Commentary & Perspective

A Spoonful of Sugar

Commentary on an article by Annette L. Adams, PhD, MPH, et al.: “Surgical Outcomes of Total Knee Replacement According to Diabetes Status and Glycemic Control, 2001 to 2009”

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Nine years of data from Kaiser Permanente’s arthroplasty registry are reviewed in the study by Adams et al. The authors report on the relative risk of complications in patients with diabetes, and they also differentiate between patients with well-controlled and poorly controlled hyperglycemia. In brief, the authors assessed all patients undergoing primary total knee arthroplasty and categorized them according to glycemic status. They then examined postoperative surgical outcomes, including the need for revision, deep infection, and venous thromboembolic disease, as well as incident myocardial infarction and all-cause rehospitalization. With the exception of thromboembolic disease, one year of follow-up was used.

The study cohort included 40,491 patients; 81.3% were identified as not having had diabetes mellitus prior to the index surgery, 12.5% as having had controlled diabetes (hemoglobin [Hb] A1c level of <7.0%), and 6.2% as having had uncontrolled diabetes (HbA1c level of 7.0%). Within one year, 10,969 patients or 27.1% were rehospitalized for any reason, 1.1% or 464 required revision, 0.7% developed a deep infection, and 1.0% developed a myocardial infarction. When adjusted for age, sex, body mass index, and comorbidity score, there was no evidence of increased risks due to diabetes. Interestingly, glycemic control made no apparent difference—patients with an HbA1c level of 7.0% (considered the cutoff for adequate control) or more did as well as those with a lower value.

Diabetes is typically considered a predictor for perioperative complications, and there is no shortage of studies associating the presence of diabetes with increased surgical risk. Much work, both in the orthopaedic literature and in the surgical literature as a whole, has been reported on the establishment of appropriate parameters for blood sugar control.

At about the time that Adams et al. began their observations, in 2001, van den Berghe et al. published a study on intensive insulin therapy in a surgical intensive care unit; they demonstrated dramatic improvements in mortality associated with a target blood glucose range of 80 to 110 mg/dL. That study, cited throughout the surgical literature, resulted in substantial changes in perioperative practice. For example, current guidelines by the Surgical Care Improvement Project for cardiac surgery include aggressive glycemic control. Since 2001, however, failure to duplicate the findings of van den Berghe et al. and increased rates of hypoglycemia have challenged this paradigm. In a recent review, Lipshutz and Gropper noted that “while avoidance of hyperglycemia is clearly beneficial, the appropriate glucose target and specific subpopulations who might benefit... have yet to be identified.”

Why did Adams et al. not find that tighter glycemic control was beneficial? A few points can be noted. First, the diabetic patients differed from the nondiabetic patients in that they were more likely to be male, obese, and have additional comorbidity. Second, patients with uncontrolled diabetes were relatively uncommon—perhaps the truly sick patients simply never appeared in the operating room and were thus never counted! Third, the outcomes assessed were also uncommon, and the observation period may not have been long enough to capture all untoward events.

Furthermore, Adams et al. were unable to capture what was done in the hospital for individual patients. For example, despite a lack of evidence of efficacy, the use of an insulin sliding scale is embedded in standard perioperative practice, and this typically

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results in persistent hyperglycemia. Coordinating appropriate meals, accurate glucose monitoring, and timely insulin delivery is a daunting task, even in a unified system such as that of Kaiser Permanente, the authors’ home institution.

What conclusion can be drawn from this study? A finding of preoperative hyperglycemia may simply be a marker for worse overall health, in the same way that an elevated ESR (erythrocyte sedimentation rate) represents a marker for nonspecific inflammation. Seen in this light, it makes sense that attacking the hyperglycemia in isolation matters little; we would not consider our work complete if we simply brought the ESR down to acceptable limits in a patient with inflammatory disease! If this is the case, the good results seen with the two diabetic patient groups may reflect the heightened awareness of overall disease burden, including diabetes, with the Kaiser Permanente system devoting more resources to managing these patients.

Finally, Adams et al. are to be commended for avoiding the “file drawer effect,” in which investigators lose interest or fail to write up their findings. A study that supports the null hypothesis is just as valuable as one that demonstrates a positive finding. In this case, Adams et al. show that the diabetic patient is not doomed to a poor result, assuming that prudent care is provided.

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References