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ORIGINAL ARTICLE

Effect of Preprocedural Thrombocytopenia on Prognosis After Percutaneous Coronary Intervention

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Abstract

Objective: To assess early and late outcomes, including bleeding, in patients with thrombocytopenia undergoing percutaneous coronary intervention (PCI).

Patients and Methods: We performed a retrospective single-center study of patients with preprocedural thrombocytopenia (platelet count ≤100,000/μL; n=204) undergoing PCI between 2003 and 2015. Inhospital and late outcomes were compared with those of a matched control group without thrombocytopenia (n=1281).

Results: The most common causes of thrombocytopenia were liver disease, immune-mediated disease, and hematologic malignant neoplasms. Inhospital bleeding events after PCI were similar in patients with thrombocytopenia and matched controls (24 of 146 [16.4%] vs 179 of 1281 [14.0%]; *P*=.40) and were largely classified as minor using the Bleeding Academic Research Consortium (BARC) classification (89% BARC 1 or 2). There was no significant difference in inhospital death (4 of 146 [2.7%] vs 71 of 1281 [2.0%]; *P*=.56), but patients with thrombocytopenia had higher rates of platelet and red blood cell transfusion (18 of 146 [12.3%] vs 93 of 1281 [7.2%]; *P*=.05). During long-term follow-up, Kaplan-Meier estimated rates of bleeding events (BARC ≥2) were higher for thrombocytopenia (at 5 years, 7.9% vs 3.6%; *P*=.03). Patients with thrombocytopenia had a similar risk of long-term cardiac mortality, but significantly higher rates of noncardiac mortality (at 5 years, 28% vs 21%; *P*=.02).

Conclusion: This study suggests that short-term outcomes after PCI in patients with thrombocytopenia were favorable. On long-term follow-up, thrombocytopenia was associated with a higher risk of long-term noncardiac mortality and bleeding.

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Bleeding is a common complication of percutaneous coronary intervention (PCI) and has been shown to be associated with increased morbidity, mortality, and health care costs.[1,2] Studies[3-5] in various patient cohorts have indicated that thrombocytopenia confers a higher risk of bleeding in patients undergoing invasive procedures and that bleeding risk is inversely proportional to platelet count and function.

Percutaneous coronary intervention requires prolonged use of dual antiplatelet agents postprocedure for at least 1 month after bare metal stent implantation and 12 months after drug-eluting stent (DES) implantation. These agents reduce platelet aggregation and function. Thrombocytopenia in the setting of PCI has been associated with a higher frequency of bleeding, ischemic complications, and higher mortality.[6-15] However, this evidence was derived from studies in patients with acquired thrombocytopenia after pharmacological treatment in the context of acute coronary syndromes, rather than patients with preexisting thrombocytopenia.

There are limited data on the outcome of patients with preexisting thrombocytopenia who undergo PCI. Cardiologists confronted with thrombocytopenia may be more reluctant to implant stents because of the perception of higher bleeding risk either after the procedure

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or during the subsequent period of dual antiplatelet therapy.

We therefore performed a retrospective case-cohort study to determine the safety of PCI in patients with preexisting thrombocytopenia and assessed whether thrombocytopenia was associated with a higher risk of short- and long-term adverse outcomes after PCI to help guide decision making in this cohort.

PATIENTS AND METHODS

After Mayo Clinic Institutional Review Board approval, we performed a retrospective single-center study of patients who underwent PCI between January 1, 2003, and April 30, 2015. Over this period, 17,652 PCI procedures were performed at our institution in patients who consented for the use of their records for research purposes. For patients with multiple PCI procedures, only the first PCI in the time period was included, leaving 17,165 patients for analysis. All patients undergoing PCI at Mayo Clinic in Rochester, Minnesota, are prospectively entered into a database registry. This database was used to obtain baseline demographic data, clinical data, clinical presentation, PCI procedural data, and postintervention outcomes including inhospital outcomes and long-term outcomes. Follow-up information on all patients dismissed from the hospital was obtained by an experienced data technician via phone calls at 6 and 12 months after the procedure and yearly thereafter. Ten percent of all records were randomly audited yearly for quality assurance. As a retrospective, single-center, cohort study, the data were not randomized and were potentially subject to selection bias.

Definition of Patient Populations

For the purpose of this study, *preprocedural thrombocytopenia* was defined as a platelet count of 100,000/μL or less obtained from a routine blood sample taken within 48 hours before coronary PCI. Platelet clumping was excluded by repeat and citrated samples if clinically suspected. Etiology of thrombocytopenia was ascertained through review of records and separated into 15 categories (end-stage liver disease/hypersplenism, hematologic malignant neoplasm, idiopathic thrombocytopenic purpura, myelodysplastic syndrome, chemotherapy induced, drug induced, heparin induced, hemolysis, multifactorial, dialysis related, autoimmune, sepsis, disseminated intravascular coagulation, HIV-related, and unknown) on the basis of the present and previous clinical information. Where the diagnosis was unclear at the time of presentation and was not elucidated by subsequent hematological testing, we did not attempt to make a retrospective diagnosis and the cause was listed as unknown.

We compared demographic data and clinical outcomes in the preprocedural population with thrombocytopenia with 2 control groups of patients who had undergone PCI. The first group comprised the 16,961 (=17,165−204 patients with thrombocytopenia) remaining patients who underwent coronary stent implantation between January 1, 2003, and April 30, 2015. The second group was a cohort of patients without thrombocytopenia (n=1281) matched to the thrombocytopenia cohort (see Matching and Statistical Analyses section for details).

Definition of Clinical Outcomes

Clinical outcomes were identified as inhospital death, all-cause death, cardiac death, noncardiac death, myocardial infarction (MI), emergent coronary artery bypass graft (CABG), stroke, and bleeding. A *cardiac death* was defined as a documented arrhythmogenic death, out-of-hospital occurrence of an unexpected presumed pulseless condition with the absence of an obvious noncardiac explanation, or death due to congestive cardiac failure or structural heart disease. *Myocardial infarction* was defined by the presence of at least 2 of 3 criteria: (1) prolonged chest pain for at least 20 minutes; (2) elevation of serum cardiac enzymes 2 or more times the upper limit of normal; and/or (3) ST- or T-wave changes or a new Q wave on the electrocardiogram indicative of myocardial damage. *Stroke* was defined as an acute episode of focal or global neurological dysfunction persisting for more than 24 hours or leaving residual signs.

Characterization of Bleeding Events

The Bleeding Academic Research Consortium (BARC)[16] definition for bleeding was used to retrospectively describe bleeding events (Table 1). Hospital records were searched for all key words associated with potential bleeding events, including bleeding, transfusion, hematoma, pseudoaneurysm, and transfusion. Each

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