

Laser-assisted fibrinogen bonding of umbilical vein grafts.

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Publication Date: 1993

Abstract:

Despite success with autologous tissue welding, laser welding of synthetic vascular prostheses has not been possible. The graft material appears inert and fails to allow the collagen breakdown and electrostatic bonding that results in tissue welding. To develop a laser welding system for graft material, we repaired glutaraldehyde-tanned human umbilical cord vein graft incisions using laser-assisted fibrinogen bonding (LAFB) technology. Modified umbilical vein graft was incised transversely (1.2 cm). Incisions were repaired using sutures, laser energy alone, or LAFB. For LAFB, indocyanine green dye was mixed with human fibrinogen and the compound applied with forceps onto the weld site prior to exposure to 808 nm diode laser energy (power density 4.8 W/cm²). Bursting pressures for sutured repairs (126.6 +/- 23.4 mm Hg) were similar to LAFB anastomoses (111.6 +/- 55.0 mm Hg). No evidence of collateral thermal injury to the graft material was noted. In vivo evaluation of umbilical graft bonding with canine arteries demonstrates that LAFB can reliably reinforce sutured anastomoses. The described system for bonding graft material with laser exposed fibrinogen may allow creation or reinforcement of vascular anastomoses in procedures where use of autologous tissue is not feasible.