Reduction of platelet adhesion and fibrinous layering by small-diameter polyurethane grafts featuring a very open luminal surface

G. Soldani[1], P. Losi[1], M. Bernabei[1], A. Dyrda[1], V. Vanini[1], S. Burchielli[2], G. Taddei[2], G. Barsotti[2], F. Bernini[2], D. Magnozzi[2], L. Taddei[2], S. Lombardi[3],

1. *Istituto di Fisiologia Clinica (C.N.R.) - Section "G.Pasquinucci" hospital, – 54100 Massa, Italy*
2. *Istituto di Fisiologia Clinica (C.N.R.) - Section "Experimental Pathology" – 56100 Pisa, Italy*
3. U.O. Immunologia ASL 1 Massa-Carrara, Italy

INTRODUCTION - Research work demonstrated that the patency and long-term wound healing characteristic of a small-diameter vascular graft (SDVG) is both affected by the chemical nature of the material used for graft fabrication and by the porosity of its structure. To improve the patency of SDVG we developed of a "spray, phase-inversion" (SPI) graft fabrication technique able to produce polyurethane grafts featuring a highly porous luminal surface.
OBJECTIVE - The aim of our work was, first, to quantitatively measure *in vitro* the interaction of platelet (PLT) with various grafts luminal surface microgeometry and, second, to develop an appropriate animal model to verify grafts performance *in vivo*.
METHODOLOGY - *In vitro* experiments were performed at 37°C by a blood circulation test system in which the PLT activation ratio between the non-test surface and the test-surface was minimised by exposing blood to a relatively large surface area of graft. PLT interaction was evaluated by counting the absolute PLTs number at different times of circulation and by flow cytometry using CD41 antibody against GpIIb/IIIa antigen and CD62P antibody against P-selectin. PLT β-thromboglobulin (β-tg) release reaction was evaluated by a β-tg ELISA kit. *In vivo* experiments involved the use of the external pig carotid artery model, in which a 7-8 cm long graft was implanted according to the by-pass technique. Optimal haemodynamic performances was obtained considering a double end-to-side anastomosis, using 7/0 polypropilene or PTFE everting suture.
RESULTS - *In vitro* results showed that PLTs adhesion is significantly reduced (15% against 45%) by a very open luminal surface structure (about 80% of void area) respect to a close structure. Preliminary *in vivo* results, in acute experiments, showed grafts pulsation similar to native carotid artery and a thin fibrinous layering on the luminal surface.

Key word: small-diameter vascular graft, polyurethane, porosity