Tissue-Engineered Vascular Grafts

Abstrak

Cardiovascular diseases are still the leading cause of death in developed countries. Revascularization procedures such as coronary artery and peripheral bypass grafts, as well as access surgery represent a 2$ billion market yearly for the US alone.
Despite intense research over many decades, no clinically suitable, shelf-ready, synthetic, vascular, small-caliber graft exists. There is therefore still a quest for such a clinical vascular prosthesis for surgical revascularization procedures and access surgery.

Many approaches have been tried and are currently under investigation with promising results. These range from acellular and cell-based, stable or bio-degradable, synthetic scaffolds to biological or decellularized grafts, not forgetting self-assembly technologies for in vitro or in vivo VTE. All these approaches can be further enhanced by functionalization, e.g. with growth factors and drug elution. This updatable book aims to cover all the relevant aspects of Vascular Tissue Engineering (VTE) and novel alternatives to develop vascular grafts for clinical applications.

The chapters in this book cover different aspects of manufacturing scaffolds with various polymers, mechanical characteristics, degradation rates, decellularization techniques, cell sheet assembly, 3-D printing and autologous mandril-based VTE. All the necessary in vitro tests such as biocompatibility and thrombogenicity are reviewed. Pre-clinical assessment of in vivo experimental models include patency, compliance, intimal hyperplasia, inflammatory reaction, cellular ingrowth and remodeling. Finally, early clinical trials will be periodically updated regarding results, regulatory aspects and post-marketing quality assessment.

Furthermore, the reader should get an insight into various approaches, technologies and methods to better understand the complexity of blood surface and cell interactions in VTE. Translational research has yielded early human applications clearly showing the enormous need of research in the field to provide better solutions for our patients and this continuously updated book will hopefully become a reference in the field for life sciences.