

## Tailoring TAVI in Asia: insights from MSCT



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Clinical outcomes from transcatheter aortic valve implantation (TAVI) have improved remarkably over the last decade and have the potential to surpass those associated with surgical aortic valve replacement (SAVR)<sup>1,2</sup>. Such success can be attributed to a number of key advances, including physician experience, device iteration, and patient selection. The latter infers choosing the most appropriate patient for the procedure and, more importantly, assumes the application of the optimal procedural strategy for each case. In this regard, the introduction of three-dimensional (3D) multislice computed tomography (MSCT) for transcatheter heart valve (THV) sizing and procedural planning has been revolutionary.

THV sizing with 2D transoesophageal echocardiography is sub-optimal. This strategy increases the rates of significant paravalvular leak, post-implantation balloon dilatation, and yields longer and more complex procedures<sup>3</sup>. It has been suggested that 3D transoesophageal echocardiography can provide similar annular measurements to MSCT; however, our group's experience with this technique has been disappointing<sup>4</sup>. Moreover, MSCT provides much more than THV sizing alone. A good quality CT data set can determine the most appropriate vascular access route, provide crucial information on coronary height, sinotubular junction and sinus of Valsalva width, aortic root angulation, and implant plane. These elements impact on the selection of the type and size of the transcatheter prosthesis.

In this issue of AsiaIntervention, Watanabe et al present a retrospective observational comparison of the MSCT-measured dimensions of the aortovalvular complex between Asian (Japanese) and European (French) TAVI populations<sup>5</sup>. As expected, the authors confirm significantly smaller and more elliptical annular dimensions in the Asian cohort: short and long annulus diameter, perimeter and area were between 11 and 20% smaller in Japanese patients.

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The height of the coronary arteries from the annular plane and both the sinotubular junction and sinus of Valsalva dimensions were similarly reduced in the Asian cohort. Consequently, Japanese patients required smaller Edwards THV (Edwards Lifesciences, Irvine, CA, USA) sizes than their French counterparts: the 23 mm Edwards SAPIEN valve was appropriate for 51.1% and 12.7% of the Japanese and French cohorts, respectively. The authors also found no between-group differences in the quantification of aortic valve calcification.

The authors of this Japanese-French collaborative should be commended for undertaking this important study that has considerable implications for both patient selection and valve development in Asia. What are these implications?

First, small anatomy (annulus, sinus of Valsalva, coronary height) has been associated with a higher incidence of serious complications

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such as annular rupture and coronary occlusion<sup>6,7</sup>. Thus, these adverse events could occur more commonly in Asian TAVI cohorts, particularly if the industry-recommended sizing parameters are not respected. In contrast, smaller annular sizes could be potentially advantageous in the longer term, as the incidence of more than mild paravalvular leak – a factor associated with poor long-term survival – is less frequently observed in smaller annuli<sup>3</sup>.

Second, as demonstrated by Watanabe et al, annular size correlates well with body surface area, which is closely associated with femoral artery dimensions<sup>8</sup>. While the current study did not compare the dimensions of the peripheral vasculature between continents, it is intuitive that Asian patients have smaller iliofemoral anatomy than European or American patients. One could therefore speculate that there may be a higher risk of vascular complications in Asian TAVI candidates.

The smaller anatomy of Asian TAVI candidates has potential implications for THV development/proliferation in Asia. Smaller annuli will require smaller valve sizes and it remains to be seen whether established THV manufacturers will develop smaller device sizes for the Asian market. Unfortunately, the retrospective nature of the study by Watanabe et al resulted in the exclusion of patients with annular sizes that were deemed too small for TAVI during the enrolment period – the CoreValve (Medtronic, Minneapolis, MN, USA) and 20 mm Edwards SAPIEN XT valve were approved in Japan in March and May 2015, respectively – and therefore does not provide information on the true spread of annular sizes in Japanese patients. Nevertheless, two THV devices specifically developed in Asia have introduced valve sizes geared towards smaller anatomy, namely the J-Valve™ (JieCheng Medical Technology Co., Ltd., Suzhou, China) available in sizes 21, 23, 25, 27 mm, and the MicroPort (MicroPort Inc., Shanghai, China), available in sizes 21, 23, 27, 31 mm. Currently available Venus valve (Venus MedTech Inc., HangZhou, China) sizes are 23, 26, 29, and 32 mm. While reducing the calibre of THV delivery systems has been a real challenge, the recent availability of new-generation THVs with low-profile delivery systems bodes well for the development of TAVI in Asia. The 14 Fr CoreValve Evolut R (Medtronic) and Edwards eSheath (Edwards Lifesciences) systems will facilitate the treatment of a greater number of patients using transfemoral access<sup>9,10</sup>.

The findings of the current study relating to aortic valve calcification are interesting. A recent analysis found significantly greater valve calcification in Chinese compared to US TAVI patients<sup>11</sup>. A similar analysis between Korean and European TAVI patients found no difference in calcium quantification<sup>12</sup>. Therefore, there may be regional differences in valvular calcification due to environmental factors, age profile of TAVI candidates, and perhaps the method of calcium quantification using MSCT. It is noteworthy that the construction of the Venus and MicroPort nitinol self-expanding prostheses has considerably greater inflow radial strength to accommodate greater calcification.

The findings of the study by Watanabe et al are important and thought-provoking. Procedural experience in many Asian nations is

in its infancy but is on the cusp of rapid expansion in an enormous population. There remains great potential to progress the field of TAVI in Asia by learning from the experience gained internationally and tailoring this to the specific needs of the Asian population. The recent introduction of dedicated courses such as PCR-CIT China Chengdu Valves and PCR Tokyo Valves will facilitate the dispersion of important educative content. Concurrently, the development of home-grown THV technologies in Asia represents an exciting benchmark on the road to TAVI adoption in Asia.

## Conflict of interest statement

D. Mylotte and N. Piazza are proctors and consultants for Medtronic and MicroPort. S. O'Connor has no conflicts of interest to declare.

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