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Reliability of Platelet Indices for Diagnosing Pulmonary Embolism; a Brief Report

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Abstract

Introduction: Early diagnosis of pulmonary thromboembolism (PTE) is crucial in clinical medicine. Many para-clinical measurements are used to diagnose PTE.

Objective: The present study was conducted to evaluate platelet indices in terms of diagnosing PTE.

Methods: The present case-control study was conducted between May 2015 to July 2016 with 173 patients suspected of PTE in the emergency wards of Shahid Madani Hospital and Imam Reza Hospital affiliated to Tabriz University of Medical Sciences, Iran. The patients' platelet indices were checked upon admission and they were evaluated in terms of diagnosing PTE. Platelet indices included mean platelet volume (MPV), platelet distribution width (PDW) and plateletcrit (PL-CR). PTE was diagnosed in 125 out of the 173 patients. Platelet indices were also compared between two groups.

Results: No statistically significant differences were observed between the two groups in term of demographic variables ($p>0.05$). MPV was found to be 10.38±8.59 in the case group and 9.46±1.11 in the controls ($p>0.05$). PDW was also found to be 12.86±5.57 in the case group and 12.32±2.48 in the controls ($p>0.05$). Moreover, PL-CR was found to be 22.59±7.32 in the case group and 21.97±8.16 in the controls ($p>0.05$).

Conclusion: According to the obtained results, platelet indices do not increase in PTE. They cannot be therefore used to diagnose PTE in suspected patients.

Key words: Blood Platelets; Correlation of Data; Diagnosis; Pulmonary Embolism

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INTRODUCTION

PTE is a life threatening condition with a mortality of 25%-30%; nevertheless, the mortality can be decreased to 2%-8% if the disease is properly diagnosed (1). The main symptoms of this disease include respiratory distress, chest pain, lower arterial blood oxygen saturation, tachypnea and tachycardia (2). Although pulmonary artery angiography constitutes a gold standard for diagnosing PTE, other para-clinical techniques such as simple chest x-rays, electrocardiogram, arterial blood gas (ABG) test, color Doppler ultrasonography, ventilation/perfusion scan, CT pulmonary angiography (CTPA) and D-dimer test can be used (3). Research suggests that platelet activation plays a key role in patients with thrombotic problems, and the platelet activation process in PTE has been reported. An increase in MPV is a predictor factor for venous thromboembolism (VTE) with an unknown origin (4). Alidaei N. et al. found MPV to increase in PTE, and proposed a simple test to use in PTE patients (5). Song JE. et al. found high levels of platelets during chemotherapy to be a risk factor for PTE in cancer patients (6). Given that platelets play a key role in developing thrombosis, variations in platelet indices appear to be effective in forming or intensifying the coagulation process and thromboembolism in patients with PTE, and platelet indices can be used to diagnose PTE (5). Given the possibility of platelet activation in the incidence of VTE, the present study was conducted to evaluate the diagnostic value of platelet indices in patients with PTE.

METHODS

Study design and participants

The present case-control study was conducted from May 2015 to July 2016 with 173 patients suspected of PTE with a complaint of chest pain presenting to Shahid Madani Hospital and Imam Reza Hospital affiliated to Tabriz University of Medical Sciences, Tabriz, Iran. The minimum sample size was calculated as 43 in each group using G*Power with $\alpha=0.05$, $\beta=0.95$ and a

confidence interval of 0.95, while primary MPV data were obtained from the study of Alidaei N. (PTE group: 10.57±1.08 fl and control group: 9.80±0.86 fl) (5). The inclusion criterion comprised an acute dyspnea score of over 3 based on the Wells' criteria. The exclusion criteria consisted of having a history of blood diseases, i.e. myeloproliferative disorder and idiopathic thrombocytopenic purpura (ITP), hypothyroidism, pulmonary embolism and DVT, kidney failure, obesity (BMI>30) and rheumatic diseases, i.e. ankylosing spondylitis and rheumatoid arthritis. Convenience sampling was used to select the subjects. The present study was approved by the Ethics Committee of Tabriz University of Medical Sciences.

Data Gathering

After performing the primary evaluation of the eligible patients, blood samples were collected, and platelet indices were examined using an automated hematology analyzer (made in Japan). The patients were then admitted and evaluated for PTE. All the patients also underwent CT angiography (Siemens, Germany, 64 slices) of pulmonary arteries, and the reports were provided by a faculty member of Tabriz University of Medical Sciences as the radiologist. The patients were then divided into a case group comprising 125 patients with PTE and a control group comprising 48 patients without PTE.

Statistical analysis

The data collected were analyzed in SPSS-16. Furthermore, descriptive tests were used to describe the data. The Kolmogorov-Smirnov test was also used to investigate the distribution normality of the data, and the independent t-test to compare the quantitative data, and the Chi-squared test to compare the qualitative data. P<0.05 was set as the level of statistical significance.

Results

Out of 173 patients with dyspnea and suspected of PTE, 125 were diagnosed with PTE. No significant relationships were observed between the two groups in terms of gender, age and BMI (Table 1). Table 2 compares platelet indices between the two groups. Given the lack of any statistically significant differences between the two groups in term of platelet indices, the receiver operator curve (ROC) was not applicable to determining the sensitivity, specificity and cut off point of MPV, PDW and PL-CR for the diagnosis of PTE.

Discussion

As a serious disease in emergency wards, PTE constitutes the cause of 100,000 deaths in the US (7, 8). Given its high mortality and potential complications, the prompt diagnosis and treatment of this disease is crucial (9).

Research suggests an increase in MPV and PDW levels in PTE and the need for the use of MPV for diagnosing PTE (9). In addition, MPV and PDW can be used to determine the intensity of pulmonary embolism (10). Studies have shown that thrombocytosis is tightly related to the increased risk of acute symptomatic PTE, and helps with the prediction of its mortality and severity (11).

According to Icli A. et al., MPV increases in patients with deep vein thrombosis (DVT), and high levels of MPV can predict the risk of PTE in these patients (12). Yardan T. et al. showed that MPV and MPV/platelet ratio are associated with the intensity of the clinical symptoms of PTE, and that lower rates of MPV and MPV/platelet ratio are related to lower risks of PTE (13). Huang J. et. al. found that MPV and PDW levels are significantly higher in patients with PTE, and that using MPV combined with D-Dimer helps diagnose PTE (9).

In contrast to the references cited, the present research did not suggest statistically significant differences between the patients with PTE and those without this condition in term of platelet indices, and did not observe any increases in PDW,

Table 1: The comparison of demographic variables between the two groups

Variable	Case (n=125)	Control (n=48)	p
Gender			
Male	66 (52.8%)	20 (41.6%)	>0.05
Female	59 (47.2%)	28 (58.4%)	
Age (year)	59.85±16.53	60.66±23.88	>0.05
Body mass index	26.12±2.52	26.26±3.26	>0.05

Table 2: The comparison of platelet indices in case and control groups

Variable	Case (n=125)	Control (n=48)	p
Platelet count	242486.49±106885.75	253192.31±127185.53	>0.05
MPV	10.38±8.59	9.46±1.11	>0.05
PDW	12.86±5.57	12.32±2.48	>0.05
PL-CR	22.59±7.32	21.97±8.16	>0.05

MPV: mean platelet volume; PDW: Platelet distribution width; PL-CR: plateletcrit

PL-CR and MPV in the patients with PTE; A significant increase in MPV and a decrease in the number of platelets have been reported in literature (8).

Conclusions

In contrast to previously-conducted studies, the present findings suggest that platelet indices do not increase in patients with PTE. These findings are recommended to be evaluated by conducting further research with larger sample sizes.

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Authors' contribution

All the authors have read and approved the manuscript. FR, PM, SG and SF performed data collection, writing, critical revision and drafting of the manuscript. KSN undertook the major parts of the study design and performed statistical analysis, data analysis and data interpretation.

Conflict of interest

The authors declare no conflicts of interest regarding the publication of the present article.

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