NOVEL DUAL-ACTION COATING FOR VASCULAR GRAFTS

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INTRODUCTION

Surgical revascularisations (CABG/distal peripheral/AV shunts) are performed with autologous arteries and/or veins due to poor clinical patency results of commercial small-calibre (<5mm ID) vascular prostheses (ePTFE/PET), mainly due to early thrombosis and late intimal hyperplasia. [1] Therefore we have developed a dual-action coating which is anti-thrombogenic and endothelial cell-favouring.

METHODS

Our dual-action coating is based on cell-favouring layer-by-layer (LbL) coating with end-point attached heparin. The coating was applied to small calibre, micro-porous, degradable polycaprolactone (PCL) electro-spun vascular grafts and patches and compared to uncoated samples. [2] *In vitro* 6mm patches were tested for coagulation tests (thrombin time/partial thrombin time/anti-Xa assays) and thrombin generation tests up to 7-days. Cell cultures were performed up to 7 days with endothelial and smooth muscle cells (spindle and rhomboid). *In vivo* uncoated and coated, 2mm ID vascular grafts were implanted in 18 rats in the abdominal aorta and followed up to 1, 3 and 12-weeks (n=3 per coating and implantation duration) [3].

RESULTS

The *in vitro* coagulation tests showed heparin (anti-Xa) in the coated patches and no thrombin generation. The uncoated patches showed no heparin, clot formations and high thrombin generation (high levels of EPT (nmol/l/m)) Fig.1. Higher endothelial cell proliferation on the coated patches were found at 7-days in cell culture as well as a reduction of smooth muscle cells. Fig. 2. The *in vivo* animal tests showed 100% patency in the coated grafts and one occlusion in the uncoated grafts. The endothelialization was faster and confluent at 12 weeks in the coated compared to the uncoated grafts.

DISCUSSION

The *in vitro* and *in vivo* anti-thrombotic and endothelial cell proliferating effects on micro-porous, degradable, vascular grafts of our novel dual-action coating have shown promising results. As future perspectives, the same approach will be used on ePTFE grafts which would allow their application for small calibre revascularization procedures such as coronary, peripheral vascular and access surgery for hemodialysis. Furthermore, such a coating could be applied to all MedTech devices in contact with blood.

Figure 1

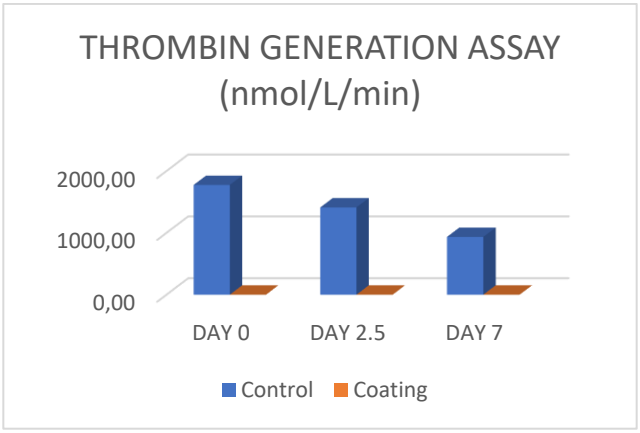
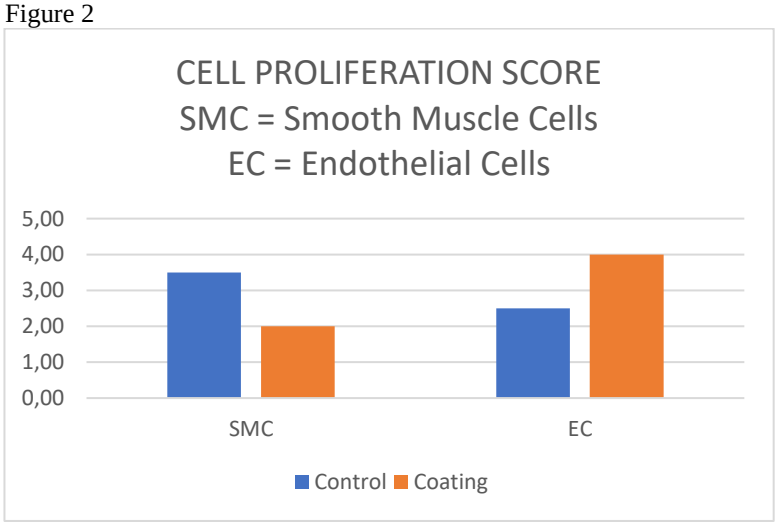


Figure 2



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