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Description

BioImplant Innovative Training Network (ITN) is a European Industrial Doctorate programme whose main goal is to provide world-class multidisciplinary training to 12 Early-Stage Researchers (ESRs) in the field of bioresorbable medical implant development. Within the programme a wide range of bioresorbable materials (both polymers and metals) as well as of applications (either cardiovascular or orthopaedic) is investigated, parted among the different ESRs. The one ITA is entitled with (in direct collaboration with Boston Scientific, Galway) is the development of a computational model of a braided bioresorbable stent that will allow to proceed with a target optimization of the design of the device itself. A brief description of the project follows.

Cardiovascular diseases (CVDs) are the leading cause of morbidity and mortality all over the world: according to the European Cardiovascular Disease Statistic, in 2017 in Europe 3.9 million deaths were caused by CVDs.
Stenting is the most common procedure to address this pathologies and different devices have been developed in the last two decades i.e. bare metal stents (BMS), drug-eluting stents (DES) and bioresorbable stents (BRS). BMS are those that at the moment performs better in terms of guaranteeing vessel sustain and patency. Nevertheless, remaining permanently in the patient, they may induce restenosis, inflammation and not allow the vessel to recover its physiological vasomotion. BRS are thought to overcome these

drawbacks: once their function is no more needed they degrade into non-toxic substances for the body.

In this setting, very few examples can be found in literature concerning bio-resorbable braided stents and computational models of these devices. From this, the idea of the present work, i.e. to build a computational model of braided bioresorbable stents that would allow to study stent behaviour for complex geometries and scenarios. Once validated, a targeted optimisation of stent design will be performable according to the stress and strain distribution obtained. Patient-specific scenarios might be taken also into consideration.

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