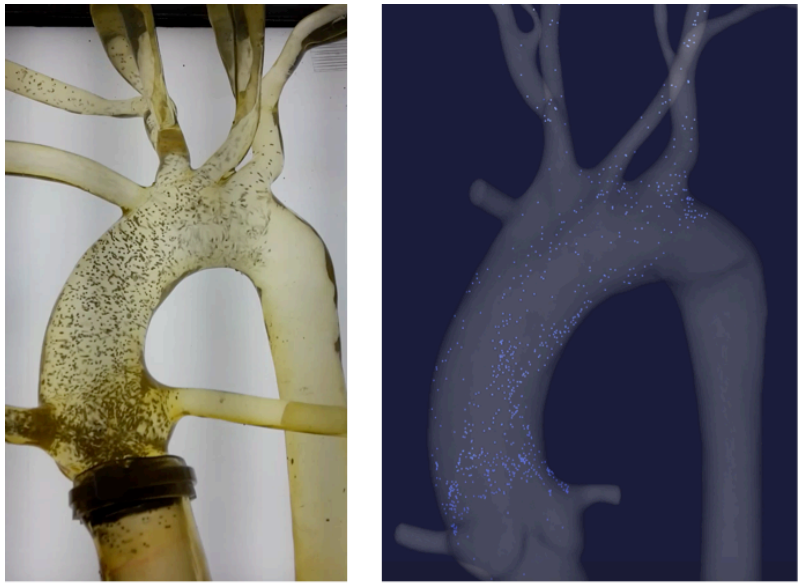
# *Hemodynamic shield for endovascular aortic embolization: in vitro and in silico analysis*

M. Conti[1,2], S. Vandenberghe[2], R. Romarowski[1], S. Morganti[3], E. Faggiano[1], S. Demertzis[2] and F. Auricchio[1]
[1] *Department of Civil Engineering and Architecture, University of Pavia. Via Ferrata 3, Pavia, Italy*
[2] *Fondazione Cardiocentro Ticino - Via Tesserete 48 - 6900 Lugano - Switzerland*
[3] *Department of Electrical, Computer and Biomedical Engineering, University of Pavia. Via Ferrata 3, Pavia, Italy*

Aortic stenosis is one of major causes of cardiovascular diseases; new endovascular solutions such as TAVI (transcatheter aortic valve implantation) has changed the way to treat such a pathology thanks to their minimally invasive features.
Unfortunately TAVI bears a high risk of stroke, due to the intraoperative dislodgment of clots and portions of plaque, which migrates along the blood-flow. Although there are some embolic protection devices already available in the market, the rate of post-TAVI neurological complication is still high.
The talk will present the outcomes of an ongoing research project aiming at modeling the distribution of emboli caused by dislodged calcifications during endovascular procedures like TAVI, and subsequently test a novel hypothesis to avoid cerebral embolism.
The in-vitro set-up is based on the mock circulatory loop proposed by Demertzis et al. [1], while the computational fluid dynamics (CFD) analyses, which resemble the in-vitro hemodynamic conditions, are based on the work proposed by Auricchio et al. [2]. Preliminary results of a) particle injection in the vitro-model of the aorta and b) particle tracking of CFD analysis of the in-vitro model are reported in Figure 1.



a) b)

Figure 1: a) in-vitro experiments; b) particle tracking based on CFD analysis.

## References

[1] Demertzis, S., Tevaearai, H., Carrel, T., & Vandenberghe, S. (2011). Aortic flow patterns resulting from right axillary artery cannulation. Interactive cardiovascular and thoracic surgery, 12(6), 973-977.
[2] Auricchio, F., Conti, M., Lefieux, A., Morganti, S., Reali, A., Sardanelli, F., ... & Veneziani, A. (2014). Patient-specific analysis of post-operative aortic hemodynamics: a focus on thoracic endovascular repair (TEVAR). Computational Mechanics, 54(4), 943-953.