A Novel Real-Time Image Processor to Facilitate Transcatheter Aortic Valve Implantation. The Paieon's C-THV System

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Introduction

Paieon's C-THV system is a real-time image acquisition and processing system designed to facilitate Edwards-SAPIEN TAVI. This is a computer based workstation that connects to operating room through a DICOM interface. It processes and quantitatively analyzes two standard imaging views performed by conventional cine-angiography. The system focuses on three aspects of transcatheter aortic valve implantation - optimal valve positioning, selection of ideal prosthetic valve diameter and post implantation measurements. The aim of this study was validation and performance evaluation of Paieon C-THV system.

Materials and Methods

Patients who underwent successful balloon-expandable Edwards-SAPIEN™ TAVI between October 1, 2008 and April 30, 2009 and who had aortic angiograms suitable for analysis were assessed retrospectively using the Paieon C-THV system. Offline measurements, obtained using this system, were compared with the cine angiography and transesophageal echocardiography measurements done at the time of transcatheter aortic valve implantation

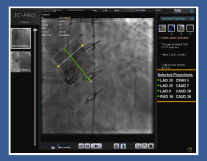

Figure 1

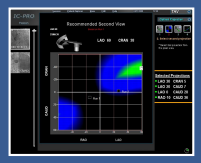

Figure 2

Figure 3

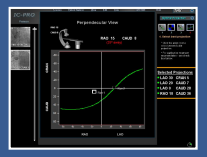

Figure 4

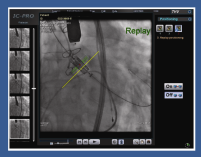

Figure 5

Figure 6

Figure 7

Figure 1. First aortic root angiogram with marking of aortic root direction.
Figure 2. Recommended second projection indicated in a graph. The next projection should be in the blue or green area.
Figure 3. Second aortic root angiogram in a projection suggested by the application with marking of aortic root direction.
Figure 4. Perpendicularity curve
Figure 5. Positioning of prosthetic aortic valve as suggested by the application.
Figure 6. Measurement of aortic sinus diameter for valve sizing.
Figure 7. Post-deployment analysis of the deployed valve (OD = outer diameter, Mid D = mid diameter, ID = inner diameter).

Results

Twenty one patients were included in the study. The suggested optimum projection for valve deployment was within $\pm 10^0$ of our valve deployment projection in 19 of 21 patients. The target line for optimal valve positioning was consistent in 17 of 21 patients with that determined by fluoroscopy, aortography and when compared to the transesophageal echocardiography guided positioning at the time of valve implantation. The prosthesis size recommended by the system was consistent with that recommended by standard transesophageal echocardiographic estimates. Post deployment measurements of inflow, mid and outflow diameters of the valve prosthesis were consistently within $\pm$ 1 mm of standard fluoroscopic measurements.

Conclusion

Initial experience with a real-time image acquisition and processing system suggests a potential role in transcatheter aortic valve implantation.