	Percentage
Histologically positive	79	73.14%
Histologically negative	29	26.85%

Table 2: Histological distribution.

Histopathologic Diagnosis	Number	Percentage
Acute appendicitis	59	54.62%
Reactive Lymphoid follicular Hyperplasia	26	24.10%
Acute suppurative with serositis	20	18.51%
Carcinoid tumors	3	2.77%
Total	108	100.00%

Table 3: Pattern of inflammatory markers in histologically positive and negative group.

	Number of histologically positive patients (N-79).		Number of histologically negative patients (N-29)		Total number of patients with high inflammatory markers.
Inflammatory markers	**Number of patients**	**Percentage**	**Number of patients**	**Percentage**	
WBC	**70**	**88.6**	**12**	**41.37**	**82**
Neutrophil percentage	**61**	**86.07**	**10**	**34.48**	**71**
CRP	**71**	**89.87**	**6**	**24.18**	**78**
Fever	**31**	**39.24**	**5**	**17.24**	**36**

Table 4: Pattern of inflammatory markers on histologically negative group.

Number of pateints with high inflammatory markers		Number of negative inflammatory markers	Percentage	Total
12	41.4	17	58.62	29
10	34.5	19	65.51	29
7	24.2	22	75.86	29
5	17.2	24	82.75	29

Table 5: Inflammatory marker in histologically negative group based on Gender.

		Higher WBC	Higher N Percentage	Higher CRP
Female	19	9	6	4
Male	10	4	3	3

DISCUSSION

Obviously the assessment of patient with acute abdominal pain particularly suspected appendicitis remain multifactorial and still depend on the clinical judgment. If the history and examination findings are typical clinical assessment should be overweight the use of investigation. In case of atypical presentation a clinical assessment is not enough to make a decision. In such a case, laboratory investigations such as WBC, and CRP can be used to reinforce the decision. If either or both markers are raised it would strengthen the clinical judgment whereas presence of normal value lead to further investigation or observation. The studies have shown that accuracy of clinical diagnosis of acute appendicitis without investigation is ranging between 76%-92% [6,7]. Some studies have shown that CRP is more accurate than WBC and neutrophil percentage [8]. However combination will increase the accuracy. Asfar et al has shown that sensitivity and specificity of CRP is 86.6% and 93.6% respectively [9]. Erkassap et al studied on 102 patients and reported that sensitivity and specificity of CRP were 96% and 78% respectively. Gronroos in his study showed that when both WBC and CRP were normal acute appendicitis is unlikely[10]. According to the Shakhatreh CRP is useful in diagnosing acute appendicitis but it does not replace the clinical judgment [7]. In borderline diagnosis of acute appendicitis Anderson concluded that WBC and neutrophil percentage will be helpful [11]. None of these tests were 100% diagnostic. The CRP and WBC by itself does not prevent negative appendisectomies, otherwise normal CRP and WBC, NP by itself does not rule out the acute appendicitis [12]

In our study from 79 patient with histologically proven acute appendicitis had high WBC, neutrophil percentage and CRP in 70 (88.60%), 61 (77.21%) and 71 (89.87%) respectively which means that all these parameters were more than 75% sensitive in diagnosis of acute appendicitis. Interestingly among 29 patient of histologically negative group 12 (41.37%) patients had high white cell count and 10 (34.48%), 7 (24.18%) patient had high Neutrophil percentage and CRP respectively. This figures reflect that these three parameters are not specific in diagnosis of acute appendicitis. Higher markers were noted among female in histologically negative group. This could explain by misdiagnosing of acute appendicitis with pelvic infection. By looking at the **(Figure 2)** it's quite clear that

specificity for WBC, Neutrophil percentage and CRP are 58.62%, 65.51% and 75.86% respectively. But there sensitivity are 88.60%, 86.06% and 89.87% respectively

Our results and the other study closely suggestive that the inflammatory markers, we studied are quite accurate in diagnosis of acute appendicitis whereas these parameters are not quite specific for diagnosis of acute appendicitis. Hence diagnosis decision must depend on clinical interpretation of expert in combination with inflammatory markers.

CONCLUSION

The basic inflammatory markers are sensitive in diagnosis of acute appendicitis but not specific for acute appendicitis. However to support the clinical decision routine inflammatory markers will be helpful especially in borderline cases.

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