In vitro-lined endothelium: Initial integrity and ultrastructural events.

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Abstract:

Background. The early fate of in vitro-endothelialized prosthetic vascular grafts was assessed in the nonhuman primate. Methods. Each of 17 male chacma baboons received a control and a confluently endothelialized 4 mm polytetrafluoroethylene graft in femoro-femoral positions (8.2 +/- 0.8 cm). All experimental grafts were precoated with fibrinolytically inhibited fibrin glue and lined with cultured autologous endothelial cells (EC) from the external jugular vein. The average time period needed to obtain first- passage mass-cultures sufficient for preconfluent graft endothelialization was 19.8 +/- 5.2 days. Before implantation in vitro-lined grafts were kept in culture for another 16.1 +/- 4.3 days to achieve complete confluence and maturation of the EC cytoskeleton. Results. After 9 days of implantation, endothelial-lined grafts still showed a confluent endothelium that was free of any fibrin deposits. However, the EC density was significantly lower than at implantation (39.7 +/- 7.6 x 10³ versus 59.9 +/- 8.5 x 10³ EC/cm²; $p < 0.05$), and occasional 10-mum-wide intercellular gaps with adherent platelets and leukocytes were visible. Transmission electron microscopy showed leukocytes and cell debris in the underlying fibrin glue. After 4 weeks of implantation, the endothelium of experimental prostheses had regained a high cell density (72.7 +/- 10.5 x 10³ EC/cm²) with a mature and well-differentiated morphologic appearance. At both observation periods, the surface of control grafts showed a wide range from fibrin deposits to an amorphous protein coverage containing spread platelets. Conclusions. The endothelium of in vitro-endothelialized vascular prostheses remains confluent after implantation and is nonthrombogenic in spite of a moderate initial cell loss.