Use of vasodilators to overcome perioperative spasm of the left internal mammary artery and saphenous vein in coronary artery bypass grafting: Comparison of papaverine and glyceryl trinitrate/verapamil combination

Abstract

Background: Left Internal Mammary Artery (LIMA) and Saphenous Vein (SV) are two of the most commonly used conduits in Coronary Artery Bypass Grafting (CABG). Perioperative spasm of these conduits, especially LIMA, is associated with perioperative morbidity and mortality. Papaverine is the conventional vasodilator used intraoperatively to overcome the conduits spasm. Accumulating evidence linking papaverine to endothelial damage has prompted the search for alternative vasodilators. Objectives: This in vitro experimental study aimed to compare the effects of a combined solution of glyceryl trinitrate and verapamil (GV) and papaverine on isolated human LIMA and SV. Materials and Methods: Isolated segments of LIMA and SV from 14 patients undergoing CABG were cut into 3 mm rings and suspended on wire hooks in organ bath chambers. The rings were stretched to their physiological resting tensions and were then contracted by Norepinephrine (NE) 10−6 M. Cumulative concentrations of either GV or papaverine were applied to the contracted LIMA and SV rings (n = 14 for each) and relaxation responses were recorded. When maximal relaxations were achieved, the vasodilators were washed out of the chambers and NE was reintroduced to the chambers after 1 h to assess the residual relaxing effects of the vasodilators. Results: GV was more potent compared to papaverine in fully (100%) relaxing both LIMA and SV (pIC50: 6.54 ± 0.10 vs. 4.58 ± 0.05 –log M and 6.35 ± 0.08 vs. 4.62 ± 0.05 –log M; P < 0.001 for both). It also had a faster onset of effect (2.9 ± 0.8 vs. 8.1 ± 1.0 min; P = 0.004 and 2.4 ± 0.6 vs. 8.0 ± 0.09 min; P < 0.001). NE-induced contractions after vasodilator treatment were significantly suppressed compared to the initial contractions in LIMAs treated with either GV or papaverine (0.64 ± 0.05 vs. 0.31 ± 0.04 g and 0.56 ± 0.03 vs. 0.08 ± 0.00 g; P < 0.001 for both), but only in SVs treated with papaverine (0.57 ± 0.02 vs. 0.40 ± 0.06 g; P = 0.014). Residual relaxations in the vessels treated with GV were not significantly different from those treated with papaverine after removing the drugs. Conclusions: The GV solution represented a potent, rapid-acting, and safe alternative to papaverine for reversal of spasm of LIMA and SV conduits and for inhibition of postoperative spasm in LIMA. © 2017, Iranian Cardiovascular Research Journal. All rights reserved.