

P3378

Differences in valve morphology and aortopathy between patients with bicuspid and tricuspid aortic valves: a Computed Tomography Study

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Background: Transcatheter aortic valve implantation (TAVI) has been shown safe and feasible in patients with bicuspid aortic valve (BAV) morphology. Evaluation of differences in valve morphology and aortic root dimensions in patients with BAV in comparison to patients with tricuspid aortic valve (TAV) is important for the spread of TAVI in patients with BAV.

Purpose: The present study evaluated the prevalence of BAV subtypes and the differences in valve morphology and aortic root dimensions between BAV and TAV in patients undergoing computed tomography (CT) before TAVI.

Methods: In five medical centers in Israel, 104 patients (69±13.5 years) with BAV and 105 patients (81±8.22 years) with TAV underwent CT angiography. BAV morphology was defined according to the number of commissures and raphe following Siever's classification. Functional BAV was defined as 3 cusps with focal fusion of 1, 2, or 3 commissures. Aortic root dimensions were measured at the level of the aortic annulus, sinus of Val-salva (SOV), sino-tubular junction (STJ), and ascending aorta (AA). Mem-branous septum (MS) length was measured in coronal view. The volume and agatston score of aortic valve calcification were evaluated.

Results: Type 0 account for 22% (23/104), type IA for 58% (60/104), Type IC for 9% (9/104), functional BAV for 11% (12/104). Type IB and II were not found in the studied population. As compared with TAV, patients with BAV have significantly larger aortic annulus area, SOV area, STJ area and AA Area; however, the ellipticity index of aortic annulus, SOV, STJ, and AA were similar. MS length was significantly smaller in patients with BAV compared to patients with TAV (6.4±2.3 mm vs. 8.1±2.7mm; retrospectively; P<0.001) and the volume of aortic valve calcifications was significantly higher in BAV compared to TAV patients: 2.3±1.6 ml3 vs. 1.4±1.2 ml3 retrospectively; P=0.003).

Conclusions: In Israel, patients with BAV showed more frequently type 1A BAV. BAV patients have larger aortic root dimensions than patients with TAV without difference in regard to the ellipticity index. MS length was smaller and the amount of aortic leaflet calcifications was higher in patients with BAV. These findings may have important impact on procedural outcome.