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Impact of Chronic Thrombocytopenia on In-Hospital Outcomes After Percutaneous Coronary Intervention

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ABSTRACT

OBJECTIVES This study sought to evaluate the impact of chronic thrombocytopenia (cTCP) on clinical outcomes after percutaneous coronary intervention (PCI).

BACKGROUND The impact of cTCP on clinical outcomes after PCI is not well described. Results from single-center observational studies and subgroup analysis of randomized trials have been conflicting and these patients are either excluded or under-represented in randomized controlled trials.

METHODS Using the 2012 to 2014 National (Nationwide) Inpatient Sample database, the study identified patients who underwent PCI with or without cTCP as a chronic condition variable indicator. Propensity score matching was performed using logistic regression to control for differences in baseline characteristics. The primary outcome of interest was in-hospital mortality. Secondary outcomes of interest included in-hospital post-PCI bleeding events, post-PCI blood and platelet transfusion, vascular complications, ischemic cerebrovascular accidents (CVAs), hemorrhagic CVAs, and length of stay.

RESULTS Propensity matching yielded a cohort of 65,130 patients (32,565 with and without cTCP). Compared with those without cTCP, PCI in patients with cTCP was associated with higher risk for bleeding complications (odds ratio [OR]: 2.40; 95% confidence interval [CI]: 2.05 to 2.72; $p < 0.0001$), requiring blood transfusion (OR: 2.10; 95% CI: 1.80 to 2.24; $p < 0.0001$), requiring platelet transfusion (OR: 11.70; 95% CI: 6.00 to 22.60; $p < 0.0001$), higher risk for vascular complications (OR: 1.94; 95% CI: 1.43 to 2.63; $p < 0.0001$), ischemic CVA (OR: 1.60; 95% CI: 1.20 to 2.10; $p = 0.01$), and higher in-hospital mortality (OR: 2.30; 95% CI: 1.90 to 2.70; $p < 0.0001$), but without a significant difference in hemorrhagic CVA (OR: 1.50; 95% CI: 0.70 to 3.10; $p = 0.27$).

CONCLUSIONS In this large contemporary cohort, patients with cTCP were at higher risk of a multitude of complications, including higher risk of in-hospital mortality. (J Am Coll Cardiol Intv 2018;■:■-■) © 2018 by the American College of Cardiology Foundation.

Platelets play a significant role in the pathogenesis of acute coronary syndrome (ACS) (1,2). Treatment for ACS involves plaelet inhibition using antiplatelet agents, anticoagulant therapy, and often, percutaneous coronary intervention (PCI) (3,4). Dual antiplatelet therapy is associated with an increased risk of bleeding (5), and this risk is higher in those with thrombocytopenia (TCP) (6). On the other hand, presence of TCP is not protective against ACS (7,8). Although the exact mechanism is unknown, several hypothesis such as increased production of young, hyper-reactive platelets, toxicity of drugs used to treat the cause of TCP and coexisting antiphospholipid antibodies have been described (9). The

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ABBREVIATIONS AND ACRONYMS

ACS = acute coronary syndrome

CI = confidence interval

cTCP = chronic thrombocytopenia

CVA = cerebrovascular accident

ICD-9-CM = International Classification of Diseases-9th Edition-Clinical Modification

NIS = National (Nationwide) Inpatient Sample

OR = odds ratio

PCI = percutaneous coronary intervention

RBC = red blood cell

TCP = thrombocytopenia

incidence of TCP in the general population may be as high as 4% and is increasing due to an aging population (10). PCI in patients with TCP can be challenging due to not only the platelet abnormality but also the increased number of comorbidities that may modulate the risk (11). Data on the safety of PCI in this population is scant, and contradictory results have been reported from single-center observational studies and pooled secondary analysis of randomized controlled trials (11–13). To help understand the safety of PCI in this understudied population, we hypothesized that patients with chronic thrombocytopenia (cTCP) experience more early complications after PCI than do those without cTCP and designed the current study to test this in a large inpatient database.

METHODS

DATA SOURCES. The National (Nationwide) Inpatient Sample (NIS) is a publicly available, all-payer inpatient database maintained by the Agency for Healthcare Research and Quality. Annually, the NIS is composed of discharge-level data from roughly 8 million hospitalizations and approximates a stratified sample of 20% of community hospitals in the United States. The sampling methodology of the NIS permits the application of weighting variables that allow for the calculation of national estimates, which have been validated against other U.S. hospital registries (14). Each hospitalization within the database contains clinical and resource-use information, including but not limited to, age, sex, race, insurance status, primary and secondary procedures, hospitalization outcome, total cost, and length of stay. Patients' diagnoses are documented in parallel, as both International Classification of Diseases-9th Edition-Clinical Modification (ICD-9-CM) and clinically meaningful clusters of ICD-9-CM codes, termed Clinical Classification Software codes.

STUDY SELECTION, ENDPOINTS, AND DEFINITIONS. We searched for hospital admissions between 2012 and 2014 with a primary or secondary diagnosis of TCP, during which PCI was performed (ICD-9-CM codes 36.06 and 36.07). TCP is generally defined as platelets count of <150,000 cells/μl of blood. In the NIS, this diagnosis is based on inclusion as an ICD code and the exact lab values are not available. To identify cTCP, we used a chronic condition indicator variable, which identifies a diagnosis that was present for at least a year from the index admission. Patients with periprocedural TCP, or for whom the chronic condition indicator variable indicated that cTCP was present for <1 year before procedure, were excluded, along with those with thrombotic thrombocytopenic purpura, those with disseminated intravascular coagulation, and those who underwent coronary artery bypass during index admission. The ICD-9-CM codes used to identify each of these diagnoses and procedures are listed in Online Table 1. Common in-hospital complications of PCI such as post-procedural hemorrhage, post-procedural red blood cell (RBC) and platelet transfusions, vascular complications (injury to blood vessel, arteriovenous fistula, retroperitoneal hematoma, and vascular complications requiring surgical intervention), cardiac tamponade requiring pericardiocentesis, post-procedural acute cerebrovascular accident, in-hospital mortality, and length of stay were identified. These complications were identified by corresponding ICD-9-CM diagnosis and procedure codes (Online Table 2).

STATISTICAL ANALYSIS. We used the weights provided with the NIS to generate national estimates of the number of admissions during each year. Chi-square test was used to compare categorical variables and Wilcoxon signed rank sum test to compare continuous variables. Propensity matching was performed with the use of a nonparsimonious multivariable logistic regression model with cTCP as the dependent variable and all the baseline characteristics outlined in **Table 1** as covariates. Matching was performed with the use of a 1:1 matching protocol with a caliper width equal to 0.2 of the SD of the logit of the propensity score. Standardized differences were estimated for all the baseline covariates before and after matching. Differences in outcomes were reported as adjusted odds ratios (ORs) with 95% confidence intervals (CIs). Multivariable logistic regression was performed to identify higher risk subgroups among those with cTCP. Variables included age, sex, and statistically significant variables derived from the univariate analysis as well as other variables that may plausibly be associated with mortality. All statistical analyses incorporated primary sampling units and clusters to obtain national estimates and were performed using SAS version 9.4 (SAS Institute, Cary, North Carolina) with a 2-sided significance level set at $p < 0.05$.

RESULTS

BASELINE CHARACTERISTICS AND MATCHED COHORT. Between 2012 and 2014, there were