What is the Best Way to do Coronary Artery Bypass Grafting in Patients with Diabetes?

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Diabetes is a growing epidemic affecting nearly 387 million people worldwide [1]. Because it is a risk factor for development of coronary artery disease (CAD), [2] the proportion of patients presenting for coronary artery bypass grafting (CABG) who have diabetes has also increased [3]. Today, diabetics represent nearly 40% of all patients undergoing surgical revascularization [3].

We know from landmark trials (SYNTAX and FREEDOM) [4, 5] that CABG is the revascularization strategy of choice in diabetics with multi-vessel CAD. However, the best way to perform CABG in these patients is not known. Therefore, we conducted a study to identify the surgical techniques that minimize surgical risk and maximize long-term survival in patients with diabetes undergoing CABG [6]. For this study we mined the extensive outcomes database maintained at the Cleveland Clinic. From 1972 to 2011, first-time isolated CABG was performed in 11,922 diabetic patients. Total available follow-up was 104,516 patient-years (median follow-up 7.8 years; 25% of the survivors were followed-up for more than 13 years and 10% more than 10 years). Multivariable analyses were performed to assess the effect of different surgical techniques on hospital outcomes and long-term mortality. Surgical techniques investigated included (i) saphenous vein grafting i.e. bypassing a clogged heart artery using piece of saphenous vein from leg, (ii) single internal thoracic artery (SITA) grafting i.e. bypassing a clogged heart artery using either left or right internal thoracic artery from chest wall,(iii) bilateral internal thoracic artery (BITA) grafting i.e. bypassing clogged heart arteries using both left and right internal thoracic arteries from chest wall, (iv) complete revascularization that involves bypassing all heart arteries with ≥50% stenosis, (v) incomplete revascularization that involves not bypassing all heart arteries with ≥50% stenosis, (vi) off-pump surgery i.e. performing CABG on beating heart without the help of a heart-lung machine, and (vii) on-pump surgery i.e. performing CABG on non-beating heart with the help of a heart-lung machine. Of the 12 possible realistic combinations of these 7 surgical techniques, we aimed to identify the combination with best outcomes. Principal findings of our study include that BITA grafting was associated with 21% (68% CL, 16%-26%) and 33% (68% CL, 28%-37%) lower long-term mortality compared to SITA grafting and saphenous vein grafting, respectively. However, BITA grafting vs. SITA grafting was also associated with higher risk of reoperation for bleeding and sternal wound infections. We identified obese diabetic females with diffuse atherosclerotic burden as the patient-population who is at the highest risk of developing sternal wound infections. Complete vs. incomplete revascularization had similar hospital outcomes but incomplete revascularization was associated with 10% (68% CL, 6%-13%) higher long-term mortality. Off-pump vs. on-pump surgery had similar hospital outcomes and long-term mortality. We also found that the combination of BITA grafting with complete revascularization using off-pump technique was associated with the best long-term survival. This survival benefit was mainly driven by BITA grafting followed by complete revascularization.

Some of the limitations of the study include that it was a non-randomized observational study and patient characteristics might have influenced its findings. However, multivariable risk-adjustment was performed to account for this. Because of long time-period of the study, the applicability of results to contemporary patients may be questioned. For this, we adjusted for the date of surgery in all multivariable models. We don't know whether the deaths in the study were cardiac related or non-cardiac related.

With nearly 40 years of data from real-world patient population, this paper provides compelling evidence that BITA grafting with complete revascularization is associated with lower long-term mortality and is therefore recommended in patients with diabetes undergoing CABG. It may be best to avoid BITA grafting in obese diabetic females with diffuse atherosclerotic burden because these patients are the highest risk of developing sternal wound infections. These findings have major implications for a number of diabetic patients undergoing surgical revascularization worldwide.

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