Cardiac CT in the Pre-Procedural Planning for Transcatheter Mitral Valve Replacement


Background

- We propose a simple method of post-processing 4-Dimensional Cardiac CT for the pre-procedural screening, planning and follow up imaging for Transcatheter Mitral Valve Replacement (TMVR) in the setting of mitral annular calcification (MAC)

Methods

- We retrospectively reviewed Cardiac Computed Tomographic Angiography (CT) imaging performed prior to mitral valve surgery in patients with MAC at The Heart Hospital Baylor Plano, Plano, TX
- A contrast based 4D-CT was performed on a GE 256-Revolution CT scanner (GE Healthcare, Waukesha, WI, USA), and the images were then transferred to an advanced workstation capable of image post-processing and manipulation
- Using multiphase analysis, the best systolic and diastolic phases were selected, and used for further post-processing
- Initially using multi-planar reformats, the mitral annulus plane was defined and aligned
- Using enhanced 3D rendering to better characterize MAC, images were generated with short axis and long axis views to portray suitability of the MAC distribution for TMVR
- Mitral annulus was sized next (perimeter, area and average diameter)
- Septal-mitral annulus distance and septal thickness were obtained to gauge the LVOT clearance and to plan for septal debulking to make space for the left ventricular part of the deployed TMVR

Results

- From Sept. 2015 through Oct. 2016; 7 patients with MAC underwent 4D CT imaging prior to port access mitral valve replacement with Sapien 3 Transcatheter Heart Valve (Edwards LifeSciences, Irvine CA)
- The mean age was 79.1 years and all patients were women
- 3 patients were undergoing mitral valve surgery for mitral stenosis and 4 for combined mitral stenosis and regurgitation
- Utilizing the pre-procedural planning information, all patients successfully underwent the procedure
- The mitral annulus sizing helped in selecting the valve size and correlated with balloon sizing during procedure
- The septal-mitral annulus distance, septal thickness and valve size mannequin embeds were very useful in surgical planning and helped avoid LVOT obstruction

Conclusions

- TMVR in the presence of MAC is performed by a variety of approaches, and pre-procedural Cardiac Computed Tomographic Angiography (CT) planning is crucial for the success of the procedure
- We propose an algorithm using 4DCT for mitral annular sizing as well as septum and LVOT evaluation to maximize successful TMVR
- This algorithm was utilized in 7 consecutive patients with successful procedures in all

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