

182

**Impact of IABP Timing on Aortic Hemodynamics: A Computational Investigation**

M. Caruso,<sup>1</sup> M. Rossi,<sup>2</sup> P. Fratto,<sup>2</sup> G. Fragomeni.<sup>1</sup> <sup>1</sup>Magna Graecia University, Catanzaro, ITALY; <sup>2</sup>Cardiac Surgery Department, Grande Ospedale Metropolitano "Bianchi-Melacrino-Morelli", Reggio Calabria, ITALY.

**Study:** Clinical indications and benefits of intra-aortic balloon pump (IABP) are undisputed, but little is known about the impact of its timing on hemodynamics when the support ratio is decreased. Thus, the aim of this study was to investigate changes on hemodynamics in aorta and its vessels at the different frequencies of IABP assistance.

**Methods:** A computational approach was employed to carry out the investigation on a 3D patient-specific aorta model, obtained from CT images using segmentation and reverse engineering techniques. Balloon size was chosen according to the technical specifications about patients' height. The inflation/deflation behaviour was obtained with a parametric study, modeling the 1:1, 1:2 and 1:3 timing using Fourier equations. Since the 1:3 assistance was considered, three cardiac cycles were simulated in order to compare the full assistance (1:1) with the partial assistances (1:2 and 1:3). As boundary conditions, the same cardiac output was applied in the three cases.

**Results:** As the ratio is progressively decreased from 1:1 to 1:3, there was a flow reduction in the head and upper body vessels. At the same time, an increase of lower body vessels flow was observed. The cause to explain this phenomenon is to find around the time reduction of abdominal occlusion induced by IABP when the support is 1:3 if the total cardiac output remains stable. These findings, applied to clinical practice, encourage a fast coming off of IABP full support as soon as possible to increase lower body vessels perfusion.

