



Original contribution

Perioperative antiplatelet therapy and cardiovascular outcomes in patients undergoing joint and spine surgery[☆]



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Abstract

Study objective: Perioperative thrombotic complications after orthopedic surgery are associated with significant morbidity and mortality. The use of aspirin to reduce perioperative cardiovascular complications in certain high-risk cohorts remains controversial. Few studies have addressed aspirin use, bleeding, and cardiovascular outcomes among high-risk patients undergoing joint and spine surgery.

Design/setting/patients: We performed a retrospective comparison of adults undergoing knee, hip, or spine surgery at a tertiary care center during 2 periods between November 2008 and December 2009 (reference period) and between April 2013 and December 2013 (contemporary period).

Measurements: Patient demographics, comorbidities, management, and outcomes were ascertained using hospital datasets.

Main results: A total of 5690 participants underwent 3075 joint and spine surgeries in the reference period and 2791 surgeries in the contemporary period. Mean age was 61 ± 13 years, and 59% were female. In the overall population, incidence of myocardial injury (3.1% vs 5.8%, $P < .0001$), hemorrhage (0.2% vs 0.8%, $P = .0009$), and red blood cell transfusion (17.2% vs 24.8%, $P < .001$) were lower in the contemporary period. Among 614 participants with a preoperative diagnosis of coronary artery disease (CAD), in-hospital aspirin use was significantly higher in the contemporary period (66% vs 30.7%, $P < .0001$); numerically, fewer participants developed myocardial injury (13.5% vs 19.3%, $P = .05$), had hemorrhage (0.3% vs 2.1%, $P = .0009$), and had red blood cell transfusion (37.2% vs 44.2%, $P < .001$) in the contemporary vs

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reference period.

Conclusions: In a large tertiary care center, the incidence of perioperative bleeding and cardiovascular events decreased over time. In participants with CAD, perioperative aspirin use increased and appears to be safe.

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1. Introduction

More than 1.5 million hip, knee, and spine orthopedic surgeries are performed in the United States each year [1]. Case volumes have risen steadily during the past decade, particularly among older adults with the highest cardiovascular risks [1,2]. Perioperative cardiovascular complications are a major concern because they impart significant postoperative morbidity and mortality. Perioperative myocardial infarction (MI) occurs in up to 5% of participants within 30 days of noncardiac surgery and is associated with increased short-term mortality [3-5]. Myocardial injury without definite MI is also independently associated with increased postoperative mortality [6-10]. Perioperative thrombotic complications are often attributed to enhanced platelet activation after surgery [11,12]. Aspirin, a potent inhibitor of platelet aggregation, can reduce risks of thrombotic complications and major vascular events but with the competing risk of bleeding [13,14]. The net benefit of perioperative aspirin to reduce rates of thrombotic complications for individuals at risk for cardiovascular complications remains uncertain. In a recent large randomized study of patients with cardiovascular risk factors undergoing noncardiac surgery, routine perioperative aspirin increased rates of major bleeding without a reduction in death or MI at 30 days, although the study enrolled few high-risk patients [15].

Despite increased awareness of perioperative cardiovascular thrombotic risks, wide variation in clinical practice remains [16]. The impact of perioperative antiplatelet administration and strategies on bleeding and cardiovascular outcomes in the highest risk groups also requires further investigation [17]. We compared participants undergoing joint and spine surgery during 2 periods at a large academic medical center to determine trends in perioperative antiplatelet administration and its association with postoperative MI, myocardial injury, hemorrhage, red blood cell transfusion (RBCT), and mortality.

2. Methods

2.1. Study design

We performed a retrospective cohort analysis of consecutive adults undergoing knee, hip, or spine surgery at a tertiary care center between November 1, 2008, and December 31, 2009 (reference period) and between April 3, 2013 and December 31, 2013 (contemporary period). The time frame of

the contemporary period was abridged to coincide with the release of an update to the institutional recommendations regarding perioperative aspirin use. Complete methods have been described previously [14]. Clinical data were obtained from hospital administrative, laboratory and blood bank databases, and retrospective review of the medical record. The study was approved by the New York University School of Medicine Institutional Review Board (New York, NY) with a waiver of informed consent.

2.2. Patients and outcomes

International Classification of Diseases, Ninth Revision (ICD-9) procedure codes were used to identify surgical spinal fusion (81.0x), refusion of spine (81.3x), joint replacement of lower extremity (81.5x), and other procedures on spine (81.6x). Patient demographics and preoperative cardiovascular comorbidities were abstracted from an administrative dataset. In-hospital antiplatelet therapy among participants with coronary artery disease (CAD) was obtained from a hospital dataset and retrospective record review. Myocardial injury was defined by a rise in serum troponin above the 99% upper reference limit of the laboratory. Plasma cardiac troponin I (cTnI) was measured using the VITROS cTnI ES assay (Ortho-Clinical Diagnostics, Rochester, NY) or the ST AIA-PACK 2nd generation cTnI assay (Tosoh Bioscience, Tokyo, Japan). Myocardial infarction was defined by *ICD-9* diagnosis code 410.x, not present on admission. Postoperative hemorrhage was defined by *ICD-9* diagnosis code 998.11 and retrospective record review. The RBCTs during admission were determined from a hospital blood bank dataset.

2.3. Statistical analysis

Normally distributed continuous variables were displayed as mean (SD) and were compared using the unpaired Student *t* test. Categorical variables were displayed as frequencies and percentages and were compared by χ^2 and Fisher exact tests. Logistic regression models were used to identify the effect of the reference and contemporary periods on thrombotic, bleeding, and transfusion outcomes for the unmatched study population. Models were adjusted for age, sex, diabetes, CAD, heart failure, prior stroke/transient ischemic attack (TIA), kidney disease, and urgent surgery, with final model covariates selected via a stepwise approach when $P < .1$. Statistics were calculated using SPSS 20 (IBM SPSS Statistics, Armonk, NY). Two-tailed $P < .05$ was considered to be statistically significant for all tests.

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