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The in vitro mechanical properties of small diameter Poly(vinyl) alcohol hydrogel (PVA) plus dextran (Dx) based vascular grafts

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Introduction

Artificial vascular grafts of small diameter is a fluorescing line of investigation The mechanical properties of PVA were never characterized *in vitro*. It was our objective to produce small diameter PVA grafts and characterize their physical and mechanical properties for posterior evaluation in an animal model.

Objectives

It was our objective to produce small diameter PVA/Dx grafts and characterize their physical and mechanical properties for posterior evaluation in an animal model.

Methods

PVA vascular grafts were prepared by the physical reticulation technique freeze/thawing plus annealing.

- Grafts 5 cm of length/internal diameter of 5 mm. PVA was associated to Dx 1%

Tested physical properties

- wettability and electrical charge;

Tested mechanical properties (ISO standard 7198:1998)

- burst pressure and dynamic mechanical analysis.

Results and Discussion

- wettability determined by contact angle (56.5º±0.2) and the surface was considered hydrophilic facilitating endothelial cell adhesion.
- The obtained results for the zeta potential determined a negative charge for the surface (PVA/Dx 1% - 2.1±0.5), which is sufficient to repels the also negatively charged membrane of platelets.
- burst pressure evidenced the resistance to a maximum value of inner pressure (3.8±0.3 bar) compatible values for human large arteries.
- The elasticity due to the pulsatile nature of flow in arterial conduits was measured . Young modulus the value for this artificial graft (9.8x104±4.8x103 Pa)

The physical and mechanical characteristics determined for PVA/Dx grafts are sufficient to pursue further in vivo testing in an animal model. However, it is also need a more complete mechanical characterization before that step. Suture pull-out resistance assay results is mandatory for graft characterization and will be addressed in the near future.

Table of results

Graft	Wetability	Burst Pressure	Young modulus
PVA/Dx0%	55.1±1.5	-	1.0x105±2.2x104
PVA/Dx1%	56.5º±0.2	3.8±0.3bar	9.8x104±4.8x103 Pa
PVA/Dx10%	54.7°±1.0	4.2±0.2bar	8.0x104±4.1x103

Figures

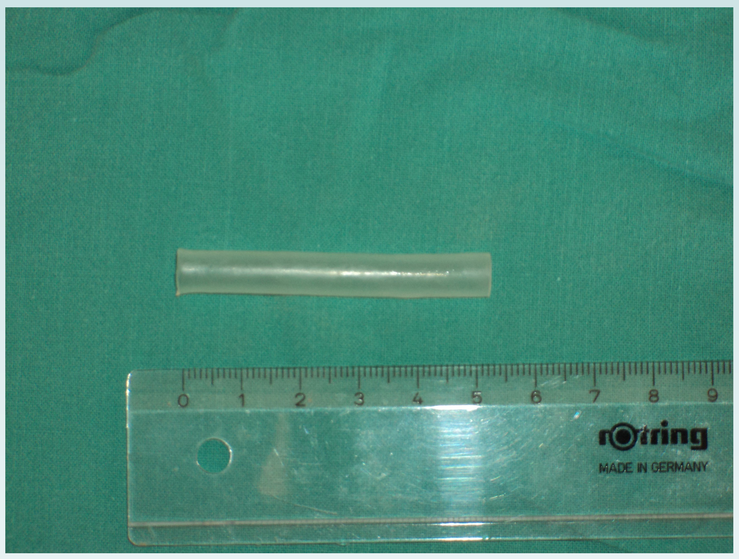

Figure 1- PVA/Dx graft 5 cm lenght/ 5 mm internal diameter.

Conclusion

The results of physical and mechanical characterization make this vascular graft a successful candidate for further in vivo characterization in a large animal model.

Ackowledgments

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