Graft Preservation Solution Improves Endothelial Function of Saphenous Vein Grafts in Patients Undergoing Isolated CABG

Louis P. Perrault, Anne Q. Nguyen, Yohann Rautureau, Daniel Rivas, Jean-Claude Tardif, Michel Carrier.
Montreal Heart Institute, Montreal, QC, Canada.

OBJECTIVE: Vein graft failure remains an issue after CABG reducing long-term clinical outcome. In this study we evaluated the effect on endothelial and vascular functions of an intraoperative graft preservation solution (DuraGraft) designed to protect against ischemic reperfusion injury and vein graft f ailure in saphenous vein grafts of patients undergoing isolated CABG.

METHODS: Two saphenous vein grafts for each patient were randomized (within-pt design) to treatment with DuraGraft or heparinized saline (standard of care) solution for at least 15 minutes. Endothelial and vascular functions of saphenous vein grafts were evaluated by carrying *ex vivo* vascular reactivity studies in standard organ chambers. Optimal tension and maximal contractions were determined with potassium chloride (90 mM), and pre-contractions (80% maximal contraction) were achieved with phenylephrine. Endothelium-dependent relaxations were studied by characterizing concentration-response curves to acetylcholine (10^{-9} to 10^{-4} M; agonist of M_2 receptors coupled to G_i-proteins, leading to release of nitric oxide) and to calcium ionophore A23187 (10^{-9} to 10^{-5} M; receptor-independent, leading to release of nitric oxide and endothelium-derived hyperpolarizing factor). To assess the integrity of underlying vascular smooth muscle cells, endothelium-independent contractions and relaxations were evaluated with incremental concentrations of phenylephrine (10^{-9} to $3X10^{-4}$ M) and sodium nitroprusside (10^{-10} to 10^{-5} M; exogenous nitric oxide donor), respectively.

RESULTS: Segments of saphenous vein grafts were obtained and divided into 3 mm-wide rings for evaluation. There were no significant differences in levels of contraction in response to potassium chloride and to phenylephrine between groups, nor in the concentrations of phenylephrine needed to achieve the target level of contraction in saphenous vein graft rings. Concentration-response curves of the DuraGraft group demonstrated an improvement in endothelium-dependent relaxations compared to the saline group. Endothelium-independent contractions and relaxations induced by phenylephrine and sodium nitroprusside, respectively, were not altered in saphenous vein graft rings from both groups.

CONCLUSIONS: Intraoperative application of DuraGraft, a solution developed for graft preservation, demonstrated a potential benefit to protect endothelial and vascular functional integrity in saphenous vein grafts of patients undergoing isolated CABG. These data suggest that DuraGraft may reduce endothelial dysfunction associated with vein graft failure and warrant further long-term evaluation.