Diabetes: To graft or not to graft is no longer the question

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The increased prevalence of diabetes, driven in no small measure by an epidemic of obesity, has been dramatic and largely unabated. Current estimates predict an astounding incidence between 1 in 5 and 1 in 3 adults by year 2050.¹ Cardiovascular disease is the leading cause of death in the diabetic population. Because of the diffuse nature of the atherosclerotic process in the diabetic patient, multiple retrospective registry and prospective randomized trials have documented the superior long-term survival of coronary artery bypass grafting (CABG) over interventional approaches for the diabetic patient with extensive coronary artery disease.²⁻⁸ The potential role of newer-generation drug-eluting stents in ameliorating these findings awaits further evidence.^{9,10}

It is in this context that the study by Raza and colleagues,¹¹ in this issue of the *Journal*, provides many important historical, clinical, and social insights. By accessing the wealth of data in a robust and well-maintained clinical registry of a high-volume, high-quality program and applying careful and sophisticated statistical analytics, these Cleveland Clinic researchers arrived at many notable conclusions. In their study, the percentage of patients referred for CABG has dramatically increased—likely both a reflection of increased prevalence of disease and increasing awareness of the preferential success of CABG as an optimal form of therapy. The risk profile of the diabetic patient has changed, reflecting an ever-increasing higher-risk patient, despite the notable decrease in hyperlipidemia, reflecting the widespread use of statin therapy. Although diabetic patients were at increased risk for both short- and long-term morbidity and mortality, careful propensity score matching seems to have teased out the associated comorbidities from the mere fact of diabetes itself, to suggest that the incremental impact of diabetes, independent of associated risk factors, is not discernable in the early postoperative period, but rather takes an increasing toll on late mortality. Likewise, hospital costs, although

certainly higher in diabetic patients, seem to be more of a reflection of associated factors than of diabetes per se.

The alarm bells having been clearly sounded, what new information can we glean from this study, and what questions remain to be addressed? The authors are to be commended for addressing the issue of prevention. Clearly the evidence regarding the effectiveness of lifestyle intervention in preventing diabetes is neither new nor surprising—just incredibly difficult to execute on a large scale.^{12,13} Similarly difficult but no less important might be the impact of smoking cessation. Although Raza and colleagues¹¹ do not report the prevalence over time, more than half of the nondiabetic patients (55%) and diabetic patients (52%) were smokers. Not only is smoking a synergistic risk factor for the cardiovascular manifestations of diabetes, but smoking itself is an independent risk factor for metabolic syndrome and type 2 diabetes.¹⁴⁻¹⁶ Unfortunately, the dramatic decrease in adult cigarette smoking over the past half century (42% in 1965 to 19% in 2011)¹⁷ has not resulted in a consequent decrease in diabetes. In short, despite the promising opportunities in the realm of prevention, diabetes is likely to remain a surgical concern for the foreseeable future.

Left unanswered by the current study is the impact of diabetic severity and therapeutic approach on clinical outcome. There is increasing evidence to suggest that insulin-dependent diabetic patients have a higher risk for both short- and long-term adverse outcomes.^{18,19} This distinction may even help to further define the incremental benefit of CABG versus interventional approaches for the diabetic patient and therefore hopefully would be included in future study.²⁰ Also critical to understanding the increasing risk hazard for late mortality would be the surgical therapy applied. Somewhat surprisingly from this institution, most likely because of the historical nature of the study, 33% of nondiabetic patients and 19% of diabetic patients received no internal thoracic artery (ITA), whereas only 11% of nondiabetic patients and 7.5% of diabetic patients received bilateral ITA grafts. Appropriately, propensity score matching was based on preoperative rather than operative factors, and the impact of surgical approach on the long-term outcome cannot be discerned from the data presented. Although the impact of

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single ITA grafting on long-term survival in both diabetic and nondiabetic patients is well accepted as virtual dogma, the increasing evidence documenting a long-term survival benefit for diabetic patients with bilateral versus single ITA grafting, without increased risk of deep sternal wound infection, is compelling.^{21,22} Last, any comprehensive analysis of costs must account for not only the upfront expenses but also the costs associated with the need for additional medical care, reintervention, longevity, and quality of life. Unfortunately, it seems that the problem will be with us for a sufficiently long time to provide us with ample opportunity to focus our future research efforts toward greater clarity in these areas.

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