

Hemoglobin A1c and Deep Sternal Wound Infection: It's Not Just About the Number



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In a recent report from the American Diabetes Association, with an additional 1.5 million to be newly diagnosed each year, the number of people in the United States with a diagnosis of diabetes in 2017 had increased to 24.7 million, approximately 9.7% of the US adult population. This does not include over 7 million more thought to have undiagnosed diabetes.¹ Not surprisingly, the percentage of patients with diabetes undergoing coronary artery bypass surgery (CABG) has increased from 40.4% in 2009 to 50.0% in 2018.² Recent trial results demonstrating improved survival for patients with diabetes and multivessel disease undergoing surgical revascularization make this trend likely to continue.^{3–7}

An increase in morbidity and mortality in patients with diabetes undergoing cardiac surgical procedures has been well documented, with a particular interest in the risk of deep sternal wound infection (DSWI) in those undergoing CABG.^{8,9} In an environment where a growing body of evidence supports the benefits of using multiple arterial conduits, including bilateral thoracic arteries even in many patients with diabetes,^{10–12} better identification of at-risk patient groups and avoidance of those factors associated with an increase in the incidence of wound infection becomes increasingly essential.

In this issue of *Seminars*, a meta-analysis from Biancari and Giordano evaluates the relationship between preoperative glycosylated hemoglobin (HgbA1c) levels above 6–7% and the occurrence of DSWI after adult cardiac surgery.¹³ The analysis includes 14 studies encompassing 17,609 patients, with most but not all having undergone CABG. DSWI rates were compared at HgbA1c levels above and below 6% in 1 study, 6.5% in 4 studies, and 7% in 9 studies. Patients with elevated baseline HgbA1c levels were found to be at an increased risk of developing sternal wound complications (RR 3.01, 2.32, 3.90). The 4 largest studies in the analysis contributed over 75% of the total study population and all independently reported significant associations between elevated HgbA1c and DSWI. As such, the results as presented are not new, cannot be unexpected, and add little beyond the information available in almost any one of the manuscripts included in the review.

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Central Message

An elevated HgbA1c level is but one of a number of factors associated with an increase in sternal wound infection in patients with diabetes. Pending further study, decisions regarding the timing and techniques of surgical coronary revascularization based on presumed level of glycemic control should be made cautiously.

That said, this study should encourage one to consider those additional possible confounders missing from the analysis, and this is a contribution of some value. As acknowledged by the authors, the definition of DSWI varied among studies, and information regarding perioperative antibiotic regimens, single vs bilateral internal mammary artery use and the associated harvest techniques, technical issues regarding sternal entry and the integrity of sternal closure, as well as eventual wound care techniques was not evaluated. The lack of comparative demographic data further limits confidence that the results reported are truly related to the effect of HgbA1c and not various other potential differences in patient or procedural characteristics.

The authors' suggestion that their findings "...may allow a stratification of the risk of SWI and may guide preventative strategies to reduce the risk of such a severe complication" is optimistic but not really consistent with the study design. It is not clear how much if any incremental value beyond that of a simple binary yes/no reporting of diabetes status is added by this analysis. Halkos et al have previously evaluated HgbA1c as a continuous factor and found an adjusted odds ratio of DSWI of 1.38 ($P = 0.29$) for each unit increase in HgbA1c, suggesting the relationship is not static but rather that outcomes worsen relative to worsening glucose control.¹⁴ Conversely, the results presented herein which generally associate infection rates with HgbA1c levels at or something above 6–7% (probably in fact >6.5%), do not allow further differentiation of outcomes as levels increase.

Better correlation of outcomes with HgbA1c levels, prompting more aggressive preoperative glycemic control to decrease the risk of DSWI, certainly seems a worthwhile goal. However, as the authors suggest, the concept that "...postponing surgery for optimization of the glycemic control can reduce the risk of SWI. . .," while intuitively sensible, requires further study. The observed association between elevated HgbA1c levels (whether static or continuous) and DSWI should not be assumed to be one of cause and effect, nor should it be assumed that preoperative correction to normal or near normal levels will decrease the incidence of this complication. Even if eventually found of benefit, such an approach would face significant practical and logistical challenges, particularly in the United States where approximately 60% of isolated CABG is categorized as urgent.²

Finally, with this analysis, the authors whether intended or not have served to remind us of the need for vigilance and strict attention, not only to the presence of diabetes and glucose control, but perhaps more importantly, to the various other clinical factors and nonstandardized technical details which in addition to diabetes status may be relevant to the risk of deep sternal wound infection.

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