

Fibrin glue containing fibroblast growth factor type 1 and heparin decreases platelet deposition.

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Abstract:

BACKGROUND: The early success rates of endarterectomy and angioplasty are influenced by the thrombogenicity of the deendothelialized surface. We previously reported decreased platelet deposition after 30 and 120 minutes and after 28 days on expanded polytetrafluoroethylene (ePTFE) grafts coated with fibrin glue (FG) containing fibroblast growth factor type 1 (FGF-1) and heparin in canine aortoiliac bypass grafts when compared with control uncoated grafts. The FG/FGF-1/heparin coating has been shown to enhance spontaneous endothelialization at 28 days in canine ePTFE bypass grafts. The current study evaluates the thrombogenicity of this FG/FGF-1/heparin suspension applied to a balloon de-endothelialization model of endarterectomy in canine carotid arteries. **METHODS:** Nine dogs underwent bilateral, deendothelialization balloon injury to 6-cm segments of their carotid arteries. Fibrin glue (fibrinogen 32.1 mg/mL + thrombin 0.32 U/mL) containing FGF-1 (11 ng/mL) and heparin (250 U/mL) was applied to the luminal surface of one carotid artery in each dog. Both femoral arteries were circumferentially dissected but not balloon injured; one femoral artery was clamped for the same period as the carotid arteries. In the 6 acute dogs, 10 minutes prior to the restitution of flow in both carotid arteries and one femoral artery, $4 \text{ to } 8 \times 10^9$ ^{111}In -labelled autologous platelets were injected intravenously. Four-cm segments of both carotid and femoral arteries were excised after 15 or 120 minutes of circulation ($n = 3/\text{time}/\text{artery}$, 24 arteries). In the 3 chronic dogs, the radiolabelled platelets were injected 30 days after carotid injury. The carotid and femoral vessels were then excised after 120 minutes of perfusion. Radioactive platelet deposition was quantitated by gamma counting.

RESULTS: After 2 hours, the injured carotid arteries demonstrated significantly more platelet deposition than either uninjured femoral artery controls ($P < 0.001$). There was also a significant 45.2% decrease ($P = 0.008$) in platelet deposition on the balloon injured carotid arteries treated with FG/FGF-1/heparin when compared with balloon injured carotid arteries alone. At 30 days there was an insignificant trend toward decreased thrombogenicity in the FG/FGF-1/heparin treated injured carotids. CONCLUSION: Surface coating with FG/FGF-1/heparin significantly decreases platelet deposition on balloon injured canine carotid arteries after 2 hours of perfusion and may be clinically applicable in endarterectomy and angioplasty procedures. The long-term induction of reendothelialization of arterial surfaces by this technique is under investigation.