Enhanced endothelialization of expanded polytetrafluoroethylene grafts by fibroblast growth factor type 1 pretreatment.

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Publication Date: 1992

Abstract:

Background. Biomaterial pretreatment with endothelial cell mitogens may enhance endothelialization. Methods. Modified fibrin glue (FG) containing 1 ng/cm² recombinant ¹²⁵I-labeled fibroblast growth factor type 1 (¹²⁵I- FGF-1), 20 mug/cm² heparin, 2.86 mg/cm² fibrinogen, and 2.86 x 10⁻² units/cm² thrombin was pressure perfused into expanded polytetrafluoroethylene (ePTFE) grafts. Grafts were interposed into infrarenal aortas of 24 New Zealand white rabbits and explanted after 0, 5, 30, and 60 minutes and 1, 7, 14, and 30 days. Residual radioactivity was determined by gamma-counting. Remaining ¹²⁵I-FGF-1 is expressed as percent of value at time 0. To determine the effect of the FG/FGF-1 on graft healing, three groups of 50 x 4 mm 60 mum internodal-distance nonreinforced ePTFE grafts were implanted in the aortoiliac position of 12 dogs. Group I (n = 12) contained the complete modified FG, group II (n = 6) contained FG with heparin but no FGF-1, and group III (n = 6) contained untreated identical ePTFE. Tritiated thymidine (0.5 muCi/kg) was injected intramuscularly 10 hours before explantation after 7 and 28 days for light and electron microscopy and en face autoradiography. Results. Retention of ¹²⁵I-FGF-1 showed rapid initial loss (DELTA%/DELTA min = -24.1) followed by slow loss after 1 hour (DELTA%/DELTA min = -0.03), with 13.4% +/- 6.9% remaining at 1 week and 3.8% +/- 1.1% at 30 days. Every FG/FGF-1 graft at 28 days showed extensive capillary ingrowth and confluent endothelialized luminal surfaces, not seen in any specimen of the other two groups.

Autoradiography revealed a significant increase ($p < 0.05$) in ³H-thymidine incorporation in the FG/FGF-1 grafts at 28 days versus all groups as a function of time and graft treatment. Conclusions. Pressure perfusion of an FGF-1/FG suspension into 60 mum internodal-distance ePTFE grafts promotes endothelialization through capillary ingrowth and increased endothelial cell proliferation.