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Original Article

Thrombocytopenia and Its Impact on Bleeding Risk During Chemotherapy Port Placement: A Comparative Study

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Background: Thrombocytopenia, a common complication in cancer patients receiving chemotherapy, poses significant challenges during medical procedures—particularly central venous port placement because of the increased risk of bleeding.
Materials and Methods: This study included 100 cancer patients undergoing chemotherapy port placement, divided into two groups: 50 with thrombocytopenia (platelet count <150,000/μL) and 50 without. Bleeding complications were evaluated and compared between groups. Laboratory parameters, including platelet counts and coagulation profiles, were analyzed, and statistical comparisons were performed using chi-square and t-tests.
Results: The incidence of bleeding complications was significantly higher in the thrombocytopenic group (12%) compared with the non-thrombocytopenic group (2%) ($p = 0.050$). Hematoma formation occurred in 4% of patients, more frequently in the thrombocytopenic group (6%) than in the non-thrombocytopenic group (2%), although this difference was not statistically significant ($p = 0.307$). Ecchymosis was observed in 3% of patients, all within the thrombocytopenic group ($p = 0.079$). Patients with severe thrombocytopenia (platelet count <50,000/μL) demonstrated a significantly increased risk of active bleeding, with a notable association between platelet count and bleeding events ($p = 0.034$).
Conclusion: Thrombocytopenic patients especially those with severe thrombocytopenia are at increased risk of bleeding during chemotherapy port placement. The use of ultrasound-guided techniques, combined with appropriate preoperative management strategies, can effectively reduce this risk.

Keywords: Thrombocytopenia, chemotherapy, port placement, bleeding complications, platelet count, cancer patients.

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Introduction

Chemotherapy port placement is an essential procedure for cancer patients requiring long-term intravenous therapy, as it provides reliable and durable vascular access. Many patients develop poor peripheral venous access after repeated chemotherapy cycles, making central venous access indispensable for continued treatment (1). However, a considerable

proportion of oncology patients also develop thrombocytopenia, either as a result of chemotherapy-induced bone marrow suppression, direct malignant infiltration of the marrow, disseminated intravascular coagulation, or the use of certain drugs (e.g., heparin) (2, 3).

This situation raises a critical clinical question: Does thrombocytopenia significantly increase the risk of hemorrhagic complications following port placement, and should it be considered a contrain-dication to the procedure? Managing thrombocytopenia in this context presents further challenges. Although platelet transfusion is a possible intervention, it is not always readily available and may not provide sustained hemostatic stability, particularly in patients with persistent marrow suppression (4). Moreover, routine platelet transfusions carry risks such as alloimm-unization, transfusion reactions, and volume overload, which limit their widespread use (5).

Given the essential role of chemotherapy ports in cancer care, it is crucial to clarify whether thrombocytopenia necessitates strict transfusion-based correction before port placement, or whether ports can be safely inserted with appropriate precautions despite low platelet counts. Although theoretical concerns exist regarding increased bleeding risk, real-world data on hemorrhagic complications in thrombocytopenic cancer patients undergoing port placement remain limited and inconsistent. Some studies suggest that ports can be safely placed, even in patients with severe thrombocytopenia, when performed under ultrasound and fluoroscopic guidance (6–8).

While some clinicians advocate for preprocedural platelet transfusion to reduce bleeding risk (7, 9, 10), definitive evidence to guide clinical decision-making is lacking. This study aims to address this gap by evaluating the incidence and severity of both acute and delayed hemorrhagic complications following chemotherapy port placement in thrombocytopenic cancer patients. By assessing whether thrombocytopenia independently increases bleeding risk and determining the necessity of platelet correction strategies, we aim to establish a more evidence-based approach to port placement in this high-risk population.

Materials and methods

This prospective observational study was conducted between 2024 and 2025. A total of 100 adult cancer patients (≥18 years) requiring chemotherapy port placement were enrolled and divided into two groups: 50 with thrombocytopenia (platelet count <150, 000/μL) and 50 without (platelet count ≥150,000/μL).

All patients underwent ultrasound-guided internal jugular vein port placement under local anesthesia (1% lidocaine), with catheters inserted using the Seldinger technique and positioned in the anterior chest wall. Exclusion criteria included severe coagulopathy (INR >1.5 or APTT >1.5× normal), therapeutic anticoag-ulation at the time of port placement, active major bleeding, a history of severe bleeding disorders, and loss to follow-up within one month. Hemorrhagic complications were evaluated both during hospitalization and at one-month follow-up. Recorded complications included ecchymosis at the port insertion site, mild hematoma (localized swelling with minimal bleeding not requiring intervention), severe hematoma (significant swelling or blood accumulation neces-sitating medical intervention such as compression, transfusion, or port removal), and prolonged bleeding from the insertion site. Bleeding severity was assessed using the grading scale previously described by Zeidler et al. (11), classified into five grades as follows:

Grade 0: No bleeding.

Grade 1: Oozing or bleeding controlled with <20 minutes of manual compression.

Grade 2: Bleeding requiring minor interventions, such as prolonged manual compression (>20 minutes).

Grade 3: Bleeding requiring radiologic or elective surgical intervention, or red-cell transfusion, without hemodynamic instability.

Grade 4: Bleeding accompanied by severe hemodyn-amic instability defined as a decrease of >50 mmHg or >50% in systolic or diastolic blood pressure, with tachycardia (heart rate increase >20% for ≥20 minutes) resulting in increased red-cell transfusion or death.

All statistical analyses were conducted using SPSS version 23. Continuous variables are presented as mean ± standard deviation (SD) and compared using the independent t-test. Categorical variables are

expressed as frequencies and percentages and analyzed using the chi-square test or Fisher's exact test, as appropriate. Logistic regression analysis was performed to identify factors associated with hemorrhagic complications. A p-value <0.05 was considered statistically significant. The study was approved by the Ethics Committee of # (Approval No. IR.MUBABOL.REC.1403.021).

All ethical guidelines were strictly followed, and informed consent was obtained from all participants after they received a detailed explanation of the study.

Results

A total of 100 cancer patients undergoing chemotherapy port placement were included, with 50 patients each in the thrombocytopenic and non-thrombocytopenic groups. The mean age of participants was 50.49 ± 12.40 years, with females comprising 69% of the cohort. There was no significant age difference between the non-thrombocytopenic group (50.46 ± 11.17 years) and the thrombocytopenic group (50.52 ± 13.64 years; p = 0.981). Hemorrhagic complications were more frequent in the thrombocytopenic group. Overall, active bleeding occurred in 7% of patients, with a significantly higher incidence in the thrombocytopenic group (12%) compared to the non-thrombocytopenic group (2%) (p = 0.050).

The severity of bleeding varied, with 2% of patients experiencing mild bleeding (Grade 1), 4% moderate bleeding (Grade 2), and 1% severe bleeding (Grade 3). Hematoma formation occurred in 4% of patients, more frequently in the thrombocytopenic group (6%) than in the non-thrombocytopenic group (2%), though this difference was not statistically significant (p = 0.307). Ecchymosis was observed in 3% of patients, all within the thrombocytopenic group (p = 0.079) (Table 1).

No platelet transfusions were administered before or after the procedure, and all bleeding complications were effectively managed with appropriate packing and re-suturing of the skin. Laboratory analysis showed that patients in the thrombocytopenic group had significantly lower platelet counts (p < 0.001), lower hemoglobin levels (p = 0.023), shorter prothrombin time (p < 0.001), and shorter activated partial thromboplastin time (p = 0.000) compared to the non-thrombocytopenic group, while INR levels did not differ significantly (p = 0.139) (Table 2).

Table 1. Comparison of Hemorrhagic Complications Between the Groups

Complication	Non-Thrombocytopenic (n=50)	Thrombocytopenic (n=50)	p-value
Ecchymosis (n=3)	0 (0%)	3 (6.0%)	0.079
Hematoma (n=4)	1 (2.0%)	3 (6.0%)	0.307
Active Bleeding (n=7)	1 (2.0%)	6 (12.0%)	0.050

Table 2. Comparison of Laboratory Parameters Between the Groups

Parameter	Non-Thrombocytopenic (Mean ± SD)	Thrombocytopenic (Mean ± SD)	p-value
Platelet Count (PLT) (cells/µL)	254,000 ± 54,847	119,380 ± 26,337	<0.001
Hemoglobin (HB) (g/dL)	11.08 ± 1.48	10.50 ± 0.98	0.023
Prothrombin Time (PT) (seconds)	12.18 ± 0.36	11.53 ± 0.47	<0.001
Partial Thromboplastin Time (PTT) (seconds)	29.66 ± 2.58	27.24 ± 1.89	0.000
INR	1.004 ± 0.02	1.062 ± 0.09	0.139

Table 3: Association Between Platelet Count Categories and Active Bleeding

Platelet Count Category	Total Patients (n, %)	No Bleeding (n, %)	Active Bleeding (n, %)	p-value
Normal (>150,000)	50 (50.0%)	49 (98.0%)	1 (2.0%)	Reference

Mild Thrombocytopenia (100,000 - 150,000)	41 (41.0%)	37 (90.2%)	4 (9.8%)	0.037
Moderate Thrombocytopenia (50,000 - 100,000)	7 (7.0%)	6 (85.7%)	1 (14.3%)	0.035
Severe Thrombocytopenia (10,000 - 50,000)	2 (2.0%)	1 (50.0%)	1 (50.0%)	0.016
Chi-square Test				0.034

There was a significant association between platelet count and the occurrence of active bleeding (p =0.034), with patients having severe thrombocytopenia (PLT <50,000/µL) exhibiting a markedly higher risk of bleeding than those with normal or mildly reduced platelet counts (Table 3).

Discussion

Thrombocytopenia remains a critical concern in patients undergoing invasive procedures, as it is associated with an increased risk of bleeding complications (12). However, the extent to which thrombocytopenia directly contributes to bleeding during procedures such as central venous catheter or chemotherapy port placement remains debated. Several studies have investigated this relationship, yielding variable results. In observational studies of patients with platelet counts below 50,000/µL, bleeding incidence ranged from 0% to 32% (13). Nevertheless, most of these studies reported predominantly minor complications-such as local hematomas or oozing-that were easily managed with routine interventions, including manual compression or simple bandage changes (14–16).

Notably, many of these studies lacked a control group, limiting the ability to draw definitive conclusions about the true impact of thrombocytopenia on bleeding risk. Interestingly, several reports documented no major bleeding events even when thrombocytopenia was not corrected prior to the procedure. This included cases with platelet counts below 50,000/µL, where prophylactic platelet transfusions were not administered, yet no significant hemorrhagic complications occurred. Some studies found no direct correlation between low platelet counts and minor bleeding, while others identified thrombocytopenia as a risk factor for localized bleeding, such as hematomas or oozing (11, 13, 17). These findings suggest that thrombocytopenia, even at very low platelet levels, does not necessarily lead to major bleeding but may increase the likelihood of minor, self-limiting complications. Consistent with this, our study observed a higher rate of bleeding complications in the thrombocytopenic group compared to the non-thrombocytopenic group, aligning with previous reports showing a modest increase in bleeding incidence among thrombocytopenic patients.

It is important to note that, although the difference in bleeding incidence between groups was statistically significant, the overall rate of serious bleeding events in our study remained low. Most bleeding complications were minor and easily managed with routine interventions. This is consistent with the findings of Keulers et al., who reported no significant bleeding complications in patients with severe thrombocytopenia when platelet transfusions were administered before and during the procedure (18). In contrast, our study did not use preoperative or intraoperative platelet transfusions, yet the overall complication rate remained low. This suggests that, while platelet transfusions may provide additional benefit in select cases, the procedural technique itself may be more critical in minimizing bleeding risk. Ultrasound-guided port placement, as used in our study, enhances accuracy and reduces the likelihood of multiple needle insertions, which are known to increase bleeding risk. Previous studies have consistently demonstrated that ultrasound guidance reduces complications in similar procedures, particularly among thrombocytopenic patients, by facilitating a single venipuncture and precise catheter placement with a guidewire (6, 19).

Given the low incidence of major bleeding events observed in our study, even among thrombocytopenic patients, it can be concluded that while bleeding risk is

slightly elevated, it remains manageable. This low complication rate likely reflects the combination of skilled procedural technique, particularly by experienced interventionalists or vascular surgeons, and the use of ultrasound guidance, which together help minimize bleeding risk in thrombocytopenic patients (20).

In conclusion, our study indicates that thrombocytopenia may slightly increase the risk of bleeding complications during chemotherapy port placement; however, these complications are generally minor and manageable with standard interventions. The modestly higher incidence of bleeding in the thrombocytopenic group aligns with the expected effects of low platelet counts. Importantly, the overall low rate of serious hemorrhagic events suggests that, with proper techniques-particularly ultrasound guidance-bleeding risks can be effectively minimized. While platelet transfusions may be beneficial in select cases, precise procedural technique appears to be the most critical factor in ensuring safety for thrombocytopenic patients. Further studies with larger sample sizes are warranted to better define the role of preoperative platelet transfusion and optimize management strategies in this population.

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