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Mean Platelet Volume and Cancer-Associated Deep Vein Thrombosis

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Abstract

Background: Deep vein thrombosis (DVT) is a common and serious complication in cancer patients, primarily driven by malignancy-induced hypercoagulability and systemic inflammation. Mean platelet volume (MPV), a hematological parameter reflecting platelet activation and inflammatory status, has been proposed as a potential marker for thromboembolic risk stratification in oncology. ***Objective:*** This retrospective study aimed to assess the association between MPV and DVT in patients with underlying cancer. ***Methods:*** We analyzed MPV levels in a cohort of 102 patients diagnosed with DVT, including 18 individuals with active malignancy. ***Results:*** Although MPV values were slightly elevated in cancer patients compared to non-cancer patients, the difference did not reach statistical significance ($p = 0.86$). ***Conclusion:*** Our findings suggest that MPV is not a reliable biomarker for cancer-associated DVT. Further studies exploring alternative hematological and inflammatory markers are warranted to improve risk assessment in this high-risk population.

Keywords: mean platelet volume, deep vein thrombosis, cancer, biomarkers, thrombosis, inflammation

1. Introduction

Cancer-associated deep vein thrombosis (DVT) is a major clinical challenge due to its high incidence and significant impact on morbidity and mortality (Lee AY & Levine MN., 2003). The pathophysiology of cancer-related thrombosis is multifactorial, involving a complex interplay between tumor-induced hypercoagulability, endothelial dysfunction, and systemic inflammation (Rickles FR & Edwards RL., 1992). Early identification of patients at high risk for thrombotic events is crucial to optimizing preventive strategies and improving clinical outcomes.

Mean platelet volume (MPV), a routinely available parameter in complete blood counts, serves as an indicator of platelet size and activity, both of which are closely linked to inflammation and thrombogenesis (Yilmaz S, Kaya MG, Demir T, et al., 2018). Elevated MPV levels have been associated with an increased risk of thrombotic events, including venous thromboembolism (VTE), in various clinical settings (Spyropoulos AC, Levy JH & Ageno W., 2016). However, its specific role in differentiating cancer-associated DVT from other etiologies remains unclear. This study aims to evaluate whether MPV could serve as a potential biomarker for the diagnosis or risk stratification of DVT in patients with underlying malignancies.

2. Materials and Methods

2.1 Study Design and Population

This retrospective observational study included 102 adult patients diagnosed with DVT at our institution between January 2018 and December 2021. Patients were divided into two groups: those with active cancer (n =

18) and those without cancer (n = 84). Active cancer was defined as any malignant disease requiring treatment or follow-up during the study period. Cancer diagnosis preceded or coincided with DVT onset.

2.2 Data Collection

Demographic data, medical history, laboratory parameters, and imaging results were extracted from electronic health records. MPV values were recorded within one month of DVT diagnosis. Other variables included age, sex, body mass index (BMI), comorbidities, and cancer type.

2.3 Statistical Analysis

Data was analyzed using SPSS version 21.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Differences between groups were assessed using Student's t-test for continuous variables and chi-square tests for categorical variables. A p-value < 0.05 was considered statistically significant.

3. Results

3.1 Description of the Study Population (Table 1)

This study included a total of 102 patients diagnosed with deep vein thrombosis (DVT). Among these, 18 patients had active cancer, while 84 did not have any malignancy.

The mean age of the entire cohort was 63.5 ± 12.7 years, with no significant difference between the cancer and non-cancer groups (p = 0.67). The majority of patients were male (52.9%), and there was no significant gender disparity between the two groups (p = 0.81). Body mass index (BMI) also showed no significant difference between the cancer and non-cancer groups (p = 0.78).

Regarding cancer types, pelvic cancers were the most common (n = 5, 27.8%), followed by hematological malignancies (n = 5, 27.8%), gastrointestinal cancers (n = 3, 16.7%), and lung cancers (n = 2, 11.1%).

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3.2 Mean Platelet Volume (MPV) Analysis (Table 2)

The mean MPV values were compared between patients with and without cancer. As shown in Table 2, the mean MPV in the cancer group was 8.25 ± 0.88 fL, while it was 8.33 ± 1.21 fL in the non-cancer group. Despite a slight numerical difference, this variation was not statistically significant (p = 0.86).

As demonstrated in Table 2, the comparison of MPV levels between the two groups revealed no statistically significant difference. Also, the analysis of different cancer subgroups did not reveal any statistically significant differences in Mean Platelet Volume (MPV) compared to the control group (patients without cancer). Specifically, the MPV values observed for pelvic cancers (8.28 ± 0.69 fL), hematological malignancies (8.30 ± 1.05 fL), lung cancers (8.25 ± 1.46 fL), and gastrointestinal cancers (8.65 ± 1.9 fL) were not significantly different from those of the non-cancer group (8.33 ± 1.21 fL), with p-values of 0.92, 0.95, 0.98, and 0.37, respectively. These findings suggest that MPV may lack specificity as a biomarker for distinguishing between DVT associated with specific types of cancer and DVT in patients without cancer.

Table 1. Descriptive Characteristics of the Study Population

VARIABLE	TOTAL (N=102)	WITH CANCER (N=18)	WITHOUT CANCER (N=84)	P-VALUE
Age (years), mean ± SD	63.5 ± 12.7	65.3 ± 13.1	63.1 ± 12.5	0.67
Male, n (%)	54 (52.9%)	10 (55.6%)	44 (52.4%)	0.81
BMI (kg/m²), mean ± SD	27.8 ± 4.3	28.1 ± 4.7	27.7 ± 4.2	0.78
Cancer Types, n (%)				
- Pelvic cancers		5 (27.8%)		
- Hematological malignancies		5 (27.8%)		
- Gastrointestinal cancers		3 (16.7%)		
- Lung cancers		2 (11.1%)		

Table 2. Statistical Comparison of Mean Platelet Volume (MPV)

VARIABLE	WITH CANCER (N=18)	WITHOUT CANCER (N=84)	P-VALUE
MPV (fL), mean ± SD	8.25 ± 0.88	8.33 ± 1.21	**0.86**

4. Discussion

Our study investigated the potential role of mean platelet volume (MPV) as a biomarker for cancer-associated deep vein thrombosis (DVT). Although we observed a slight increase in MPV levels among patients with malignancies, this difference did not reach statistical significance. These findings are consistent with previous studies suggesting that MPV alone lacks sufficient specificity and sensitivity to reliably distinguish cancer-associated thrombosis from other causes (Zhang L, Wang H, Li X, et al., 2020).

Several factors may account for these results. First, MPV is influenced by a wide range of physiological and pathological conditions, including systemic inflammation, infections, cardiovascular diseases, and hematological disorders (Bode C & Greinacher A., 2007). These confounding factors may obscure its potential utility as a standalone marker for cancer-related thrombosis. Second, the relatively small sample size of our cancer subgroup may have limited our ability to detect statistically significant differences. Larger, well-powered prospective studies are required to confirm these observations and further explore the clinical implications of MPV in this context.

Given these limitations, a multimodal approach incorporating MPV alongside other biomarkers may enhance its predictive value. For instance, D-dimer and C-reactive protein (CRP), both of which are well-established indicators of coagulation activation and systemic inflammation, have shown promise in improving thrombotic risk stratification (Liu Y, Zhao J, Chen J, et al., 2021). A recent meta-analysis highlighted the potential of composite scoring systems integrating multiple inflammatory and hemostatic parameters to refine risk assessment in oncology patients (8). Future research should focus on developing and validating such predictive models to optimize early detection and management strategies for cancer-associated thrombosis.

5. Conclusion

MPV does not appear to be a reliable biomarker for differentiating cancer-associated DVT from other forms of venous thrombosis. While it reflects general inflammatory and thrombotic tendencies, its lack of specificity limits its clinical applicability. Further investigations into alternative or combined biomarkers are essential for advancing personalized medicine approaches in oncology and hematology.

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