

## Editorial



# Is a Low Dose Computed Tomography Angiography Protocol Feasible in Terms of Maintaining Adequate Diagnostic Image Quality for TAVR Candidates?

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Transcatheter aortic valve replacement (TAVR) has been initiated first for inoperable patients with severe aortic stenosis (AS) and prohibitive comorbidities, then in high-, intermediate-, and, more recently, low-risk patients. Nowadays, TAVR has been established as the first-line treatment method for symptomatic patients of any age with severe AS and a high or prohibitive surgical risk.<sup>1)</sup> Computed tomography angiography (CTA) allows pre-procedural comprehensive evaluation for TAVR including coronary artery, aortic valve, aortic root, entire aorta, and vascular access site suitability at the same time.<sup>2)</sup> Accordingly, large amount of contrast medium is mandatory for obtaining good quality of images from the subclavian arteries to the femoral arteries. Chronic kidney disease is a common underlying disease in patients with severe AS and is significantly associated with aggravation of renal function in case of excessive use of iodinated contrast medium during both the pre-TAVR planning and TAVR procedure.<sup>3)4)</sup> Therefore, reducing the use of contrast medium for pre-procedural CTA imaging in TAVR is required for prevention of deteriorating renal function and worsening clinical outcomes in patients with renal dysfunction.

With the technical advances in computed tomography (CT) technology, lowering the tube voltage leads to a greater attenuation level of iodinated contrast medium and high attenuation difference between iodine-containing arteries and poorly enhanced surrounding tissues. Therefore, lowering the tube voltage reduces the contrast medium volume but increases image noise level. A number of studies using the CTA setup combined with the tube voltage reduction and low contrast medium volume have been done in terms of maintaining adequate diagnostic image quality for TAVR candidates.<sup>5)10)</sup>

In this issue of the *Journal of Cardiovascular Imaging*, Lacy et al.<sup>11)</sup> performed a systematic literature review with 6 studies reporting on 353 patients to compare image quality for low contrast and low kV CTA versus conventional CTA in patients with AS undergoing TAVR planning. The average contrast medium volume (low dose  $51.6 \pm 14.2$  mL, conventional  $92.3 \pm 23.6$  mL,  $p = 0.001$ ) and tube voltage (low dose  $82.0 \pm 13.0$  kV, conventional  $108.0 \pm 11.0$  kV,  $p = 0.018$ ) was decreased for the low dose protocols when compared to the conventional protocols. There was no statistical difference in cardiac signal-to-noise ratio (SNR), cardiac

contrast-to-noise ratio (CNR), aortic SNR, aortic CNR, and iliofemoral SNR between the low dose and conventional CTA protocols. Overall subjective image quality was similar with high quality scores for both protocols. Authors concluded low contrast medium volume and low kV CTA protocol allows similar diagnostic image quality for pre-TAVR assessment as compared to the conventional CTA protocol.

Considering that TAVR is mainly performed on more elderly with multiple comorbidities, the primary concern is the amount of contrast medium volume rather than the radiation dose. On the other hand, if the use of contrast medium is insufficient during pre-TAVR evaluation, there may be concerns about the possibility of poor or non-diagnostic image quality for pre-TAVR evaluation. This problem can be solved using a low dose CT protocol consisting of a low tube voltage (70–90 kV), low contrast media volume, and iterative reconstruction algorithms.<sup>440</sup> A low dose CTA protocol is feasible in severe AS with renal dysfunction and continues to play an important role in the comprehensive pre-TAVR evaluation.

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#### Conflict of Interest

The author has no financial conflicts of interest.

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