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Original Contribution

A retrospective study showing the extent of compliance with perioperative guidelines in patients with coronary stents with regard to double antiplatelet therapy☆

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Abstract
Study objective: To evaluate perioperative dual antiplatelet therapy management in patients with previously placed coronary stents.
Design: Retrospective medical record review.
Setting: Academic medical center.
Patients: A total of 1891 surgical cases performed at Vanderbilt University Medical Center in 2012 were evaluated using a perioperative database. Of these, 161 had complete data records that were evaluated using 2 evidence-based and expert opinion–supported protocols.
Interventions: N/A.
Measurements: This study is meant to evaluate perioperative antiplatelet management decisions in patients with coronary stents.
Main results: Management decisions were consistent with guidelines regarding antiplatelet therapy in 13% (21/161) of patients. Of the 87% (140/161) of cases where decisions were not consistent, 88% (123/140) were due to discontinuing aspirin preoperatively when there was not a high risk of surgical bleeding.
Conclusions: This study revealed suboptimal adherence to current perioperative antiplatelet management guidelines in patients with coronary stents. The lack of adherence to current guidelines is concerning and could be used to support the notion of an anesthesiologist-led Perioperative Surgical Home.

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1. Introduction

The advent of percutaneous coronary intervention with bare-metal stent (BMS) and drug-eluting stent (DES) placement has improved the treatment of patients with obstructive coronary artery disease but poses challenges to the perioperative management of these patients. The current treatment approach to prevent coronary artery in-stent thrombosis is to use dual antiplatelet therapy (DAPT), specifically a $P2Y_{12}$ receptor inhibitor (ie, clopidogrel, ticagrelor, prasugrel, or ticlopidine) in addition to aspirin [1]. There is, however, a lack of clinical agreement regarding the optimal perioperative management of DAPT in patients with previously placed coronary stents [2–4].

There are data indicating that the single most important risk factor for late stent thrombosis is complete and premature discontinuation of DAPT [5–7]. However, continuing such medications throughout the perioperative period has been shown to increase the risk of intraoperative bleeding, which can be life threatening [8]. One review concluded that the risk of thrombosis following antiplatelet discontinuation exceeds the risk of hemorrhage when continuing the medication intraoperatively [9]. Furthermore, although continuing antiplatelet agents during the surgical period may increase intraoperative bleeding, bleeding-related mortality is not increased except during intracranial surgery [9,10]. It is clear that this issue remains a clinical challenge.

Recently, the University of Alabama at Birmingham Health System established an Anticoagulation Task Force to create 2 evidence-based and expert opinion–supported protocols with the goal to standardize perioperative management of antiplatelet agents in patients with previously placed coronary stents [4]. Such protocols use a consensus decision-making approach and facilitate decision making in complex clinical situations [11,12]. At the Vanderbilt University Medical Center (VUMC), antiplatelet management decisions in the perioperative setting are made by our surgeons in partnership with the physician prescribing the antiplatelet agent, typically a cardiologist. These decisions are intended to balance the risk of bleeding against the risk of thrombosis. In this study, our aim was to evaluate management decisions regarding the utilization of DAPT in patients with coronary stents at VUMC using the established, standardized protocol. Our second study aim was to assess 30-day postoperative patient outcomes.

2. Materials and methods

This study was approved by the Vanderbilt University Institutional Review Board (protocol 130721). We evaluated all surgeries performed at VUMC in 2012 where DAPT use was documented preoperatively. Case data were extracted from the Vanderbilt Perioperative Data Warehouse (PDW). We queried the PDW for all cases in which clopidogrel (Plavix) and aspirin (or acetylsalicylic acid) were documented in the preoperative anesthesia assessment. From these cases, we then identified all patients with coronary stents where perioperative management of these medications was documented. To do this, we queried the PDW for specific instructions within the medication section of the preoperative evaluation to continue or discontinue (or "hold," "held," "d/c," "last," "stop") medications, which were then manually reviewed. At VUMC, medication management decisions (ie, whether to continue DAPT preoperatively) are made by our surgeons in partnership with the physician prescribing the antiplatelet agent, typically a cardiologist. At the time of this study, assays of platelet function, including thromboelastograms, were not performed as part of the perioperative assessment. The anesthesiologist or preoperative clinic nurse practitioner then documents these decisions during the preoperative assessment.

Medication data were collected and included discontinue/continue instructions, date of last dose, and time off medications before surgical procedure. Surgical data were extracted from the PDW which included the date and type of procedure. Based on the type of procedure, each surgical case was stratified in terms of risk (low, moderate, or high) of morbidity or mortality from intraoperative and postoperative bleeding based on a preestablished categorization (see below). This categorization was developed by a multidisciplinary institutional task force using a consensus-oriented decision-making model (Fig. 1*B*):

> Low: minor plastic, general, orthopedic, ENT, GYN surgery; biopsies, tooth extraction, surgery of the anterior segment of eye
> Moderate: cardiovascular surgery; major intraabdominal, intrathoracic, orthopedic, ENT, urology, or reconstructive surgery
> High: intracranial surgery, spinal canal surgery, surgery of the posterior segment of eye, transurethral prostatectomy [4]

Stent data were manually extracted from StarPanel, VUMC's electronic medical record system, and included the date of stent placement, stent characteristics (ie, type, number, size, and location), and the time between stent placement and surgery. All data, from both manual medical record review and those collected from the PDW, were imported and organized in Microsoft Excel. We then used summation functions to generate the results.

We used 2 (ie, BMS and DES) evidence-based and expert opinion–supported protocols established by an anticoagulation task force [4] to evaluate perioperative medication management decisions at VUMC (Fig. 1 *A* and *B*). Thirty-day postoperative mortality and cardiovascular morbidity outcomes (ie, death, myocardial infarction, and stroke) were obtained from the social security death master index. These data were then supplemented by institutional records of patient deaths and compared across groups by management decision.

3. Results

We identified 1891 surgical procedures performed in 2012 where patients were preoperatively on DAPT. There