Coronary Artery Restenosis

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Cardiovascular diseases (CVDs) are the leading cause of global mortality. Meanwhile, coronary heart disease (CAD) is the most common type and is responsible for almost half of the total deaths from CVDs (1). According to the World Health Organization (WHO), CAD will be one of the four leading causes of death in the world in 2030 and global cardiovascular deaths will increase from 17.1 million in 2004 to 23.4 million in 2030 (1). Coronary artery restenosis is a major post-surgery problem response to arterial injury and inflammation for current CVD treatment using synthetic vascular grafts. Extensive studies have been done to understand the pathophysiology of restenosis and therefore figure out the solutions to this problem.

In this issue, Zhang et al. (2) give a comprehensive summary of the physiological structure and functions of coronary artery, and the main constituents involved in the pathophysiology of restenosis development. The current clinical measures to control restenosis and improve the performance of implanted devices for CVD treatment are also addressed. Dr. Zhang and colleagues summarized that the restenosis development involves the thrombosis formation and neointimal hyperplasia, and the lack of bioactivity regulation and the mismatch of mechanical properties between the synthetic graft and host tissue further aggravate the problem. The understanding of these factors involved in the pathophysiology of restenosis would be much helpful to determine the effective therapeutic control of restenosis. Nonetheless, conventional restenosis prevention measures require extensive anticoagulant/anti-thrombotic control and have the risk of further hemorrhagic complications. An ideal drug-eluting stent (DES) polymer should be non-thrombotic, non-inflammatory, and non-toxic and should facilitate vascular healing by accelerating re-endothelialization (3). In the future, studies should focus on creating biocompatible nanoparticles with targeting moieties to allow for increased tissue-specific delivery and cellular uptake with limited toxicity upon systemic administration (4).

In the clinic, the use of bioactive synthetic grafts and tissue engineered blood vessels (TEBVs) are considered as promising approaches to provide regulation towards vascular remodeling and better biocompliance to prevent restenosis (5, 6), and a favor in vascular tissue engineering (VTE), an interdisciplinary field, has been shown in current research (7). We believe that surface or material modification of synthetic vascular grafts and stents for enhanced remodeling regulation will still be a main research direction due to the ease of synthetic graft availability and the feasibility of bulk production. The field is rapidly evolving and further studies are required to identify clinical and anatomic characteristics that may help to refine selection and tailor available therapeutic strategies in order to improve clinical outcomes.
ARTICLE INFORMATION

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