Heparin immobilization reduces thrombogenicity on small-caliber ePTFE grafts.

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Background. The patency of small diameter expanded polytetrafluoroethylene (ePTFE) grafts for vascular reconstruction is impaired by acute thrombotic occlusion. Prosthetic materials are thrombogenic and cause platelet adhesion and activation of the coagulation cascade. Heparin is a potent anticoagulant drug widely used to prevent thrombosis. A new ePTFE graft with long-term bonding of heparin is now commercially available but a basic analysis of clotting parameters in humans has never been described. The present study was performed to evaluate the thrombogenicity of heparin-bonded ePTFE grafts and to compare it with standard ePTFE in a newly developed human *ex vivo* model.

Methods. Non-anticoagulated blood was drawn from antecubital veins of 10 healthy donors with a 19-G needle. The proximal end of a 60 cm ePTFE vascular graft with a diameter of 3 mm was connected to the needle, while the distal end was connected to a syringe, which was placed in a syringe pump. Every volunteer served as its own control, by using a heparin-bonded ePTFE graft on one arm, and a standard ePTFE graft on the other arm. The perfusions were performed over 6 minutes with a flow rate of 20 ml/minute corresponding to a shear rate

of 74/sec. Serial samples were taken at the distal end of the graft for determination of prothrombin fragment F_{1+2}, fibrinopeptide A (FPA), and P-selectin expression on perfused platelets. Fibrin deposition and platelet deposition were studied using Scanning Electronic Microscopy (SEM).

Results. FPA production over time was significantly reduced on the heparin-bonded ePTFE grafts compared to standard ePTFE grafts ($p<0.05$). There was no increase in the production of F_{1+2} or P-selectin over time on either type of graft. SEM scanning showed platelet deposition and fibrin formation on standard ePTFE grafts, while no platelets or fibrin were observed on heparin-bonded ePTFE grafts.

Conclusion. Heparin immobilization substantially reduces thrombogenicity of small diameter ePTFE in a newly developed human *ex vivo* model. This may be an important improvement of ePTFE, hopefully resulting in better patency rates for vascular reconstructions.