Perioperative cardiovascular evaluation: heads or tails?

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Summary

When dealing with surgical patients, a perioperative evaluation is essential to anticipate complications and institute measures to reduce the risks. Several algorithms and exams have been used to identify postoperative cardiovascular events, which account for more than 50% of perioperative mortality. However, they are far from ideal. Some of these algorithms and exams were proposed before important advances in cardiology, at a time when pharmacological risk reduction strategies for surgical patients were not available. New biomarkers and exams, such as C-reactive protein, brain natriuretic peptide, and multislice computed tomography have been used in cardiology and have provided important prognostic information. The ankle-brachial index is another significant marker of atherosclerosis. However, specific information regarding the perioperative context of all these methods is still needed. The objective of this article is to evaluate cardiovascular risk prediction models after noncardiac surgery.

Keywords: Perioperative care; general surgery; brain natriuretic peptide; general anesthesia; cardiovascular risk; ankle-brachial index.

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Introduction

Perioperative evaluation is an important step before referring a patient to surgery. The purpose is not just clearance for surgery, but to perform an overall evaluation of the clinical status, make recommendations, deal with cardiovascular risk factors or cardiac problems, and estimate the procedure's risk. Thereupon the medical team and patient can decide the best way to minimize complications, or even to postpone the operation[1]. In addition to clinical experience and common sense, algorithms for perioperative evaluation have been proposed, tested, and validated to contribute to this decision. In general, sensitivity and specificity are quite similar among algorithms; however, they are unfortunately only somewhat better than a coin toss. In addition, most of the assessments have been based upon clinical characteristics of patients submitted to surgery over ten years prior. More recent perioperative evaluation guidelines include flowcharts suggesting tests or pharmacological interventions that may be a rather frustrating support for the algorithms, although much more acceptable to attending physicians.

On the other hand, population growth, developing countries' welfare, technological improvement, new surgical techniques allied to new materials and devices, and faster non-invasive strategies have led to an increase in the number of surgeries[2,3]. Indeed, patients previously considered non-candidates for surgery may now have renewed hope. Consequently, a larger number of patients older than 75 years are being referred to surgery involving multiple cardiovascular risk factors bringing about increased postoperative mortality and duration of hospitalization[4]. Recent predictions estimate that, from 2010 to 2040, the aging population in the United States will increase the incidence of coronary heart disease by approximately 26%, as well as the costs related to care by 41%[5]. It is estimated that more than 40 million surgeries are performed annually in Europe[6], and 240 million around the world[7]. In developing countries, the same scenario is observed. From 1997 to 2007, an increase of 20.42% was observed in the number of surgical procedures in Brazil[2]. In the last few years, however, the same authors observed a 30% increase in the number of case-fatalities[2]. Whether coincident or related events, both findings represent important challenges: how to anticipate and prevent the increase in perioperative complications in this apparently higher risk population without imposing a great economic burden?

Cardiovascular complications and perioperative algorithms

Cardiovascular complications are of special concern when dealing with surgical patients, since approximately 1% of them present with acute myocardial infarction (AMI) after the procedure. Generally it is associated with other noncardiac events with an odds ratio > 6, significantly increasing duration of hospitalization[8]. Related cardiovascular mortality reaches 0.3% (1.2 million patients in Europe alone), accounting for more than 50% of postoperative deaths after vascular surgeries[6,9].

Perioperative cardiovascular risk can be estimated by assessing clinical status, functional capacity and intrinsic risk of the surgery[3]. However, sometimes it may be very difficult to estimate this risk in patients with subclinical presentation of diseases.

Methods and algorithms were developed some time ago, and are being used in clinical practice with a high frequency[10-12]. However, some of these algorithms were proposed prior to the development of important advances in cardiology such as the use of aspirin and statins for coronary artery disease and acute coronary syndromes[13-19]. They were also developed before important pharmacological risk reduction strategies were available for surgical patients, such as beta-blockers and statins[20-22]. Despite having been cautiously validated in the past, it remains to be investigated whether these algorithms are still applicable in different populations submitted to different treatments. Do they continue to merit confidence? Do they predict cardiovascular events or are they little better than as tossing a coin?

The American Society of Anesthesiologists (ASA) classification was first described in 1941[23] and revised in 1963 (Box 1). It was the first attempt to predict surgical complications and is still, by far, the most often used by anesthesiologists. No other preoperative index has achieved the same widespread use. It was first designed to estimate the physiological status with no need for clinical resources and, although it can predict postoperative complications, it has a limited capability to predict cardiovascular complications. Moreover, there is a major problem related to poor reproducibility even among anesthesiologists[24].

The Detsky Index[11] is a modified version of the original risk index[10]. In his study, Detsky showed that the accuracy of the original method proposed by Goldman et al. had dropped from 81% to 69%. After inclusion of angina pectoris severity, previous myocardial infarction, critical aortic stenosis, and alveolar pulmonary edema, the accuracy of the new index increased to 75%. Conversely, the authors observed many events in patients with low-risk scores (false negative) and a limited discrimination power in patients referred for vascular or other major surgery. Based upon the findings of Eagle et al.[9] and Vanzetto et al.,[25] the American College of Physicians (ACP) published a guideline for assessment and management of perioperative risk, suggesting the Modified Cardiac Index for stratification of all patients prior to surgery (Box 1)[26,27]. To minimize the limitations of this method, they recommended the use of a non-invasive cardiac ischemic test for individuals with a