ORIGINAL INVESTIGATIONS

Percutaneous Intervention for Myocardial Infarction After Noncardiac Surgery

Patient Characteristics and Outcomes

Akhil Parashar, MD,[a] Shikhar Agarwal, MD, MPH,[b] Amar Krishnaswamy, MD,[b] Karan Sud, MD,[b] Kanhaiya L. Poddar, MBBS,[b] Mehak Bassi, MBBS,[a] Stephen Ellis, MD,[b] E. Murat Tuzcu, MD,[b] Venu Menon, MD,[b] Samir R. Kapadia, MD[b]

ABSTRACT

BACKGROUND Few studies have explored percutaneous coronary intervention (PCI) in perioperative myocardial infarction (PMI), even though PMI is a major cause of mortality in patients undergoing urgent/emergent noncardiac surgery.

OBJECTIVES This study sought to describe the angiographic characteristics and outcomes in patients presenting to the cardiac catheterization laboratory for myocardial infarction sustained after undergoing noncardiac surgery, with a detailed analysis of those undergoing PCI.

METHODS We included all patients presenting to the catheterization laboratory at our institution after PMI from 2003 to 2012, who had noncardiac surgery within the previous 7 days. Data from patients who underwent PCI were analyzed using both standard regression and time-to-event survival analysis.

RESULTS From 2003 to 2012, 1,093 patients with 3,832 person-years of follow-up underwent diagnostic coronary angiography, of whom 281 (40 ST-segment elevation myocardial infarction [STEMI] and 241 non-ST-segment elevation myocardial infarction [NSTEMI] cases) underwent PCI. Using Kaplan-Meier survival analysis, we found 30-day mortality was 5.2% and 1-year mortality was 15% in the overall population. In the PCI subpopulation, we estimated 30-day mortality to be 11.3%. The 30-day death rate in the STEMI cohort was 31.2% and 8.5% in the NSTEMI cohort of the PCI subpopulation. Stepwise logistic regression revealed the following factors as strong predictors of 30-day mortality after PCI: bleeding event after PCI (odds ratio [OR]: 4.33; 95% confidence limits (CL): 1.52 to 12.30), peak troponin T level (OR: 1.20; 95% CL: 1.08 to 1.34), and underlying peripheral vascular disease (OR: 4.86; 95% CL: 1.66 to 14.22). Cox proportional hazard analysis of survival data showed that increasing age (hazard ratio [HR]: 1.03; 95% CL: 1.01 to 1.04), bleeding after PCI (HR: 2.31; 95% CL: 1.61 to 3.32), renal insufficiency (HR: 2.26; 95% CL: 1.51 to 3.39), and vascular surgery (HR: 1.48; 95% CL: 1.02 to 2.15)) were all significant predictors of long-term mortality after PCI.

CONCLUSIONS Perioperative MI has a markedly high mortality rate, despite PCI. Bleeding event, peak troponin T level, and peripheral vascular disease predict mortality within 30 days of PCI in this patient population. Similarly, older age, vascular surgery, bleeding event, and renal dysfunction strongly predict long-term mortality after PCI in the setting of PMI. (J Am Coll Cardiol 2016;68:329–38) © 2016 by the American College of Cardiology Foundation.

Listen to this manuscript's audio summary by *JACC* Editor-in-Chief Dr. Valentin Fuster.

Myocardial infarction is a serious complication in the post-operative setting in many patients undergoing noncardiac surgery. Current estimates put the incidence of perioperative myocardial infarction (PMI) at 5% within 30 days, with most events occurring within 48 h after major surgery (1). Considering the fact that >200 million patients throughout the world undergo major noncardiac surgery every year, these estimates are of paramount clinical significance (2). The American College of Cardiology/American Heart Association (ACC/AHA) and European guidelines on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery focus on prevention and detection of PMI; however, specific recommendations on effective management of PMI are not available due to a paucity of data (3,4).
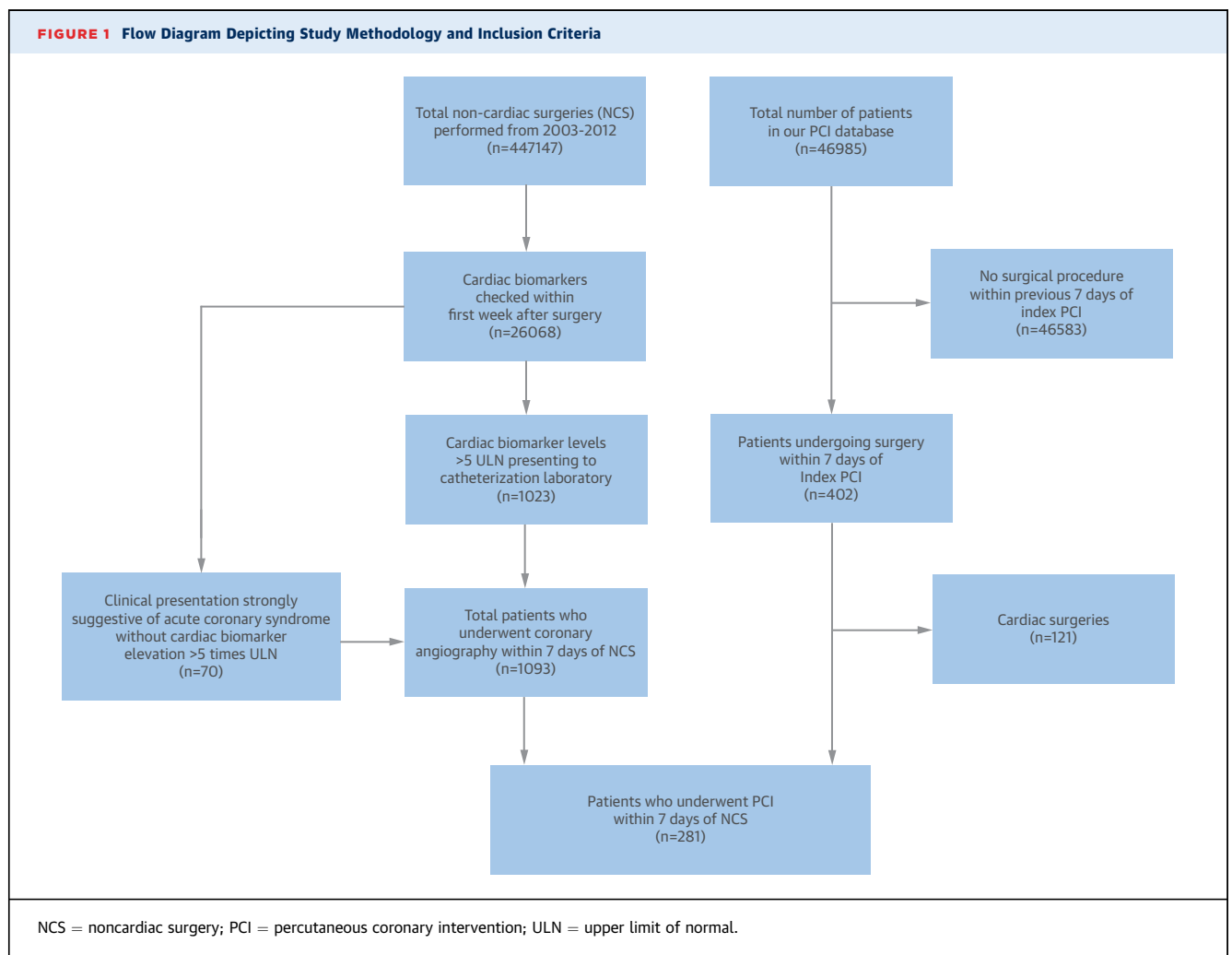
Numerous risk models have been developed to predict adverse cardiovascular outcomes after noncardiac surgery, using well-recognized surgery and patient-specific variables. These predictive models enable risk stratification and risk mitigation, but they are of little value when ischemia and infarction are actually encountered in the post-operative setting. Although the role of revascularization in the acute coronary syndrome setting is well established, performance of percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) surgery in the early post-operative setting is challenging due to patient comorbidities and relatively higher bleeding risk. PCI performance requires the mandatory use of adjunctive potent antithrombotic and antiplatelet therapies. Major bleeding especially in the nonaccess site has been consistently associated with poor short- and long-term outcomes in multiple PCI datasets (5).

As a result, data on outcomes in this high-risk patient population are scant. To overcome this

---

FIGURE 1   Flow Diagram Depicting Study Methodology and Inclusion Criteria

NCS = noncardiac surgery; PCI = percutaneous coronary intervention; ULN = upper limit of normal.