Crimpability of a Percutaneous Caval Valve Stent

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Abstract

Objective: To design a hooked self-expandable caval valve stent and analyze its crimpability during transcatheter implantation for the treatment of tricuspid regurgitation [TR].

Methods: This paper discusses the design and finite element analysis (FEA) of a percutaneous caval valve stent. The hooked, Nitinol based stent design was modeled using SOLIDWORKS and FEA was carried out using ABAQUS. The Nitinol material used in this study was modeled in ABAQUS as a superelastic model. The stent model was crimped to 18F.

Results: Results showed the model could be crimped to 18F and did not undergo static failure with a maximum crimping strain value of 9.2% which is lower than the recoverable strain limit of Nitinol.

Conclusion: Simulation results show that the studied stent design seemed to be good by virtue of its acceptable maximum crimping strain. This methodology will also help to optimize the crimping process of stents for other applications as well.

Keywords: Caval valve stent, Finite element analysis, Crimping, Maximum crimping strain