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Antithrombotic Strategy in Non–ST-Segment Elevation Myocardial Infarction Patients Undergoing Percutaneous Coronary Intervention

Insights From the ACTION (Acute Coronary Treatment and Intervention Outcomes Network) Registry

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Objectives The aim of this study was to examine the use of and outcomes associated with antithrombotic strategies in patients with non–ST-segment elevation myocardial infarction (NSTEMI) who undergo percutaneous coronary intervention (PCI).

Background A variety of antithrombotic strategies have been tested in clinical trials for NSTEMI patients treated with PCI.

Methods Antithrombotic strategies for NSTEMI patients undergoing PCI at 217 ACTION (Acute Coronary Treatment and Intervention Outcomes Network) hospitals from January 1, 2007, to December 31, 2007, (n = 11,085) were classified into commonly observed antithrombotic groups: heparin alone (Hep alone; low-molecular-weight heparin or unfractionated heparin), bivalirudin alone (Bival alone), heparin with glycoprotein IIb/IIIa inhibitors (Hep/GPI), and bivalirudin with GPI (Bival/GPI). Baseline characteristics are shown across treatment groups. In addition, unadjusted and adjusted rates of in-hospital major bleeding and death are shown.

Results The standard strategy used was Hep/GPI (64%), followed by Hep or Bival alone (28%), and Bival/GPI (8%). Patients who received Hep or Bival alone were older with more comorbidities, higher baseline bleeding and mortality risk, and lower peak troponin. Compared with patients who received Hep/GPI , those who received Hep alone and Bival alone had lower rates of major bleeding (adjusted odds ratio [OR]: 0.52; 95% confidence interval [CI]: 0.42 to 0.65; adjusted OR: 0.48; 95% CI: 0.39 to 0.60; respectively), yet only patients who received Bival alone had lower mortality (adjusted OR: 0.39; 95% CI: 0.21 to 0.71).

Conclusions NSTEMI patients undergoing PCI are more likely to receive Bival or Hep alone when at higher baseline bleeding risk than when at lower baseline bleeding risk. Despite higher baseline risk, those receiving Bival or Hep alone had less bleeding. (J Am Coll Cardiol Intv 2010;3:669–77)

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Antithrombotic therapy is central in the treatment of the activated thrombotic process in non–ST-segment elevation myocardial infarction (NSTEMI), particularly among moderate- or high-risk patients who undergo an initial invasive strategy (1–3). Yet, invasive care also increases risk for bleeding due to arterial puncture and the use of antithrombotics in the catheterization laboratory. Guidelines emphasize the importance of risk stratification for ischemic and bleeding complications when selecting treatments to optimize short- and long-term clinical outcomes (2).

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Although outcomes associated with antithrombotic strategies used in NSTEMI patients undergoing percutaneous coronary intervention (PCI) have been well-studied in clinical trials, the patterns of use and outcomes in clinical practice are less well-described (4–6). Therefore, our objectives were to describe: 1) the selection of antithrombotic strategies among NSTEMI patients undergoing PCI in the ACTION (Acute Coronary Treatment and Intervention Outcomes Network) registry as a function of patient profiles; 2) the selection of antithrombotic strategies according to baseline risk of in-hospital mortality and major bleeding; and 3) the timing of antithrombotic therapy in relation to PCI. Additionally, we assessed the association between antithrombotic strategy and in-hospital major bleeding and mortality before and after adjustment for clinical factors.

Abbreviations and Acronyms

Bival = bivalirudin
CABG = coronary artery bypass grafting
CI = confidence interval
GPI = glycoprotein IIb/IIIa inhibitor
HCT = hematocrit
Hep = heparin
MI = myocardial infarction
NSTEMI = non–ST-segment elevation myocardial infarction
OR = odds ratio
PCI = percutaneous coronary intervention
RBC = red blood cell

Methods

National Cardiovascular Data Registry's ACTION registry. The National Cardiovascular Data Registry's ACTION registry is a national quality improvement registry of ST-segment elevation myocardial infarction (MI) and NSTEMI patients that began enrolling on January 1, 2007 (7). Patients are eligible for inclusion in ACTION if they present within 24 h from onset of ischemic symptoms and receive a primary diagnosis of NSTEMI or ST-segment elevation MI. De-identified data are extracted from existing medical records on a web-based case form by trained data collectors at each center. Study participation at each center was approved by local institutional review boards. The National Cardiovascular Data Registry has a data quality program in place to ensure consistent and reliable data. Quality assurance measures, such as data quality reports and random site audits by trained nurse abstractors, are used to maximize the completeness and accuracy of all records submitted.

Study population. The study population was limited to the 11,085 NSTEMI patients treated with PCI from January 1, 2007 to December 31, 2007, at 217 ACTION hospitals. The original NSTEMI population included 31,036 patients enrolled at 275 ACTION hospitals. The following patients were excluded sequentially: those who did not have PCI performed or were missing PCI status (n = 18,172); those with contraindications to antithrombin therapy (n = 118) or glycoprotein IIb/IIIa inhibitors (GPI) (n = 506); those who did not receive any heparin, bivalirudin, or GPI (n = 205); those who received other less commonly used antithrombotic agents (n = 908); and those who received bivalirudin before hospital stay (n = 42). The remaining 11,085 PCI patients receiving antithrombotic therapy were divided into 4 groups of antithrombotic treatment by use of GPI and antithrombins, either alone or in combination. Patients who received any bivalirudin were classified in 1 of the 2 bivalirudin groups—Bival alone or Bival/GPI—even if they previously received heparin. Some patients received low-molecular-weight heparin or unfractionated heparin and were classified as Hep alone as long as use of bivalirudin or GPI was not recorded. Patients who received GPI with or without heparin were classified as Hep/GPI, because only 3.8% received GPI alone. Therefore, the 4 antithrombotic treatment groups were denoted as: Hep alone, Bival alone, Hep/GPI, and Bival/GPI.

Definitions. Major bleeding was defined as intracranial hemorrhage, documented retroperitoneal bleed, hematocrit (HCT) drop ≥12% (baseline to nadir ≥12%), any red blood cell (RBC) transfusion when baseline HCT ≥28%, or any RBC transfusion when baseline HCT <28% with witnessed bleed. The HCT cut-point of 28% was chosen to ensure that transfusions given for baseline anemia were not considered to be bleeding events. Coronary artery bypass grafting (CABG) patients were included in the analysis, but bleeding events were censored at the time of surgery. Baseline and nadir (lowest-recorded) HCT were abstracted on the data collection form. Blood transfusion was defined as any nonautologous transfusion of whole or packed RBCs. Witnessed bleeding was a variable on the case report form requiring evidence of a bleeding location. Prior-PCI timing was defined as any time from hospital presentation up to 1 h before the procedure. Peri-procedure timing was defined as 1 h before the procedure to any time after the procedure. We excluded patients for whom the time was unknown from the timing analyses. Key outcomes included in-hospital major bleeding and death, and secondary outcomes included post-admission MI, heart failure, stroke, RBC