Original Research Article

Significance of platelet indices in burns patient

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Abstract

Introduction: Burns constitute an important health concern all over the world. The main aim of burns treatment is reducing morbidity and mortality. Platelet count was proved to be an important prognostic index in burns. The main aim of this study is to find the significance of other Platelet indices in burns patient. **Methods:** This study was conducted in a Tertiary care Hospital in Chennai for a sample size of 143 burns patients. Patients were divided into two groups based on the Total burn surface area (Group A with <30% Total Burns Surface Area and group B with >30% Total Burn Surface area). Normal persons with similar ages are taken as Control. Platelet indices were analysed for these patients on the day of admission and on the fourth day of admission using Sysmex 5-part analyser. BAUX score was also calculated for the Burns patient. The results were compared between platelet indices, clinical parameters and Baux score among different groups. **Results:** The results of platelet indices between group A, group B and control group were compared. In group A, no significant change in platelet indices was observed. But in group B, the mean value of Platelet count decreases from 217 on the day admission to 164 on the fourth day of admission and the Mean Platelet Volume increases from 9.88 on the day of admission to 10.54 on the fourth day of admission. Mean Platelet Volume also correlates linearly with BAUX score. **Conclusion:** BAUX score is a prognostic scoring system in which higher value indicates poorer prognosis. MPV correlates linearly with BAUX score which indicates raising MPV act as poor prognostic factor. Platelet indices which can be analyzed with simple automated analyser can act as important prognostic factor in burns patient which helps in deciding appropriate treatment at appropriate time.

Keywords: Platelet indices, BAUX score, Burns, Prognostic index.

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Introduction

Burn injuries constitute a major health concern in India and it ranks second in having high mortality, disfigurement and morbidity. It could be due to suicides, homicides or accidents. WHO estimates that burns cause 10 million Disability Adjusted Life Years per year globally [1]. The high incidents of burns are related to the low economic status and lack of preventive measures. The main aim of burns treatment is reducing the morbidity and mortality. For that we need to identify the prognosis of the patient and provide intensive treatment at appropriate time. Many studies have showed Platelet count as prognostic index in burns. The aim of this study is to find the significance of Platelet in burns patient by analyzing the Platelet indices.

Materials and Methods

Place of Study: Clinical Pathology lab, Department of Pathology, Govt. Kilpauk Medical College.

Type of Study: Case Control Study

Inclusion Criteria: Patients who sustained burn injuries and admitted in burns ward were included in the study.

Exclusion Criteria: Age less than 15 years, Elelctrical burns, scalds and patients with known hematological disorders were excluded from the study.

Sampling Method: 143 patients were included in this study. Cases with >30% total burn surface area are included under group B and rest were included under group A.

Sample Collection: Blood samples were collected in EDTA coated vacutainers from the cases on the day of admission and on fourth admission day.

After gentle thorough mixing, the samples were analysed within one hour of collection using Sysmex- 5 part analyser. The Platelet indices were noted. Patients details like age, sex, Total Burns Surface Area (TBSA), presence of inhalational injuries and degree of burns were obtained from case sheet. The BAUX score was calculated using the formula "TBSA+age of patient+17" [2]. Same number of age matched controls were selected and their platelet indices were noted. The results were entered in excel sheet and the platelet indices were compared between cases and controls and among different burns groups.

Results

In this study period, a total of 285 burns patient were admitted. By adhering inclusion and exclusion criteria, 143 patients were included in this study. 51 patients classified under group A and 92 under group B. Maximum number of Burns patients come under the age group of 30-35 years with mean age of 32 years.

On comparing Platelet indices of Burns patient with the control group, it was observed that in burns patient Platelet indices remains the same as that of control group on the day of admission but differs on the 4th admission day. The Platelet count decreases and other indices like MPV, PDW, PCT, P-LCR increases. In group A cases (<30% TBSA), the changes in the Platelet indices between the first and fourth post admission day remains minimal. In group B (>30%TBSA), the mean value of Platelet count on the day of admission is 217×10^3 cells/cu.mm. and it drops to 164×10^3 cells/cu.mm. on the fourth day. The mean value of MPV on the day of admission is 9.88fl which increases to 10.54fl on the fourth day. The mean value of PDW and P-LCR which are 11.43 and 20.39fl on the day of admission increases to 12.21 and 27.1 fl on the fourth day respectively. To this contrary, the plateletcrit value lowers a little on fourth day.

On comparing the platelet indices with the BAUX score, MPV correlates linearly with BAUX score and shows a positive correlation between them. All the other platelet indices like PDW, P-LCR and PCT doesn't correlate with BAUX score.

Table-1: Comparison of Platelet indices among Burns groups and control on first and fourth day of admission.

Platelet Indices	Mean value in burns patient				Control Group
	Group A (<30% TBSA)		Group B (>30% TBSA)		
	1st Day	4th Day	1st Day	4th Day	
PLT(X10³cells/cu.mm)	282	304	**217**	**164**	297
MPV(fl)	9.71	9.98	**9.88**	**10.54**	9.54
PDW(fl)	10.64	11.94	11.43	12.21	9.3
PLCR (%)	21.21	21.94	20.39	27.1	19
PCT (%)	0.27	0.3	0.21	0.17	0.28

In group B, the platelet count decreases and Mean Platelet Volume increases on the fourth day of admission. No Significant change observed in group A.
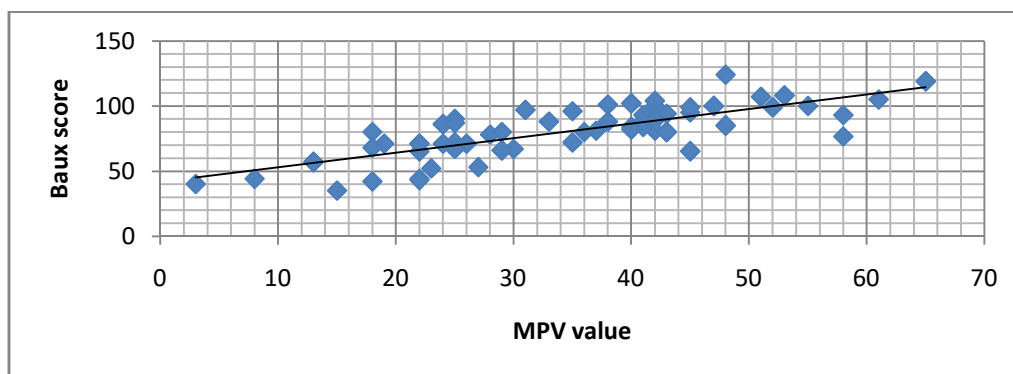

Figure-1: Linear correlation between MPV and Baux score.

Discussion

Burns constitute one of the leading cause of morbidity and mortality in India. It ranks second to road traffic accidents. Several programs aimed at preventing burn injuries through various modalities, as 90% of burns cases are preventable. Still in India, there are about 6-7 million cases of burns happening every year [3]. 10% of these cases are life threatening which requires hospitalization and 50% of those succumb to their injuries.

Burn is a type of skin injury not only caused by heat and chemicals but also by cold, electricity, friction and radiation. The burn injuries are classified into 4 degrees. First degree burn which is also called superficial burn involves only epidermis. Clinically they appear as redness without blisters and disappear spontaneously within few days. Second degree or Partial thickness burns involve epidermis and papillary dermis. Painfull bisters occur and they heal with scarring which takes upto 8 weeks.

Third degree or full thickness burns involve epidermis, papillary and reticular dermis. This is not associated with pain as the nerve endings also damaged. Fourth degree burns involve deeper tissues like muscle, tendon and bones which is associated with poor prognosis. Degree of burns can be predicted clinically and can be confirmed with biopsy of skin [4,5].

The basis behind burn injuries is coagulation of Proteins which results in cell and tissue damage [6]. More than physical disruption, the health hazards in burns are due to functional derangement of skin like loss of sensation, loss of protection against water evaporation, loss of control of body temperature and significant inflammatory response associated especially with larger burns [7,8].

This inflammatory response leads to tissue edema, plasma loss and hypermetabolic state which are associated with increased cardiac output and poor immune function. Hence the treatment of burns patient involve intense volume replacement and prevention of complication of burns.

There are many prognostic factors that determine the outcome of burns which include age, sex, presence of inhalational injuries, bone fractures and comorbid conditions like heart disease and Diabetes Mellitus. The most important prognostic factor followed till now are Total Burn Surface Area (TBSA) and the BAUX scoring system [2]. The BAUX score is calculated by adding TBSA, age and 17.

Many studies aimed at finding new prognostic markers in burns which helps clinician in deciding active treatment and thereby preventing complications. One among them is the hematological changes associated with burns patient.

Baxter and Enrenus showed that the red cells in burns patient have shorter life span and they explained that these changes are due to some plasma factor which influences the peripheral blood phagocytic cells.

Platelets play an important role in burns patient. Thrombocytopenia in burns can be due to consumption of platelet in bacteremia or Disseminated Intravascular Coagulation and is an indicator of impending septicemia. They also produce hemostatic disturbances in burns patient [9].

Platelets can release inflammatory mediators, interact with leukocyte and endothelial cells through their proinflammatory surface molecules, thus has a role in induction of acute and chronic inflammatory response in burns [10].

The tissue damage in burns also release proinflammatory cytokines like IL-6, IL-1b, TNF-α which activates macrophages [11,12]. These cytokines and other acute phase reactants suppress the size of platelets [13]. This explains the importance of Mean Platelet Volume which could reflect the proinflammatory and prothrombotic situation in burns. There is also spontaneous aggregation of platelets immediately after burns [14].

The significance of platelet count as a prognostic factor in burns has been shown by many studies [15]. But studies on Platelet indices in burns patient is limited.

The Platelet indices are calculated by the automatic analyzers. MPV indicates average volume of a single platelet. PDW is the quantity of changes in the size of the platelets. P-LCR indicates the percentage of quantity of large sized platelets. Plateletcrit is the total volume of platelets per unit volume of blood.

The changes in the platelet indices reflect the production of platelets in the bone marrow and also activation of platelets in peripheral blood. In this study group A patients do not show much difference in the platelet indices. But group B patients show significant changes in all platelet indices. MPV, PDW, PCT increases on fourth day indicates platelet activation. BAUX score is a prognostic scoring system, higher values indicate poor prognosis. Mean platelet volume correlates positively with BAUX score thereby indirectly indicating that raising MPV act as poor prognostic factor.

Similar result with correlation between MPV and BAUX score was obtained in study by Sadiye et al [16]. The other platelet indices show no correlation with BAUX score.

Conclusion

Appropriate treatment at appropriate time remains the only thing to reduce burns mortality. Several prognostic and predictive factors have been followed in several institutes which help in timely treatment. Platelet indices which can be easily assessed from simple blood analysis in the automated analyzer can serve as a prognostic factor and predict the severity.

The Significance of Platelet indices from this study

By analyzing 143 Burns patients we found that Platelet count decreases with increasing total Burn Surface area. Mean Platelet Volume correlates linearly with BAUX score. Hence this study shows that decreasing platelet count and increasing MPV in the serial blood test monitoring indicate poor prognosis and the patients should be evaluated further and intense management should be given which can increase the rate of survival of the patients.

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