**Abstract**

**What is TAVI? Why the tracking of aortic valve plane? Why the tracking of calcification?**

Transcatheter aortic valve implantation(TAVI) is a therapeutic alternative for high-surgical-risk patients with severe symptomatic aortic stenosis. 2-D X-ray angiographic and fluoroscopic images are typically used to guide TAVI procedures, for which contrast agent needs to be injected from time to time to make the anatomy of the aortic root visible under X-ray. Exact valve placement is crucial during the intervention, also, the contrast of fluoroscopic images is generally limited to minimized the radiation exposure for the patient and the physician. Advanced visualization and augmented reality involving patient-specific 3-D models of the aorta can greatly facilitate the relatively complex TAVI procedures by providing a more realistic anatomy of the aortic root. In this paper, the issue of aortic valve calcifications tracking in fluoroscopic images is presented. We propose a new method based on the *Tracking-Learning-Detection* approach, applied to the aortic valve calcifications in order to determine the position of the aortic valve plane and 2-D/3-D fusion in intra-operative TAVI images. (Contributions). The approach has been evaluated on 18 TAVI procedures. Edwards SAPIEN and CoreValve were implanted in 12 and 33.33% of patients, respectively. The TAVI approaches used were transarterial (transfemoral: 66%; subclavian: 5%) or transapical in 29%. Tracking success rate was 68.3%. Providing an absolute mean displacement error less than 10 pixels (≈2mm),the early results are satisfactory in terms of feasibility. Its suitability for the TAVI procedure has been analyzed.

**Introduction**

(The replacement aortic valve prothesis is delivered via one of several access methods: transfemoral (in the upper leg), transapical (through the wall of the heart), subclavian (beneath the collar bone) and direct aortic (through a minimally invasive surgical incision into the aorta). After reaching the correct position, the stented AVP is deployed to reach it final diameter, thus fixing the prosthesis to the aortic annulus.)

(The annular plane is sometimes visible depending on the amount of annular calcification, but often only indirect clues are provided by the position of a pigtail catheter. The pigtail catheter should be placed at the bottom of a coronary sinus.)