A new study demonstrates proof-of-concept for combining computational design and simulation tools with 3D printing technology to produce self-expandable polymer stents that can grow with pediatric patients, are biodegradable, and require only a minimally-invasive procedure for implantation. This innovative method is described in an article in 3D Printing and Additive Manufacturing.

M.S. Cabrera, B. Sanders, O.J.G.M. Goor, A. Driessen-Mol, C.W.J. Oomens, and F.P.T. Baaijens, Eindhoven University of Technology, the Netherlands, coauthored the study entitled “Computationally Designed 3D Printed Self-Expandable Polymer Stents with Biodegradation Capacity for Minimally-Invasive Heart Valve Implantation: A Proof of Concept Study.”

To overcome the current challenges in designing bioabsorbable polymer stents with the necessary mechanical properties for use in minimally invasive procedures to implant tissue-engineered heart valves in young patients, researchers have developed a novel approach to create stents with growth potential and a sufficient degree of plastic deformation. The rapid prototyping method they describe involves creating an in silico model of a conventional nitinol stent and then translating the computational simulation into prototype stents using 3D printing and a flexible copolyester elastomer. The authors evaluated the mechanical properties of the stents by subjecting them to crush and crimping tests, and performed accelerated degradation tests to assess their biodegradability.


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