



## Mean Platelet Volume Levels in Patients With Burn Injury

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### ABSTRACT

**Background:** We aimed to investigate the levels of MPV in adult patients (>16 age) with burn injury who admitted to our emergency service and hospitalised.

**Material Method:** Fifty five hospitalised burn injury patients and a control group of 44 healthy adults were included to our study. MPV levels of the groups were compared.

**Results:** Admission time mean MPV value of patients was  $9.59 \pm 0.78$  and this value for the control group was  $8.47 \pm 1.07$ . MPV was not related with TBSA ( $p > 0.05$ ), mechanism of burn injury ( $p > 0.06$ ), presence of inhalational injury ( $p > 0.05$ ), hospitalisation unit ( $p > 0.05$ ), duration of hospitalisation ( $p > 0.05$ ), presence of infection ( $p > 0.05$ ), dischargement ( $p > 0.05$ ) and surgery requirement ( $p > 0.05$ ), but MPV was related with Baux Score ( $p < 0.05$ ). MPV was related with Hb ( $p < 0.05$ ) but we couldn't find a relation between MPV and WBC ( $p > 0.05$ ) or Plt ( $p > 0.05$ ).

**Conclusion:** Initial admission MPV levels of adult burn injury levels are related with Baux score which is an important scoring system for predicting the severity and the prognosis in burn injured patients and determining MPV levels of burn injury patients may be helpful for emergency doctors in triage of these patients.

**Keywords :** Burn, emergency service, Mean Platelet Volume

### BACKGROUND

Burn injuries are important causes for morbidity and mortality (1,2). 1,25 millions of people admit to the emergency units as a result of burn injury in America (3,4). Nearly 6000 of these burn injured patients are hospitalised (5-7).

An inflammation cascade occurs in burn injured patients. Many cellular elements especially macrophages and cytokines are involved with this process. The level of inflammatory response varies due to severity of disease (8).

A simple parameter of complete blood count (CBC) analyze, Mean platelet volume (MPV) is known as a marker of platelet function and activation (9-12). MPV is related with cardiometabolic risk factors such as obesity, hypercholesterolemia, diabetes, hypertension and arterial stiffness (13-17). And high MPV levels have been reported in cardiovascular diseases (18-20). It is known that MPV is elevated or decreased in some rheumatologic diseases such as Raynaud's phenomenon, systemic sclerosis diseases, Systemic Lupus Erythematosus, Behçet's disease rheumatoid arthritis, ankylosing spondylarthritis, Familial Mediterranean Fever, Acute Rheumatic Fever and osteoarthritis (8,21-26).

### OBJECTIVES

In the present study, we aimed to evaluate the levels of MPV in patients with burn injury for determining the role of MPV in the severity and prognosis of burn injured patients.

### MATERIALS AND METHOD

In this retrospective study, we included burn injured patients who admitted to Şanlıurfa Research and Education Hospital Emergency Department between July 2011 and December 2011. We carried out the patients' data from the hospital automation system. Totally 4309 burn injury patients admitted during six months 425 patients were hospitalised. 370 hospitalised patients were under the age of 17. Other 3884 patients who didn't have indication for hospitalising were discharged from the emergency unit without overlooking laboratory tests. 55 hospitalised adult patients who did not have a chronic disease or active infection were included to our study. We used the Baux scoring system (BSS) to determine the severity of burn injury. The BBS is a system used by clinicians for predicting severity of severe burns (27,28). The calculation Formula is:

**Baux Score = TBSA + age of patient + 17.**

We excluded pediatric burn injury patients because of the differences in Baux score calculation. We also noted age, gender, mechanism of injury, injured TBSA (total body surface area) (by the rule of nines), hospitalisation into burn unit or burn intensive care unit, duration time of hospital stay, result of hospitalisation and CBC (WBC, Plt, MPV, Hb) results of the patients.

We looked for relations between Baux score-MPV, hospitalisation into burn unit or burn intensive care unit-MPV, duration time of hospital stay-MPV and result of hospitalisation-MPV.

A control group of 100 healthy adults from the family medicine polyclinic data was constituted and their CBC results were noted. We compared the CBC results of burn injury patients' and healthy healthy groups. The normal distribution and homogeneity of each parameter was tested by using Shapiro-Wilk test and Kolmogorov Smirnov test. In the patient group Baux score, Hb, MPV values were evaluated with parametric tests. In all test significance level  $p < 0.05$ . SPSS (Statistical Package for the Social Sciences) software 20.0 was used for all analysis.

## RESULTS

38 males (%69.1), 17 females (%30.9) totally 55 burn injured adult patient were included to our study. Mean age of the study group was  $34.13 \pm 17.90$  (min 16, max 88). 24 males (%54.5), 20 females (%45.5) totally 44 participants were included to our study. Mean age of the control group was  $58.2 \pm 10.1$  (min 42, max 79). Most of the patients' (%32.7) TBSA (total body surface area) percentage was under %10 (Table 1). And hot liquid burn (%52.7) was the most common reason (Table 1). 47 patients (%85.5) were hospitalised into the burn unit, and 8 (%14.5) patients were hospitalised into the burn ICU (intensive care unit). 26 (%47.3) patients hospitalised lower than seven days, 17 (%30.9) patients hospitalised between 1-2 weeks, 6 (%10.9) patients hospitalised between 2-4 weeks, 6 patients (%10.9) patients hospitalised more than 4 weeks. Infection occurred in 13 (23.6) patients during hospitalisation. 5 patients (%9.1) became exitus during hospitalisation. 2 (%3.6) patients underwent surgery during hospitalisation. 4 (%7.3) patients had inhalational injury. Admission time mean MPV value of patients was  $9.59 \pm 0.78$  and this value for the control group was  $8.47 \pm 1.07$ . Detailed laboratory results of the groups are given in table 2.

Gender and TBSA ( $p > 0.05$ ), hospitalisation unit ( $p > 0.05$ ), presence of inhalational injury ( $p > 0.05$ ), dischargement ( $p > 0.05$ ), surgery requirement ( $p > 0.05$ ) and presence of infection ( $p > 0.05$ ) were not related, but gender was related with duration of hospitalisation ( $p < 0.05$ ), burn injury mechanism ( $p < 0.01$ ).

MPV is not related with TBSA ( $p > 0.05$ ), mechanism of burn injury ( $p > 0.06$ ), presence of inhalational injury ( $p > 0.05$ ), hospitalisation unit ( $p > 0.05$ ), duration of hospitalisation ( $p > 0.05$ ), presence of infection ( $p > 0.05$ ), dischargement ( $p > 0.05$ ) and surgery requirement ( $p > 0.05$ ), but according to paired sample T test, MPV is related with Baux Score ( $p < 0.05$ ).

MPV was related with Hb ( $p < 0.05$ ) but we couldn't find a relation between MPV and WBC ( $p > 0.05$ ) or Plt ( $p > 0.05$ ).

## DISCUSSION

Elderly patients, patients with high TBSA percentage and inhalation burn injuries are known as high risk patients in burn injury (29). In literature, some studies have been reported about predicting the severity of burn injuries (27,29,30).

Inflammatory response in burn injuries are well known (31-33). Proinflammatory and antiinflammatory processes in burn injured patients have been described in several studies status. Burn injuries causes an increment in the macrophage activity, by increasing the productive capacity for the pro-inflammatory mediators such as IL-1b, IL-6 and TNF-a. (31,33,34).

With the cytokins and other acute phase reactants' levels elevation cause the suppression of the size of platelets by megakaryopoiesis and release of small size platelets from the bone marrow (34). It is known that, large platelets are more active in releasing a variety of pro-inflammatory and thrombotic agents than smaller size platelets, and their demand arises during the acute stage of inflammation. MPV is a reflection

of both proinflammatory and prothrombotic situations, where thrombopoietin and numerous inflammatory cytokines regulate thrombopoiesis. The intensity of systemic inflammation can be viewed as a distinctive factor for classifying conditions associated with large and small-sized circulating platelets (34).

Spontaneous aggregation of platelets is considerably enhanced in the acute period after burn injury has been shown in a study (35). And Goff et al reported about the hypercoagulability, cardiac instability, hyperaggregability, and impaired fibrinolysis in burn injured patients (36).

In our study MPV levels were higher in the burn injury group and this can be explained with the inflammatory and vascular response in patients with burn. MPV was not related with TBSA, mechanism of burn injury, presence of inhalational injury, hospitalisation unit, duration of hospitalisation, presence of infection, dischargement and surgery requirement, but according to paired sample T test, MPV is related with Baux Score.

## CONCLUSION

Initial admission MPV levels of adult burn injury levels are related with Baux score which is an important scoring system for predicting the severity and the prognosis in burn injured patients. High levels of MPV would help emergency service doctors in the triage and evaluation of these patients.

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**Table 1. Distribution of burn injuries according to mechanism and TBSA.**

|           |           | F  |      | M  |      |
|-----------|-----------|----|------|----|------|
|           |           | N  | %    | N  | %    |
| Mechanism | Liquid    | 16 | 94.1 | 13 | 34.2 |
|           | Flare     | 1  | 5.9  | 15 | 39.5 |
|           | Electric  | 0  | 0    | 8  | 21.1 |
|           | Corrosive | 0  | 0    | 1  | 2.6  |
|           | Sun       | 0  | 0    | 1  | 2.6  |
|           | Total     | 17 | 100  | 38 | 100  |
| TBSA (%)  | 0-10      | 5  | 29.4 | 13 | 34.2 |
|           | 10-20     | 4  | 23.5 | 13 | 34.2 |
|           | 20-30     | 6  | 35.3 | 3  | 7.9  |
|           | 30-40     | 1  | 5.9  | 3  | 7.9  |
|           | >40       | 1  | 5.9  | 6  | 15.8 |
|           | Total     | 17 | 100  | 38 | 100  |

**Table 2. Laboratory results of the groups.**

|                         | Burn injury group | Control group     | p        |
|-------------------------|-------------------|-------------------|----------|
| Hb (g/dl)               | $14.80 \pm 2.37$  | $14.39 \pm 3.11$  | $< 0.05$ |
| WBC (/mm <sup>3</sup> ) | $13.59 \pm 6.63$  | $7.35 \pm 1.97$   | $< 0.05$ |
| Plt (/mm <sup>3</sup> ) | $272.69 \pm 82.3$ | $283.93 \pm 80.6$ | $< 0.05$ |
| MPV (fL)                | $9.59 \pm 0.78$   | $8.47 \pm 1.07$   | $< 0.05$ |

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