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# Editorial corner – a personal view

## Small-diameter polymer-based vascular grafts: towards a biomimetic mechanical response

*G. A. Abraham, P. M. Frontini**

Instituto de InvestigacionesenCiencia y Tecnología de Materiales (INTEMA), CONICET – Universidad Nacional de Mar del Plata, Av. Juan B. Justo 4302, B7608FDQ Mar del Plata, Argentina

Coronary arteries diseases represent almost half of the deaths worldwide caused by cardiovascular illnesses. Despite the advances in the development of bioresorbable polymer-based small-diameter vascular grafts (SDVG), the compliance mismatch between the native artery and the artificial graft remains as one of the major failure causes over prolonged periods of implantation. Meeting strict biomechanical requirements in the physiological range such as mechanical strength, compliance, suture retention strength, burst pressure, and J-shaped stress-strain response is imperative to succeeda vascular graft. Therefore, the development of fully biomimetic SDVG constitutes a key challenge.

The mechanical response of the arterial wall depends on the mechanical contribution of its components. Accordingly, the mechanical function of bioengineered polymer-based vascular substitutes should mimic the structure and composition of native vessels. In order to obtain a biomimetic response, different strategies for SDVG production are currently being explored.

Among the most interesting current approaches in this field we can mention the use of electrospinning as versatile processingtechnology and bioreactors to mimic the physiological environment. On one hand, electrospun nanofibrous multilayered structures composed of synthetic/natural biocompatible and bioresorbable polymers could offer a tailor-made solution to the mechanical mismatch problem and nanotopographical cues to promote endothelization. Moreover, surface modification could improve thrombogenicity, cell functions and performance. On the other hand,some strategies to achieve a biomechanical performance involve the use of bioreactors that provide luminal laminar flow, introducing dynamic biochemical and mechanical gradients that favor tissue ingrowth and arterial remodeling. Although SDVG have extensive potential in vascular regeneration and studies under static environments have been reported, investigations on the mechanical performance under dynamic conditions are still scarce. Only a complete evaluation of the biomechanical response of constructs that result from the scaffold colonization during cell growth as a function of the maturation time can provide relevant information for optimizing graft production and properties.

Clinically successful engineered grafts with long-term patency rates and viscoelastic properties that mimic those of human arteries should be further studied to assess both in vitro and in vivo mechanical and biological functionality of the neo-artery. Moreover, regulatory issues such as sterility, stability, and quality control testing are still lacking.

In summary, considerable work remains to optimize materials and biomolecular approaches towards real vascular tissue regeneration. Future research should definitively focus on the design of substrates able to provide complex biological signals and appropriate biological response under continuous cyclic loading in the physiological environment.

*Corresponding author, e-mail: pmfronti@fi.mdp.edu.ar