Coagulation-induced resistance to fluid flow in small-diameter vascular grafts and graft mimics measured by purging pressure.

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Abstract:

In this study, the coagulation-induced resistance to flow in small-diameter nonpermeable Tygon tubes and permeable expanded polytetrafluoroethylene (ePTFE) vascular grafts was characterized by measuring the upstream pressure needed to purge the coagulum from the tube lumen. This purging pressure was monitored using a closed system that compressed the contents of the tubes at a constant rate. The pressure system was validated using a glycerin series with well-defined viscosities and precisely controlled reductions in cross-sectional area available for flow. This system was then used to systematically probe the upstream pressure buildup as fibrin glue, platelet-rich plasma (PRP) or whole blood coagulated in small-diameter Tygon tubing and or ePTFE grafts. The maximum purging pressures rose with increased clot maturity for fibrin glue, PRP, and whole blood in both Tygon and ePTFE tubes. Although the rapidly coagulating fibrin glue in nonpermeable Tygon tubing yielded highly consistent purging curves, the significantly longer and more variable clotting times of PRP and whole blood, and the porosity of ePTFE grafts, significantly diminished the consistency of the purging curves. © 2013 Wiley Periodicals, Inc. J Biomed Mater Res Part B: Appl Biomater, 101B: 1367-1376, 2013.