

**PROCEEDINGS**

## Additive Manufacturing of Stents for the Coarctation of Aorta

Yi Huang<sup>1</sup>, Giovanni Biglino<sup>1</sup> and Fengyuan Liu<sup>2,\*</sup>

<sup>1</sup>Bristol Medical School, Tyndall Avenue, Bristol, BS8 1UD, UK

<sup>2</sup>School of Electrical, Electronic and Mechanical Engineering, University Walk, Bristol, BS8 1TR, UK

\*Corresponding Author: Fengyuan Liu. Email: fengyuan.liu@bristol.ac.uk

### ABSTRACT

Coarctation of aorta (CoA) is one of the congenital heart diseases with a proportion of 5% to 10%, which has a prevalence of four per 10,000 babies. As the most common cardiac defect missed at routine physical exams, CoA has a high undiagnosed rate of 60% to 80% in newborns before hospital discharge. The insertion of bare metal stents (BMS) with balloon dilatation is the useful method to reopen the narrow area of aorta. However, the stented vessel has a fixed diameter and cannot grow with the age, resulting in a relative restenosis and frequent surgeries intervention, as well as series of comorbidity. This project aims at featuring and analysis of CoA in different age phases, generating a series of stents for varying ages with different sizes, which will be helpful for surgeons to therapy the patient-specific CoA. For newborns to toddlers, various types of bioabsorbable vascular stents (BVS) made from biodegradable polymers have been designed, and dynamic simulations have been conducted to optimize the designs. The stents have been additive manufactured and tested with three point bending tests. Further studies will be carried out to develop self-expanded stents with vibration amplitude control.

### KEYWORDS

Stents; additive manufacturing; the coarctation of aorta; dynamic simulation

**Funding Statement:** The authors received no specific funding for this study.

**Conflicts of Interest:** The authors declare that they have no conflicts of interest to report regarding the present study.



This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.