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EDITORIAL

Preoperative coronary computed tomography angiography: in search for the right role

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Coronary computed tomography angiography (CCTA) has emerged as a relatively noninvasive test, when compared to invasive coronary angiography, in the work up of patients with suspected coronary artery disease.[1] It provides information about the patients' coronary calcium score with an increased likelihood of coronary artery disease in patients with a coronary calcium score above 400.[2] More importantly, the injection of contrast dye allows accurate quantification of the anatomy of the coronary vessels, including the presence, location, and severity of coronary artery obstruction. When combined with functional flow reserve (FFR), CCTA has been shown to be more effective in selection of patients who would benefit from subsequent invasive coronary angiography and possible percutaneous coronary intervention.[3] CCTA FFR assessment utilizes computational fluid dynamics to simulate blood flow through the coronary arteries based on a three-dimensional reconstruction and virtually calculates how much a coronary artery stenosis is functionally limiting blood flow by comparing pressures distal and proximal to the obstruction. A ratio of 1.0 indicates no difference in pressures while values ≤0.8 indicate that the stenosis is hemodynamically significant.[4] Based on current recommendations and level of evidence regarding its utility in preoperative evaluation, CCTA may be considered for patients with poor or unknown functional capacity and elevated risk of perioperative cardiovascular events who are undergoing elevated risk surgery.[5] In their prospective observational trial published in this issue of *Minerva Anestesiologica*, Bittar *et al.*[6] evaluated the use of preoperative CCTA to predict postoperative myocardial injury in patients undergoing high risk oncologic surgery who had two or more cardiovascular risk factors. After excluding 49 patients from the analysis, 184 patients were analyzed and the primary outcome of myocardial injury within 72 hours of surgery occurred in 38% of patients. Notably, an impressive 30% of patients developed postoperative acute renal failure and 11% of patients developed postoperative septic shock. A multivariate logistic regression identified a primary location of the tumor in the bladder or esophagus, a longer duration of anesthesia and a high calcium score >400 as significant predictors for postoperative myocardial injury after non cardiac surgery (MINS). This study was not designed to define the role of CCTA in preoperative assessment of patients with suspected or confirmed coronary artery disease undergoing elevated risk oncologic surgery. In fact, it would be misleading to even attempt to do so. The authors prudently chose to focus on a homogenous subset of oncologic surgeries: thoracic or abdominal-pelvic surgery with

an anticipation surgical duration of two or more hours. This is certainly an elevated risk surgery category. It is important to note that the authors excluded patients a history of ischemic heart disease and those with renal failure as defined by a creatinine of ≥2 mg/dL. Both are components of the revised cardiac risk index criteria, and the included patient population may therefore have had an artificially lowered cardiovascular risk profile. This is in addition to their exclusion of patients with cardiovascular symptoms, which likely eliminated most patients with heart failure, another criterion of the revised cardiac risk index. Indeed, the second table of the study identifies that most included patients had a good functional status (as evidenced by 88% of patients having four or more METS), had normal left ventricle ejection fraction, and only 15% of included patients had a calcium score of >400. Notably, the two most prevalent cardiovascular risk factors in the included patients were hypertension and hyperlipidemia. This study found an alarmingly high incidence of MINS of 38%. While this can be partially explained by the elevated-risk surgery, the reported intraoperative hypotension frequency and duration (the authors reported a median hypotension time of sixty minutes) may have significantly contributed to the high incidence of MINS. The hypotension may have also increased the incidence of acute kidney injury. It is worth noting that despite the exclusion of patients with chronic kidney disease, the authors reported a 30% incidence of acute kidney injury. As with all postoperative acute kidney injury, the etiology is usually multifactorial and the use of contrast dye as part of the preoperative CCTA may have further contributed to the incidence of AKI. Despite the aforementioned limitations, this study provides important information. Based on the results of this study, we now know that patients with a calcium score of >400 have a higher incidence of MINS after high-risk oncologic surgery. Coronary computed tomography for calcium scoring does not require the injection of contrast dye and therefore preoperative CCT calcium scoring may be utilized as a truly noninvasive test to predict MINS after elevated risk surgery. The finding of a preoperative calcium score of 400 or more may then trigger a more proactive approach to perioperative goal directed fluid management, hypotension avoidance, intensive care management, periodic postoperative measurements of highly sensitive troponin T and serum creatinine. It may also trigger preoperative aggressive lifestyle modification strategies (diet modification, smoking cessation, avoiding alcohol intake) and medication regimens, including statins, to further reduce the unacceptably high reported risk of MINS.[2, 7]

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Conflicts of interest
The author certifies that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions
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