■ CORRESPONDENCE

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Cardiac Outcomes after Regional or General Anesthesia: Do We Know the Question?

To the Editor:—Because they are not Domain Experts, Go and Browner[1] may have overlooked certain critically important factors in their analysis of the study by Bode *et al.*,[2] which found no difference in cardiac outcomes between regional and general anesthesia after lower extremity vascular bypass grafting (LEVBG). The process of conducting a randomized trial can cause distortions of normal clinical care that must be considered before generalizing the results. In addition, the realities of contemporary medicine dictate that all clinical reports acknowledge the financial impact of their methods, including the use of special preoperative testing, monitoring, and intensive care. Several recent studies have a bearing on both of these issues and suggest that we may "have the answer," but are not necessarily asking the right questions.

The incidence of cardiac morbidity found by Bode *et al.*[2] (4.5% myocardial infarction [MI]) is similar to that previously reported by Christopherson *et al.*[3] in the Perioperative Ischemic Randomized Anesthesia Trial (PIRAT) (4% MI), and both are among the lowest in the literature for this procedure. Conversely, L'Italien *et al.*[4] recently found an MI rate of 12% in a group of 177 patients undergoing LEVBG who were being evaluated to determine the efficacy of a risk assessment model. Perioperative clinical management was not affected by the investigation, and the results are more likely to reflect normal outcomes at a quality institution. We believe that this implies that mere inclusion of patients in clinical studies affects their outcome. How does this happen?

Consider that protocols in the PIRAT study, comparing morbidities and mortality between regional and general anesthesia groups undergoing LEVBG, called for aggressive treatment of heart rates of 85 beats/min or above during and for 24 h after surgery, and included specified limits and management guidelines for other physiologic variables.[3] Structured management was intended to optimize perioperative care, thereby giving the fairest test of the null hypothesis. Such is often the case in randomized clinical trials and prejudices the results to improve the outcomes in both groups. Therefore, the differences in cardiac outcome between the groups in PIRAT were small and not statistically significant. Subsequent analysis[5,6] of the PIRAT data, however, has shown that patients in the general anesthesia/intravenous patient controlled analgesia group required many more interventions to achieve the predetermined goals than those receiving regional anesthesia/analgesia. With this additional piece of information, we can surmise that a real benefit of regional anesthesia would be manifested in a nontrial setting, where tight control is less likely to occur. The original finding, as reported, is important, because we discover that equivalency in outcome is achievable; however, generalization of the study results to the real world may carry a significant caveat.

The cost of alternate management pathways is becoming increasingly important. Bode *et al.*[2] had protocols that called for pulmonary artery (PA) catheterization and postoperative intensive care for as long as 48 h after surgery. Presumably, the New England Deaconess staff evolved these procedures in response to the high-risk nature of lower extremity bypass surgery, but their routine use would, for most institutions, add a staggering cost. This practice might not be looked on with favor by managed care organizations or insurance companies. Tuman *et al.*[7] achieved comparably low rates of cardiac morbidity in patients undergoing LEVBG using regional anesthesia without PA catheterization and with a much shorter intensive care stay. In the PIRAT[3] study, PA catheterization was not routine, and patients were observed for 24 h or less in an intensive care setting. Therefore, very low rates of cardiac morbidity after LEVBG may be achieved using regional techniques and/or careful perioperative management combined with general anesthesia, but at a significant cost increase for the latter.

Other morbidities show similar trends. Although Bode *et al.*[2] did not mention revascularization results in their article, a previous abstract from the same patient set reported a very low rate (~2%) in both groups.* In both the PIRAT[3] and Tuman *et al.*[7] studies, revascularization rates were approximately 2% in the regional anesthesia groups, but were significantly higher (20%) in the general anesthesia groups. To understand these findings, it is instructive to review an investigation by Berlauck *et al.*,[8] who compared three groups of patients undergoing LEVBG, all under general anesthesia. The first two groups received PA catheterization, fluid management and nitroglycerin, and prolonged intensive care (as in Bode *et al.*[2]). Group III received "standard" care without such interventions. Revascularization rates were 2% in groups I and II and 20% in group III, similar to those in the general anesthesia groups of the Tuman *et al.*[7] and PIRAT[3] studies. Therefore, very aggressive (and expensive) perioperative management in patients receiving general anesthesia achieved rates of a morbid variable (revascularization) similar to those found when regional anesthesia was *part* of a standard care plan that did not include routine PA catherization or prolonged intensive care.

We believe several important inferences logically follow from published data:

1. The issue is perioperative management, not just anesthetic technique. Adherence to properly drawn clinical protocols can positively influence outcome.
2. With sufficient attention to detail throughout the perioperative period, patients may safely undergo LEVBG procedures with either regional or general anesthesia.
3. Regional anesthesia, as part of an appropriate management plan, may well promote patient stability and good outcome with a lower cost and consumption of medical services, whereas general anesthesia may require more intense care to produce similar outcomes.

The appropriate issues are both more interesting and more complex than "regional *versus* general." They include determining the

* Bode RH Jr, Lewis KP, Lewis RP, Pierce ET, Satwicz PR, Hunter JA, Gibbons GW: Graft occlusion after peripheral vascular surgery with general vs regional anesthesia. Annual Meeting of the Society of Cardiovascular Anesthesiologists, May 1993.

morbidity and mortality for LEVBG in typical clinical settings with standard perioperative care; examining the elements of perioperative management that maximally influence outcome, and evaluating specific therapeutic issues such as: What is the value of perioperative beta blockade, or nitroglycerin therapy with fluid management to designated endpoints, during LEVBG? Can we identify high-risk subgroups who may benefit from PA catheterization? What is the role of regional anesthesia or deep general anesthesia in attenuation of the surgical stress response? What effect does the stress response have on morbidity and mortality? Resolution of these issues is vital if we intend to improve quality while progressively decreasing the cost of medical care.

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In Reply:—Beattie, Roizen, and Downing's letter highlights some of the limitations of clinical trials, and emphasizes the major point of our editorial: that further clinical trials of regional *versus* general anesthesia are unlikely to demonstrate differences in cardiac outcomes between the two anesthetic techniques. One of the constraints of clinical trials is that they require detailed management protocols. Otherwise, it is not possible to determine which particular aspect of an intervention was responsible for any difference in outcome: was it the type of anesthesia, or the regulation of hemodynamic parameters? Another limitation is that patients in trials, because they must meet selection criteria, have fewer comorbidities than patients in routine clinical care. Quality of care and attention to outcome ascertainment may be higher in the context of a study. After a study is completed, nonrandomized analyses often suggest alternative explanations for the results. The question of generalizability in this case, whether a "real world" comparison of regional *versus* general anesthesia would yield the same results plaguing nearly all trials. A treatment may be better (or worse), cost more (or less), or be impractical in a clinical setting.

We agree that alternative strategies for the prevention of perioperative cardiac morbidity, such as the use of beta blockade or nitrates, may be beneficial, and that they should be studied. Compared with additional studies that compare available regional and general anesthetic agents, these appear to be fruitful lines of inquiry. As to the use of pulmonary artery catheters in selected patients, if Beattie, Roizen, and Downing believe that the risk of postoperative myocardial infarction after lower extremity vascular bypass grafting is truly 12% in their institutions, then high-risk patients have already been identified. A randomized trial of whether such patients benefit from pulmonary artery catheterization would be worthwhile. Such a trial, if it demonstrated benefit, would raise the question of whether hemodynamic management in response to PA abnormalities in the "real world" could match that in the trial. Conversely, a study that showed no difference would be subject to the flip side of the same criticism: that physicians in nonacademic centers may need the information from a PA catheter more.

We have a more difficult time understanding the purpose of clinical trials to study differences in the proxy variable of surgical stress response. Without demonstrated differences in cardiac morbidity and mortality, the meaning of any differences in stress responses will be uncertain.