Optimal Timing of Noncardiac Surgery After Stents

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The planning of noncardiac surgery in patients with a history of coronary artery disease and previous percutaneous coronary intervention with stent implantation is a topic that elicits clinical concern and discussion. These patients face risks related to their underlying coronary heart disease, as well as potential problems related to the coronary stent or associated antiplatelet medications. Some surgical procedures that confer a significant risk of surgical bleeding may require consideration of interrupting dual antiplatelet therapy. This is particularly challenging within the first year after coronary stenting, for which there are only limited data to guide practice.1–5

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In this issue of Circulation, Wijeysundera and colleagues6 examine cardiovascular outcomes during the 30 days after elective noncardiac surgery among patients who were previously treated with stents. Using province-wide data from Ontario, including 8116 patients undergoing surgical procedures from 2003 to 2009, they assessed the impact of various time intervals between stent and surgery on outcome. They included subjects undergoing orthopedic, vascular, and oncolgical surgical procedures. The authors concluded that the risk of the composite outcome of 30-day mortality, readmission for acute coronary syndrome, or repeat revascularization after bare metal stent (BMS) implantation was lowest at 46 to 180 days and, after drug-eluting stent (DES), was lowest more than 180 days after the procedure.

There are limitations to the data that were available for analysis that the authors acknowledge—no data are available on some key in-hospital outcomes such as perioperative bleeding, myocardial infarction, congestive heart failure, and stent thrombosis. The management of antiplatelet therapy around the time of surgery, and clinical factors such that might determine the urgency of surgery, could not be discriminated finely in this administrative database study. Adverse cardiac events after surgery were fairly infrequent (2.1% at 30 days), limiting the power to compare multiple time intervals, as is manifest by the broad confidence intervals reported. Furthermore, residual bias—survivor bias in particular—is likely to be present given that sicker patients may have been more likely to have been operated within the first 30 to 45 days, a time period in which guidelines would recommend that surgery be delayed. The conditions of patients were diverse in this study, and perhaps not entirely controlled for in the comparisons made. Many of the surgeries performed in the study, although not emergency surgeries, are indicated for life-threatening time-sensitive conditions such as cancer or severe vascular conditions, and are associated with highly variable risks of bleeding. Likewise, the coronary substrate may have varied from a single large vessel stent compared with a complex bifurcation stent, indicating different stent thrombosis risks. This degree of detail was not available for adjustment in the study.

Nonetheless, this is the largest published observational cohort to examine the optimal time for surgery after stents. Its chief strength is the breadth of the study population. Randomized trials focused on the question of timing of surgery are unlikely to be performed, so it is likely that clinical decisions will continue to rely entirely on observational data such as these. The authors report their findings in the context of current recommendations from the American College of Cardiology/American Heart Association/Society of Cardiac Angiography and Intervention Guidelines that recommend, if possible, at least 30 days after BMS and at least 365 days after DES implantation.7,8

Given the limited number of available analysis, the authors have combined events of different pathophysiologic cause—myocardial infarction (the minority of which is likely to be related to the stent itself) and repeat revascularization. To define the optimal time for elective surgical procedures one must consider the potential hazards separately, how these vary over time, and the safety of stopping dual antiplatelet therapy if required. Although the current study offers new information regarding the hazard of certain events after surgery, there is also considerable preexisting information about the expected time course of recovery and risk after coronary stenting. In particular, clinical events that are directly related to the stent procedure—stent thrombosis and stent restenosis—follow a predictable time course (Figure)9–19

For BMS and DES it is clearly established that the thrombosis rates are highest periprocedure, decline over the first 2 weeks, and then continue to decline.9,20 Studies of BMS21 and clinical practice guidelines7,8 have indicated 30 days of antiplatelet therapy are warranted to minimize stent thrombosis risk, and studies of noncardiac surgery after BMS describe a diminution in risk of in-hospital complications after this period. When surgery is required within 30 days of revascularization and when dual antiplatelet therapy is not feasible periooperatively, balloon angioplasty alone may be a reasonable strategy if a good acute result is expected because aspirin rather than dual antiplatelet may be sufficient.22

In-stent restenosis, leading to recurrent coronary ischemia, is pathophysiologically distinct from stent thrombosis, and
usually develops gradually. The hazard for BMS restenosis
peaks at 4 to 9 months after stent placement, with a few
additional events presenting later in the first year, and an
overall risk of about 14% over the first year.23 The raison
d’être for DES is prevention of restenosis; DES are associated
with a risk of 3% to 4% over the first year, a relative risk
reduction of approximately 75% compared with BMS.24

Based on the mechanism of delayed endothelialization, a
longer duration of antiplatelet therapy has been presumed to
be necessary in clinical use of DES. It is clear that for current
DES, discontinuation before 6 months is associated with a
higher risk of stent thrombosis than continuation. Although
the incremental risks are low beyond 6 months, as measured
in several randomized studies not powered to detect stent
thrombosis,25,26 the optimal duration of antiplatelet therapy is
under ongoing investigation in larger randomized trials.27,28

We must congratulate the authors for their efforts to bring
more evidence to the question of surgical timing faced
commonly in clinical practice. What is reassuring from this
report is that clinicians do fairly well choosing the timing of
surgery with a low rate of adverse cardiac events. It is also
clear from this report that whether a BMS or DES was
recently implanted, undergoing noncardiac surgery in the
initial 45 days after percutaneous coronary intervention is
associated with an increased risk of adverse events. In a
perfect world, the delay between percutaneous coronary
intervention, especially with DES use, and surgery would be
a minimum of 1 year. For BMS, the optimal duration falls
after the stent thrombosis risk of the first 30 to 45 days has
been passed, and before restenosis becomes likely (at 6
months). For DES, larger datasets with more detail around
cardiac and anatomic risk and on more refined cardiac
outcomes will be helpful to navigate cardiac and surgical risk
more clearly in the future.

The finding that most DES patients who are operated on
beyond 6 months after stenting do well is consistent with a
large body of knowledge from the initial trials of DES, where
the standard duration of antiplatelet therapy was 3 to 6
months. However, these trials were conducted primarily in
subjects without acute coronary syndromes and with noncom-
plex single vessel stent treatment. Although surgery after 6
months may be reasonable in some simple lesions with good
acute results, data such as those from the study by Wijeysun-
dera and colleagues do not have sufficient size and scope to
change the current guidelines to cover the scope of broad
practice and recommend earlier surgery after DES, when
there remain concerns regarding the residual risk of stent
thrombosis within the first year. Ongoing randomized studies
to examine whether it is reasonable to stop antiplatelet
therapy earlier than 1 year across the range of patients treated,
and identification of new stent technology to allow both low
restenosis and low stent thrombosis risk, are directions that
may allow greater certainty of safety for patients with
coronary disease requiring noncardiac surgery in the future.
Ultimately the decision of timing is quite individual, balanc-
ing the well-understood risks of restenosis with less certain
risks of stent thrombosis, as well as patient anatomy, perip-
operative bleeding risks, and risks of delaying surgical
procedures. It is important to remember that these complex
decisions will not be answered by simple rules, because the
interplay of surgical risk anatomic complexity of the coronary
stent procedures and the urgency of surgery will vary be-
tween patients.

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