

Discussion: The Role of Chronic and Perioperative Glucose Management in High-Risk Surgical Closures: A Case for Tighter Glycemic Control

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It is refreshing that the discussion of complications and the efforts to avoid them has reached “primetime exposure” across multiple specialties. Historically, best results, most favorable outcomes, and seemingly impossible to achieve (or reproduce) or negligible levels of complications were reported in the literature and showcased on the podium at meetings. In recent years, however, a more realistic view has been taken. Stand-alone symposia and meetings have been held actually focusing on complications—something that would have been unheard of even 10 years ago. We all realize that the only way to avoid complications is to not operate. However, in an effort to truly be patient-centered and to focus on quality and outcomes, and of course driven by the looming change in the healthcare landscape and its methods of reimbursement to both hospitals and doctors alike, we all must learn to use available evidence to minimize complications rather than pay for them postoperatively through increased lengths of stay, reoperations, bounce-backs, and costs to the healthcare system. It is within this context that this report, “The Role of Chronic and Perioperative Glucose Management in High-Risk Surgical Closures: A Case for Tighter Glycemic Control,” is a welcome addition to the surgical literature.

In this article, recognized experts in the field of wound care and diabetic limb salvage have interrogated their prospectively collected database on complex patients and performed a retrospective study on the closure of surgical wounds and the glycemic factors that can sabotage results. They found perioperative poor glycemic control, defined as any blood glucose measurement recorded above 200 mg/dl as well as elevated hemoglobin A1C levels above 6.5 percent, were significantly associated with worse outcomes in

the form of increased rates of dehiscence. They recommend that every effort be made to ensure tight control in both the chronic and subacute perioperative periods.

The effects of diabetes on wound healing and the pathophysiology of hyperglycemia have been well documented in the literature. In essence, glycosylation of proteins and enzymes results in their dysfunction.¹ Wound bed characteristics are altered because of changes to basement membrane permeability and decreased delivery of nutrients, not to mention impaired blood flow and insufficient oxygen delivery.² Taken together, and combined with hyperglycemia’s negative effects on the immune system, this pathophysiology predisposes diabetics to complications, especially delayed wound healing and postoperative infections.^{3–5} It is interesting to note that in this study, however, the authors did not find an association with poor glucose control and postoperative infection. The authors admit this may be due to low patient numbers and their strict adherence to their protocol of avoiding attempts at closure until postdebridement cultures were negative. This point should be underscored as a valuable method to augment outcomes in addition to good glycemic control, and has been espoused by this group for years with proven outcomes. It is a take-home point of the article in my view, and is reproducible, as we have adopted the same protocol in my practice as well with similar success in complicated patients.

The authors recommend maintaining perioperative glucose levels below 200 mg/dl based on their data demonstrated in their Figure 1. Looking at Figure 1, one can interpret that dehiscence rates start to climb, albeit at a different (less steep) slope actually before that, perhaps around the 150 to 180 range. While the authors are correct in suggesting the most significant inflection point appears to be at 200 mg/dl, and are realistic in their attempts

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to control sugars in this difficult-to-control patient population, it is clear that better glycemic control (even at levels lower than 200) seems to suggest lower complications rates. This is true across other specialties as well. For instance, in cardiac surgery patients, tight glucose control improved survival and decreased wound complications in comparison with sliding-scale insulin protocols.⁶ In another cardiothoracic study of the effects of glucose control on surgical-site infections, Latham et al.⁷ assessed the infection rates among 1000 cardiothoracic surgery patients in whom preoperative hemoglobin A1c levels were known and found that the rate of surgical-site infections among diabetic patients with A1c levels of 8 percent or higher was twice that of those whose A1c levels were less than 8 percent (8 percent versus 4 percent, respectively; odds ratio, 1.97; 95 percent confidence interval, 0.77 to 5.04).⁷ They also found that perioperative hyperglycemia was associated with increased resource utilization (longer postoperative stay and increased hospitalization costs). In a 2008 article by Ramos et al.⁸ looking at the effects of hyperglycemia in almost 1000 general and vascular surgery patients, the authors found that postoperative infection increased by 30 percent for each 40 mg/dl over 110 mg/dl. Multiple other articles suggest postponing surgery for hemoglobin A1C levels greater than 9 percent, with target perioperative glucose levels of 140 to 180 mg/dl.^{9–12} While this has been balanced by reports of higher mortality rates and increased risks of hypoglycemia associated with aggressive glucose control,^{13,14} previously acceptable glucose levels of greater than 200 mg/dl are almost uniformly associated with worse outcomes and should be avoided.¹⁵

In sum, the take-home points of the article, and its impact on the literature, are that close attention to glycemic control before definitive primary closure of open wounds is paramount to avoiding complications. Keeping glucose levels below 200 mg/dl (if not lower) and keeping hemoglobin A1c levels below 6.5 percent are excellent targets. Relegating glucose control to others who may not be as familiar with all of the strategies available to achieve these levels will certainly result in difficulty achieving these perioperative targets. The multidisciplinary approach that this group utilizes, including the liberal use of an endocrinologist, in this challenging patient population is a key to success and should be emulated. The use of predebridement and postdebridement cultures to guide therapy and help time definitive closure is a useful tool with proven results. Adequate blood flow was confirmed (or restored) before closure,

which is also critical to success. The authors should be applauded for their honest reporting of their complications and development of protocols and strategies to improve outcomes, as well as for their acknowledgement of some of the limitations of their study. Evidence such as this is just what the field needs as we all shift to achieving better-quality outcomes with limited resources.

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