Numerical Analysis and Scientific Computing Seminar

Insights from computational fluid dynamic modelling for aortic arch pathologies

Massimiliano Marrocco-Trischitta
San Donato Hospital in Milan, Italy

Abstract: Objectives. To assess whether the geometrical and hemodynamic reappraisal of the Ishimarus Aortic Arch Map according to Aortic Arch Classification in Type I, II, and III, may provide valuable information regarding the suitability for thoracic endovascular aortic repair (TEVAR), and the risk of aortic dissection. Methods. Anonymized thoracic computed tomography scans of healthy aortas were reviewed, and stratified according to the Aortic Arch Classification. Twenty patients of each Type of Arch were selected. Further processing allowed calculation of angulation and tortuosity of each proximal landing zones. Data were described indicating both proximal landing zone and Type of Arch (e.g. 0/I). Also, among these 60 CT angiography scans, 15 were selected, 5 per Type of Arch, for further analysis. Computational fluid dynamics were performed to compute displacement forces, exerted by pulsatile blood flow on the aortic wall in the defined landing areas. Equivalent surface tractions were computed dividing the displacement forces magnitude of each proximal landing zone by the corresponding area. The three-dimensional orientation (x,y,z) of displacement forces was described as an upward (z direction), and a sideways component (x-y plane).

Friday, November 3, 2017, 2:00 pm
Mathematics and Science Center: W301

Mathematics and Computer Science
Emory University