

Medical Stents: State of the Art and Future Directions

Stents have revolutionised the treatment of arterial disease. Acting as a supporting scaffold, these small mesh devices are now routinely inserted into arteries where the blood flow has become dangerously restricted. While coronary artery stenting is now relatively mature, significant scientific and technological challenges still remain, particularly in relation to arterial restenosis and late stent thrombosis. Overall however, the revolutionary success of coronary artery stenting has led to the emergence of stenting technology for the carotid, neural and peripheral vasculature. And the adaptability of the stent concept has opened horizons beyond the vasculature, with stent technology now being developed for, amongst others, pulmonary, gastro-intestinal and structural heart applications.

Given the rapid development of the field, this Special Issue is very timely and it assembles a collection of 27 review articles and original research papers from the top researchers in the field: academics from a variety of disciplines, including those with strong links to industrial application, and clinical practitioners. Through the assembled articles, the Special Issue presents a comprehensive overview and in-depth synthesis of the state of the art and future perspectives for medical stenting science and technology.

The Special Issue is structured around the following inter-woven themes that illustrate the complexity and multi-disciplinary character of the modern medical stenting domain:

- The importance of real-world clinical data in assessing stent performance
- Mathematical modelling, both computational and analytical, covering solid mechanics, fluid mechanics, fluid–structure interaction (FSI) techniques, and diffusion and transport modelling
- Modelling informed and validated by experimental data, including in vitro and in vivo data (pre-clinical and clinical)
- Drug eluting stents (DES), covering the most recent advances in DES analysis, design and performance characterisation, for coated and polymer-free stents
- Biodegradable stents, both polymeric and metallic, covering the development of modelling methods for analysis and design, and the characterisation and development of biodegradable stent materials



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- Stent coatings, covering drug release characterisation, novel coating development, and coating mechanical integrity assessment
- Stent mechanical performance in deployment and long-term fatigue loading
- Stent design optimisation and stent manufacturing
- The range of applications: from coronary applications to neural, peripheral, structural heart and pulmonary applications.

It is expected that this collection of articles will both inform and drive future scientific and technological developments for medical stenting

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