Traction injury during minimally invasive harvesting of the saphenous vein is associated with impaired endothelial function

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Objective: Many methods of minimally invasive surgical harvesting of the great saphenous vein have been developed because of the morbidity related to the long skin incision after traditional (open) great saphenous vein harvesting. One such method involves the use of multiple small incisions separated by 10- to 15-cm skin bridges through which the saphenous vein is harvested. Cook et al hypothesized that this method of saphenous vein harvesting might subject the saphenous vein to considerable traction forces, resulting in impaired endothelial cell function.

Methods: Four-millimeter great saphenous vein segments were obtained from patients undergoing elective coronary artery bypass graft surgery. Group A (minimally invasive surgery) consisted of 23 rings from 20 patients (age, 65.8 + 11.1 years, mean + SD). Group B (open harvesting) consisted of 33 rings from 8 patients (age, 69.8 + 8.6 years). All great saphenous vein segments were undistended and were used within 24 hours of harvesting. Isometric tension experiments were performed on each ring of the great saphenous vein by using a force-displacement transducer to measure the force of contraction in grams. Measurements included developed force after exposure to high-potassium depolarizing solution and 50 micromol/L phenylephrine and decrease in force of contraction (relaxation) after exposure to 1 and 10 micromol/L acetylcholine.

Results: There were no differences between the minimally invasive surgery and open harvesting groups in their responses to high-potassium depolarizing solution or phenylephrine: high-potassium depolarizing solution, contractions of 4.26 + 0.72 g (mean + SEM) and 3.95 + 0.38 g, respectively ($p = .70$); phenylephrine, contractions of 3.49 + 0.63 g and 2.73 + 0.39 g, respectively ($p = .41$). There was no net relaxation in segments from the minimally invasive surgery group after exposure to 1.0 or 10 micromol/L acetylcholine. In contrast, rings from the open harvesting group demonstrated relaxation of -0.41 + 0.07 g and -0.32 + 0.09 g after exposure to 1.0 and 10 micromol/L acetylcholine, respectively.

Conclusion: In undistended saphenous vein segments isolated from patients undergoing minimally invasive surgical

and open techniques of harvesting, there was no acetylcholine-mediated endothelium-dependent relaxation in the minimally invasive surgery group. Therefore, harvesting of the great saphenous vein through multiple small incisions might result in endothelial dysfunction, possibly caused by traction injury.

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