

## Original Research Article

# Absolute eosinophil count as a reliable prognostic marker in patients with perforative peritonitis: a prospective study

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### ABSTRACT

**Background:** The aims of the study were to find whether a decrease in absolute eosinophil count was a reliable prognostic marker in patients with perforative peritonitis and to determine whether the levels of Absolute eosinophil count had any correlation with the type of perforation.

**Methods:** A total of 104 patients with perforative peritonitis presented consecutively to Madras Medical College, Rajiv Gandhi Government General Hospital from October 2017 to October 2018 were chosen and were allocated into two groups based on the outcome as mortality or survival. 88 patients were in the survival group and 16 patients were in the mortality group. The Absolute eosinophil count distribution in both these groups were recorded along with the type of perforation.

**Results:** Data were processed using SPSS software. All values were expressed as mean±standard deviation / median. Comparison of absolute eosinophil count between the two groups was done using student 't' test and prognostic accuracy of the parameters were done using ROC curve analysis. It was found that a decrease in absolute eosinophil count was associated with adverse outcome in perforative peritonitis patients.

**Conclusions:** From this study, we conclude that Absolute Eosinophil Count is a reliable marker of survival. It allows timely identification of high-risk patients and can be used as a marker for risk stratification and hence can be considered a reliable prognostic marker in perforative peritonitis patients. It can also be concluded that there is no correlation between the Absolute eosinophil count levels and the type of perforation.

**Keywords:** Absolute eosinophil count, Perforative peritonitis

### INTRODUCTION

Perforative peritonitis is a common surgical emergency in India. In spite of advances in diagnosis, intensive care treatment, surgical techniques and antimicrobial therapy management of perforative peritonitis continues to be challenging for the surgeons. Peritonitis is the commonest cause of sepsis in developing countries. Despite the treatment measures, mortality rates are still high (up to 40%). In addition to this in developing countries, most of the patients present to the clinic late with septicemia,

increasing the morbidity and mortality of the disease. This increases the need for a tool predicting the morbidity and mortality in patients with perforative peritonitis. The etiological spectrum of perforative peritonitis in India differs significantly from its western counterparts. It is commonly seen in younger age groups. The site of perforation is most commonly involving the proximal part of the gastrointestinal tract whereas it is distal in the western countries. Etiological factors also show a wide geographical variation. In India the most common causes of perforation are peptic ulcer, typhoid followed by

appendicular and tubercular perforations.<sup>1</sup> The most important factors responsible for the mortality are Septicaemia and Shock. A rapid and persistent decrease in the numbers of circulating eosinophils is a distinctive aspect of physiological response to acute inflammation. Eosinopenia (<150cells/dl) may be the result of migration of eosinophils into the inflammatory site due to release of the chemotactic factors. Recent reports have shown that eosinopenia as a marker of sepsis.<sup>2-5</sup> This promoted us to assess the diagnostic value of eosinopenia as mortality marker in patients with perforative peritonitis.

## METHODS

The present study was done in Madras medical college, Rajiv Gandhi Government General Hospital between October 2017 to October 2018. Total of 104 patients with perforative peritonitis presented consecutively to this college were chosen in the study population in the age group of 15-90 years.

### Inclusion criteria

Patients with secondary bacterial peritonitis due to hollow viscous perforation (by clinical and radiological methods) were included.

### Exclusion criteria

- Patients with spontaneous bacterial peritonitis
- Malignant perforation,
- Traumatic perforation,
- Non-resuscitable patients,
- Post-surgical leak.

Diagnosis of peritonitis due to hollow viscous perforation was done by History and Clinical Examination, X-ray chest PA view showing air under diaphragm, USG abdomen showing free fluid in peritoneum and CT scan.

Mortality was defined as any death occurring during the hospital stay. Morbidity was defined in terms of post-operative complications such as wound infection, Intra-abdominal collection, pneumonia or lung atelectasis, Acute myocardial infarction or heart failure, Acute renal failure and urinary tract infection.

Once the diagnosis of peritonitis was made, the patients were enrolled in the study. In addition to personal data such as name, age, sex other details like comorbid illness, perforation operation interval, heart rate, blood pressure were recorded. Blood samples were to be collected for determination of AEC. Blood samples were collected at the time of admission. 5mL of venous blood was collected in EDTA tube for the determination of Absolute Eosinophil Count (AEC). All patients were treated conventionally after stabilising their general condition. The absolute eosinophil count was determined in the Neubauer counting chamber by counting the number of

eosinophils per 100 white blood cells; It is then multiplied by the white blood cell count of the patient.

### Statistical analysis

Data were processed using SPSS software. All values were expressed as mean  $\pm$  Standard deviation / median. Comparison of absolute eosinophil count between the two groups was done using student 't' test.

## RESULTS

A total of 104 patients who were admitted in Rajiv Gandhi Government General Hospital in the study period (October 2017 to October 2018) with an eventual diagnosis of perforative peritonitis and meeting the inclusion criteria and the exclusion criteria were chosen for present study. These patients were allocated into two groups based on the outcome as: a mortality group or a survival group. Among them, 88 patients were found to be in the survival group and 16 patients were found to be in the mortality group. The age group of the patients in current study ranged from 24 years to 75 years. In present study a total of 86 patients were male and 18 patients were female. The characteristics of the patients like age, type of perforation, AEC were tabulated.

**Table 1: Characteristics of patients in the survival group.**

Parameter	Mean $\pm$ SD	Range	95% CI	Median
Age (years)	48.24 $\pm$ 12.03	24-75	45.69 - 50.79	48
M:F	76 :12			
AEC (cells/cu.mm)	168.64 $\pm$ 34.84	107- 242	161.25- 176.02	164.5

**Table 2: Characteristics of patients in the mortality group.**

Parameter	Mean $\pm$ SD	Range	95% CI	Median
Age (years)	53.75 $\pm$ 8.68	34-66	49.12 - 58.38	55
M:F	10 : 6			
AEC (cells/cu.mm)	33.13 $\pm$ 7.50	23-45	29.13 - 37.12	32

Table 1 showing the characteristics of the patients in the survival group. The age, AEC values were expressed as mean $\pm$ SD. Their median values and range of distribution are also given.

Table 2 showing the characteristics of the patients in the mortality group. The age, AEC values were expressed as mean $\pm$ SD. Their median values and range of distribution are also given.

Table 3 shows the comparison between various types of perforation and their AEC levels. Among them it was found that the peptic (53%) perforations were commonest (commonly found in the first part of duodenum and in the prepyloric of the stomach) followed by ileal (39%), appendicular (5%) and colonic (3%) forms of perforation. P value <0.05 was considered statistically significant. It was found that there was no statistically significant difference in AEC levels with respect to the type of perforation.

**Table 3: Comparison of AEC with the type of perforation.**

Type of perforation	N (%)	AEC	
		Mean ± SD	p
Peptic	55 (53%)	141.89±59.98	0.28
Ileal	41 (39%)	148.54±59.26	0.92
Appendicular	5 (5%)	187.20±38.29	0.12
Colonic	3 (3%)	180±28.79	0.33

**Table 4: Distribution of AEC among the patients.**

Parameters	Mean±SD	T	P
AEC Survivors	168.64±34.84	15.43	0.0001*
Dead	33.13±7.50		

Table 4 showing AEC distribution between the two groups. P value <0.05 was considered statistically significant. There was statistically significant difference in AEC levels between the two groups. This shows that decrease in AEC levels are associated with adverse outcome in perforative peritonitis patients.

## DISCUSSION

Perforation peritonitis is a frequently encountered surgical emergency in tropical countries like India, most commonly affecting young men in their prime of life. Most of these patients present with perforation of the upper gastrointestinal tract.

In a majority of the cases, presentation to the hospital is late with well-established generalized peritonitis with purulent / fecal contamination and varying degrees of septicemia.

Assuming that the patients with peptic ulcer perforation are septic upon admission, the determinants of mortality in sepsis should hold true for perforation peritonitis as well. It is necessary to recognize patients at risk preoperatively and prepare for an intensive postoperative management strategy. This becomes more significant in authors' setup, where the intensive care facilities are limited and overwhelmed by the number of patients.

Eosinopenia is a form of agranulocytosis where the number of eosinophil granulocytes is lower than expected. Eosinopenia per se is a very rare event.<sup>6</sup> It has

been associated with enteric fever where there is anemia, leukopenia and eosinopenia in the haematological profile.<sup>7</sup>

One distinctive aspect of acute inflammation is the rapid and persistent decrease in the number of circulating eosinophils the reason for which remains unclear.<sup>8-10</sup> It has been postulated that the abrupt eosinopenia may be due to the migration of eosinophils to the site of inflammation as a response to the release of chemotactic factors of inflammation into the blood stream.<sup>11</sup>

The precocity and precision with which the eosinophil trend follows the phases of the infection underline the value of the assay as a reliable parameter for monitoring acute infection.<sup>12</sup> Many recent studies have concluded eosinopenia as an accurate marker in blood stream infections in critically ill patients. Abidi et al, found eosinopenia as an early marker of mortality in critically ill patient. Also, they found that eosinopenia is a better marker of blood stream infections in critically ill patients than CRP and procalcitonin.<sup>6-9</sup>

Garnacho-Montero et al, and many others have concluded that procalcitonin and CRP are better markers of sepsis than Absolute eosinophil count.<sup>13</sup> The initial differential diagnosis between SIRS and sepsis is quite difficult most of the times in patients presenting to tertiary care institution.

Clinical signs of infection are nonspecific, and the identification of the culprit pathogen is not available in the early hours. Sepsis is associated with a strong acute-phase response resulting in pronounced changes in the concentrations of many plasma components. Apart from their values in discriminating no-sepsis-SIRS from sepsis, several biochemical indicators have been assessed regarding their potential in predicting prognosis. Of these procalcitonin appears to be good diagnostic marker of sepsis.

However, some authors have questioned its capacity to discriminate infection from controls.<sup>9,10</sup> These observations only confirm that testing for goodness of fit with the data, to which it is being applied, is a must for any prognostic scoring system or biomarker. Geographical variation in the different patient subsets makes such testing and validation mandatory. Since each surgical/medical unit serves a different patient population, each score system/biomarker must be calibrated and may have different cut-off values (disease or setting specific) in the individual hospital to ensure that the model is applicable for the patient material involved, before it is accepted as quality standard.<sup>13,14</sup> Clearly, the septic syndrome is far too heterogeneous and complex to be reduced to a single cut off of any surrogate marker.

Different microbes might induce distinct responses, resulting in a variable up/do downregulation of

circulating biomarkers and mediators.<sup>15</sup> Sepsis related markers research in developing countries are mainly focusing on Procalcitonin and CRP and it is widely accepted as a potential biomarker in sepsis.<sup>16</sup> Only few studies are available in this setting of eosinopenia as a marker of survival in peritonitis.<sup>17</sup>

Many research and educational programs are being done at national and international level to improve the outcome of severe sepsis.

On the other hand, the developing countries are struggling in many ways to identify the patients as high risk and to treat them with intensive therapy since the resources are limited. JPS (Jabalpur Prognostic Index) was identified first and used in response to this need since it does not use expensive investigations considering it to be a user-friendly risk stratification scoring system and can be used at a wider scale. Addition of AEC to this can identify patients with better prognosis but have higher JPS. CRP has also been found to be a promising marker of sepsis but cost constraints prevent its use as a routine marker of sepsis especially in critical care setup in developing countries.

AEC is a simple test as it is part of the Complete blood count tests being routinely done for patients admitted in intensive care setup. It does not cause any extra effort or expenditure loss. AEC allows timely identification of patients at high risk for sepsis related mortality.

## CONCLUSION

From this study, we conclude that AEC is a reliable marker of survival and it allows timely identification of high-risk patients. It can be used as a marker for risk stratification in perforative peritonitis patients. AEC has the necessary sensitivity and specificity in addition to easy methodology and cost effectiveness as seen with other markers of sepsis and that there is no correlation between AEC levels and the type of perforation.

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