Patency of endothelial cell seeded PTFE Prostheses as Coronary Bypass compared to other Graft Materials

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Introduction:
The internal thoracic artery (ITA) and the autologous saphenous vein (SVG) are the gold standard for coronary artery bypass grafting (CABG). Alternative conduits must be chosen when autologous grafts are not available for CABG.

Methods:
12 patients (10 male / 02 female) between 62 and 78 years old with symptomatic coronary artery disease (CAD) lacking sufficient own bypass material received autologous endothelial cell (EC) seeded poly-tetra-fluoro-ethylene (PTFE) vascular bypass grafts for coronary artery revascularization. The PTFE grafts were seeded with autologous ECs in a multiple step procedure. The ECs were harvested enzymatically by 0.2% collagenase from a cutaneous vein and multiplied in cell culture using modified Dulbecco’s Eagle Medium (DMEM) and human recombinant basic Fibroblast Growth Factor (bFGF). Prior EC seeding the luminal wall of the PTFE graft 4 mm in diameter was prepared by the application of modified fibrin glue and bFGF as a matrix. Using a special rotating procedure the homologous spreading and the adhesion of the ECs onto the luminal surface of the graft was achieved after 3 to 4 hours. After 8 to 10 days of maturation under cell culture conditions the EC seedet PTFE graft was implanted using extracorporal circulation and cardioplegic arrest for bypass surgery and conventional surgical techniques. The 12 patients received 29 coronary artery bypass grafts. 5 patients had already previous bypass operations. 17 aorto-coronary bypasses were performed with the EC seeded PTFE grafts to revascularize in one case the LAD, 2x the first diagonal branch (D1), 2x the ramus intermedium (RIM), 5x the first marginal branch of the circumflex artery, 2x the circumflex artery itself and 5x the right coronary artery (RCA). All patients were re-evaluated by selective coronary angiography, angioscopy and/or intravascular ultra sound (IVUS) at least 12, 24 and 36 month postoperatively.

Results:
One patient with a Re-CABG operation died of septic multi organ failure caused by a pneumonia. One perioperative myocardial infarction occurred following the occlusion of the right ITA to the RCX and the EC seeded PTFE graft to the RCA. Another EC seeded PTFE graft to the RCA was asymptomatically occluded 20 month after the implantation. So far 4 - 36 (mean: 20.3) months postoperatively 86.6% of the EC seeded PTFE grafts are patent. In the literature the reported patency rates are 59% for untreated 4 mm PTFE grafts and 86% for the saphenous vein, 64.9% for the radial artery and 14% for bovine internal mammary artery 12 months postoperatively, 57% for the cephalic vein, 77 - 95% for the GEA and 93% for the ITA after 24 months, 41% for cryopreserved homologous saphenous vein at 2 to 16 month.
Conclusion:
4 mm autologous endothelial cell seedet PTFE vascular grafts are an alternative in coronary artery bypass surgery if the ITA or a SVG are not available.

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