DÜSTAD
Dünya Sağlık ve Tabiat Bilimleri Dergisi
JOGHENS
Journal of Global Health & Natural Science
ISSN: 2687-637X Yıl: 2021 Cilt: 4 Sayı: 1

Can Changes in Platelet Count, Mean Platelet Volume, and Platelet Distribution Width Be Used to Determine the Post Dural Puncture Headache?

Aydın MERMER[1]

Abdullah CELEP[2]

Mehmet Selçuk ULUER[3]

Abstract: Diagnosing factor for the development of post-dural puncture headache. This article examined a total of 41 patients (19 males, 22 females). The rate of developing a post-dural puncture headache was significantly higher for all patients with platelet distribution width ($p<0.01$). Although the other parameters had no significant values, platelet distribution width had significant differences for post-dural puncture headache..

Keywords: Post dural puncture headache, platelet count, mean platelet volume, platelet distribution width.

Özet: Pıhtılaşma parametrelerinin iltihaplı hastalıkların bir göstergesi olduğu bilinmektedir. Bu parametrelerin dural ponksiyon sonrası baş ağrısının gelişmesinde tanı koyucu bir faktör olabileceğini bulmayı amaçladık. Bu makalede toplam 41 hasta (19 erkek, 22 kadın) incelenmiştir. Trombosit dağılım genişliği yüksek olan tüm hastalarda dural ponksiyon sonrası baş ağrısı gelişme oranı anlamlı olarak daha yüksekti ($p <0.01$). Diğer parametreler anlamlı değere sahip olmasa da trombosit dağılım genişliği, dural ponksiyon sonrası baş ağrısı için önemli farklılıklar gösterdi.

Anahtar Kelimeler: Spinal baş ağrısı, trombosit sayısı, ortalama trombosit hacmi, trombosit dağılım genişliği.

INTRODUCTION

Neuroaxial blocking has numerous advantages over general anesthesia. Being safe, low required dose of drugs, lower cost for patients, no risk of pulmonary aspirations, no age limits are some benefits of neuroaxial blocking. However, some complications have been reported for spinal anesthesia. Post-dural puncture headache (PDPH) is the most frequent complication of these procedures, which is attributed mostly to the excessive leak of cerebrospinal fluid (CSF) from the puncture point leading to intracranial hypotension, associated with a resultant cerebral vasodilatation. (1-3) The incidence of PDPH was reported to be 1-30% (4, 5), with 0%-14.5% incidence rate when small needles are used. (6) In the post-operative period, PDPH remains a bad experience that patients who undergo spinal will never forget throughout their lives. (7) In this sense, it stands before us as an obstacle for patients to return to normal life, especially in the post-operative period (8).

We aimed to find that the practical and cheap parameter may diagnose PDPH by using the coagulation parameters which were platelet count, platelet distribution width (PDW) and mean platelet volüme (MPV).

[1] aydinmer@yahoo.com, 0000-0002-9859-4737
[2] dracelep@hotmail.com
[3] drmehmetselcuk@gmail.com, 0000-0002-5699-8688

METHODS

Our study is a retrospective case study that was performed according to the principles of the Declaration of Helsinki, approved by the ethics committee of Karatay University, Scientific Research Board (Ethics committee decision number: 41901325-050.99). Forty-one patients with a confirmed diagnosed of PDPH were evaluated in this study. These patients were selected to apply to Konya Training and Research Hospital between January 2016 and December 2018.

All of the patients received standart treatment in the our clinic. The inclusion criteria of the study were a diagnonsis of PDPH. Patients were also included that they had to have the hemogram assays were regularly examined; and the standard drug using the current treatment guidelines had been fallowed (9).

The exclusion criteria included the presence of diseases, such as cardiovascular disease, thromboembolic disease that required medication that would affect the bleeding clotting panel, and a lack of assays performed at the specified intervals.

The following data were recorded from the patient by computer registration database: platelet count, platelet distribution width (PDW) and mean platelet volüme (MPV) for PDPH. When the PDPH diagnosis was made, it was scanned and recorded on days. We only assessed the patients who had a normal preoperative values about Plt, PDW and MPV.

Statistical analysis

All statistical analyses were performed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA). One sample t-test was used for inter-group comparisons and Pearson and Spearman correlation tests were used to assess" the correlation between numerical and categorical parameters. A value of $p<0.05$ was considered statistically significant.

RESULTS

Demographic and clinical features

Forty-one patients who diognosed positive for PDPH. Of these patients, 19 were male and 22 were female. The average age of the patients was 34.68±11.15 for male and 35.18±8.30 for female. All of the patients were treated by the drugs which recommended in the guidelines. (9).

Platelet Index Findings

There was a significant difference in the groups in the PDW values for PDPH patients ($p<0.01$), (Figure 1). There was no significant difference for each measurement in all patients in terms of platelet count and MPV values (Table 1). There was a istatistically differences in the platelet count and MPV values, but all of the mean values for the platelet count and MPV were within normal values.

DISCUSSION

In this study, which we conducted in the hope that we could find a new parameter for the diagnosis of PDPH, which remained a bad experience that will not be forgotten throughout their lives in patients with spinal surgery in the post-operative period, we especially recorded an increase in the PDW parameter above normal values. The most effective factor in coagulation, thromboplastin counting, distribution, and width can also be caused by these effects, which led us to conduct this study. There has always been a need for a simple and inexpensive test based on a possible disease rate relationship (10).

As hospitals around the world continue to accept patients with PDPH, the unknown pathogenesis

behind the mechanism is continuining. (11) Many studies, especially intra- operative, have been conducted on the effects of spinal anesthesia before. (12) While there are studies focusing on cognitive functions after general anesthesia in the elderly in terms of the post-operative period, (13) one of the most important causes of discomfort in the post- operative period in patients is PDPH. (8) However, studies regarding the post-operative process and diagnosis of PDPH are limited.

Trombus formation mechanisms are variable. Generally, evidence of viruses suggests that the inflammation of immune and non-immune cells can lead to an imbalance of procoagulant and anticoagulant conditions during infection. The risk of hematopathology is standard, as it plays an essential role in endothelial homeostasis regulation, and its structure is impaired in viral infections. In addition, the Von Willebrand factor, toll-like receptor activation, and tissue factor pathway activation caused by viral infection may play a role in the following clotting cascade leading to the formation of cross-linked fibrin clots (14). The breakdown of these clots according to the physiological response to the excessive activation of the clotting cascade is responsible for procoagulant D-dimer increases. With the antigen effect, platelets are activated, coordination WBC is ensured for pathogen clearance and clot formation occurs. Immune cells, platelets, and endothelial cells, therefore, all play a role in the clothing mechanism related to viral infections (15). So we conclude that coagulation parameters can determine the inflamation situations like PDPH.

In our study, the effects of the coagulation mechanism on platelet parameters in terms of platelet count, MPV, and PDW values were examined. Although there are numerical changes in all these parameters, a statistically significant difference was only found in relation to the PDW values ($p=0.01$).

In another study (16), the relationship between MPV, PDW, other acute phase reactants and radiological pulmonary tuberculosis was investigated. One hundred patients with pulmonary tuberculasis (Group 1), 50 patients with community-acquired pneumonia (Group 2), and 28 healthy control individuals (Group 3) were included in this analytical study. When the results were evaluated, WBC, erythrocyte sedimentation rate, CRP, PLT, and PCT values are both in Group 1 and Group 2 compared to Group 3, PDW values are in Group 1. This difference was found to be significantly higher than Group 3. This study shows that reactively higher PDW in pulmonary tuberculosis often develops. Similarly, in our study, the most numerical changes in intensive care patients were seen in the first measurement of the PDW values. Moreover, meaningfulness was found with a repeated measure ANOVA test. In addition to a significant difference as indicated by ROC analysis. The ROC analysis was our purpose to evaluate as a diagnostic tool. Still, a considerable area could be determined on the diagonal curve for PDW values(AUC= 0.407), although the AUC value was relatively low.

When the limitations related to our study were evaluated,we deduced that the number of patients included in the study could have been higher. The reason for the limited number of patients was the evaluation of two-years evaluation period, as well as the condition that the PDPH patients were diagnosed, as well as requiring the standard application of medication per the current treatment guidelines was another reason for the low number of patients included in our study.

CONCLUSIONS

Although all the platelet indexes did not have a specific value for early recognition of the severity of PDPH, the PDW values did have a higher value. This study found that the PDW parameters can be used as a new reference in future studies for the diagnosis of PDPH.

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Tables

Table 1. Distribution of demographic variables and coagulation parameters in Post-dural puncture headache patients (PDPH).

PDPH Patients	
Age (years)	34.95 ± 9.60
Gender (n*)	19 m**/22f***
Plt (10^3/mm^3) measurements	245.02 ±62.03
MPV (μm^3) measurements	10.48 ±0.80
PDW (%) measurements	12.62 ±1.89

*n: number of the patients, **m: male, ***f: female

Figures

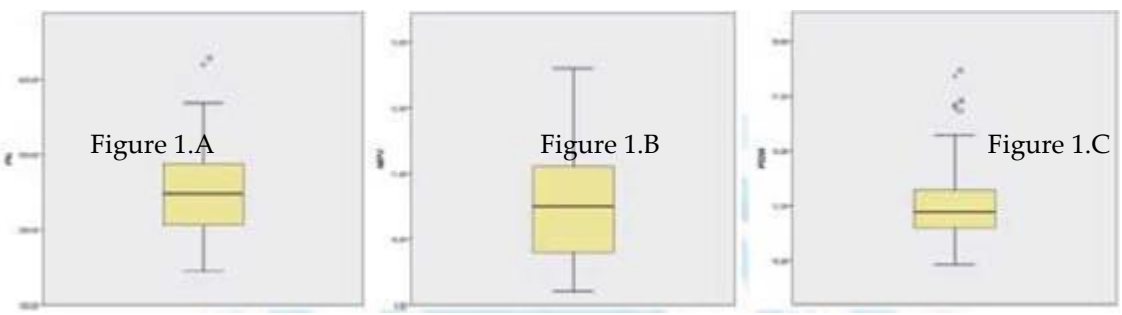

Figure 1.A. Distribution of platelet count, boxplot graphic, Figure **1.A.** Distribution of Mean platelet volüme, boxplot graphic, Figure 1.C. Distribution of platelet distribution width, boxplot graphic.