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Role of Multi-modality Imaging Techniques in Selecting Size of Prosthesis for Transcatheter Aortic Valve Implantation

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Introduction

Transcatheter Aortic Valve Implantation (TAVI) has become a well established alternative treatment for severe aortic stenosis in patients who are considered inoperable or high risk for conventional open heart surgery. Appropriate prosthesis selection is of paramount importance in succeeding the procedure and avoiding the complications. Oversizing may increase the risk of aortic rupture and atrio-ventricular block necessitating pacemaker implantation. On the other hand, undersizing may result in significant peri-prosthetic aortic regurgitation or increase the chance of device dislodgement. Unlike surgical aortic valve replacement where sizing of the aortic annulus could be done under direct vision, TAVI procedures rely heavily on different cardiac imaging techniques to provide information on aortic annulus dimension.

Objectives

We report our experience on multi-modality imaging techniques on procedural preparation and peri-operative outcomes.

Methodology

From December 2010 to October 2012, 19 patients (11 male, 8 female) with symptomatic severe aortic stenosis underwent TAVI procedures. Severity of aortic stenosis is assessed by both transthoracic (TTE) and transesophageal echocardiogram (TEE). Aortic annulus diameter measurement is required for determining the size of prosthesis (CoreValve) to be used. Currently three different sizes of CoreValve are available (26mm, 29 mm and 31 mm) and guideline on size selection is provided by the manufacturer. All patients had TTE, TEE and cardiac computerized tomography (CT) for determination of aortic annulus diameter. The relationships of these measurements with the final size of CoreValve selected, and the peri-operative complications are analyzed.

Result

TTE and TEE aortic annulus measurements were available for all patients while CT

measurements were not available in 2 patients prior to the procedure. The agreement rate of predicted versus actual CoreValve size were 73.7%, and 84.2% for TTE and TEE respectively. For CT measurements, agreement rate were 47.1% and 29.4% for CT minor diameter and CT major diameter alone, respectively. This was improved to 70.6% when CT mean diameter was used. In 5 patients with CT aortic annulus perimeter reported (in more recent period of TAVI program) prior to the procedure, 4 (80%) were in agreement with actual CoreValve size implanted while the remaining one was considered undersized. 11 out of 17 (64.7%) patients had TEE and CT mean diameter predicted CoreValve size agreed with each other. There was no aortic rupture or device dislodgement in all patients. Two patient (10.5%) developed conduction disturbance (one atrioventriular block, and one paroxysmal atrial fibrillation with new onset left bundle branch block) requiring permanent pacemaker implantation. None of these CoreValve implanted were considered oversized by both TEE and CT mean diameter measurement. On the other hand, 2 patients (10.5%) developed periprosthetic aortic regurgitation of more than mild degree prior to discharge; in whom one of the prosthesis was considered undersized by CT mean diameter, whereas the other prosthesis was considered appropriate size by both TEE and CT mean diameter. Conclusion: The performances of TEE and CT in appropriate CoreValve size selection are comparable. In addition, each of these imaging provides unique and yet complementary information in overall management of patient undergoing TAVI procedure. Collaboration between cardiac imaging specialists from different departments is the key to achieve optimal results.