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Special considerations on TAVI implanted in bicuspid aortic valves Experience of Institute of Cardiology in Warsaw, Poland

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ABSTRACT

Since the advent of transcatheter aortic valve implantation (TAVI), bicuspid aortic valves (BAVs) have been considered relative contraindication for this procedure. Patients with BAV were excluded from the majority of large clinical TAVI trials. However, the development of the implantation technique and further studies have proven this method feasible and safe also in BAVs. Nowadays some clinicians claim that BAV should no longer be a contraindication. Nevertheless some special aspects of the unique anatomy need to be taken into consideration when qualifying patients for this procedure.

In our center since 2010 a total number of 28 patients with bicuspid aortic valve stenosis underwent TAVI.

Bicuspid aortic valve (BAV) is one of the most common congenital heart defects. It is recognized in about 0.8–2% of general population [1,2]. Among patients requiring treatment for aortic stenosis proportion of those with BAV may be as high as 20% [3]. Clinical characteristics of patients with BAV dysfunction relevantly differ from patients with tricuspid aortic valves.

Degeneration of BAVs occurs earlier in life and substantially higher percent of patients with BAV develops through life clinically significant stenosis, insufficiency or both.

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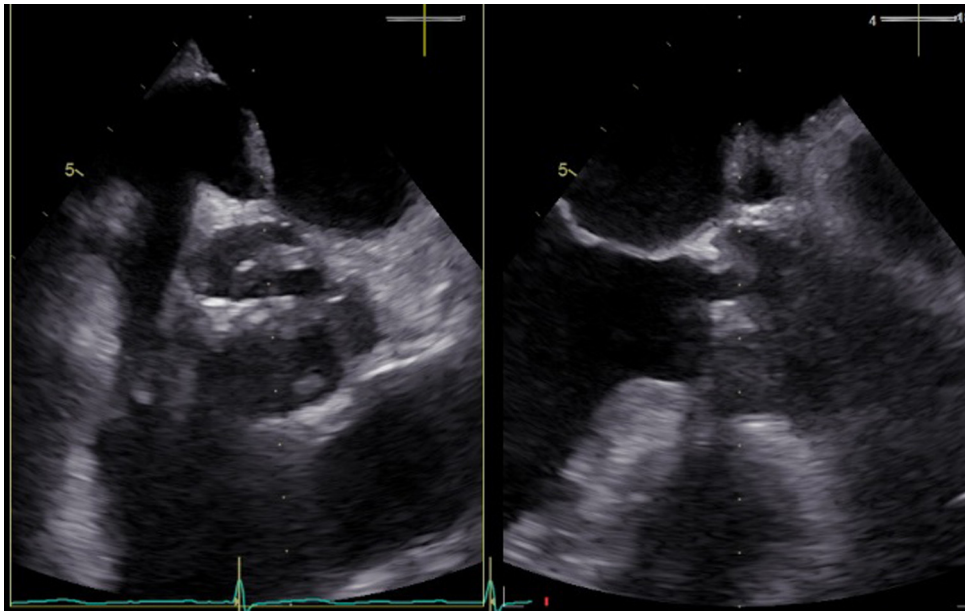

Fig. 1 – An example of BAV type 1 RCC-LCC – TEE image – transverse and longitudinal projections.

Traditionally patients with BAVs are primarily qualified for surgical aortic valve replacement or repair. It often occurs as soon as in third to fifth decade of life. Nevertheless, there is an increasing number of patients who require less invasive procedure due to severe comorbidities and/or advanced age. Many patients with BAVs disease stay symptomless until senility and clinically overt stenosis reveals so late (e.g. octogenerians) that surgical procedure risk is too high. Those may benefit from TAVI.

From anatomic point of view BAV is not a homogenous defect, but a spectrum of several developmental variants. In 2007 Sievers and Schmidtke published a classification of BAVs based on analysis of 304 surgical specimens. This classification was originally created for facilitation of surgical repair techniques, however it may also be easily adapted for TAVI, as it gives many essential information on structure of the valve. The main criterion is number of raphes, what determines one of the 3 following types: type 0 (no raphe); type 1 (1 raphe); and type 2 (2 raphes) [4]. Further, this implies the shape of annulus (round or elliptic/eccentric), predominating dysfunction (stenosis or insufficiency) and distribution of calcium. The most common type (88%) is Sievers 1 with raphe between left and right coronary cusps (71%) (Figs. 1 and 2). This type is particularly related to asymmetric annular geometry (oval shape of the annulus) and presents predominantly with stenosis (insufficiency in about 26–31% of specimens). On the other hand Sievers type 0 and type 2, which are quite rare (7% and 5% respectively) present in similar proportion with stenosis and insufficiency. Type 2 often demonstrates extremely narrow orifices upon diagnosis.

In general BAV presents with stenosis in 75% and insufficiency in 15% of cases. It was documented that stenosis develops more rapidly if the aortic cusps are oriented asymmetrically or in the antero-posterior position. Calcific and fibrotic deposits are distributed mostly in raphes and at the base of the cusp. This process is age-dependent and occurs faster in BAVs than in patients with tricuspid aortic valves [5].

BAV cannot be fully understood without assessment of aortic root pathology. Coarctation of aorta, aortic dissection and aortic aneurysm frequently coexist with BAV [6]. Such pathology may indispensably eliminate patient from TAVI and impose surgical intervention [7]. Sievers type 1 LCC-RCC may be connected to aortic coarctation, which is usually diagnosed in younger age [6].

Aortic aneurysms are approximately 85 times more frequent in patients with BAVs than in the general population and account for 8 times higher incidence of dissection.

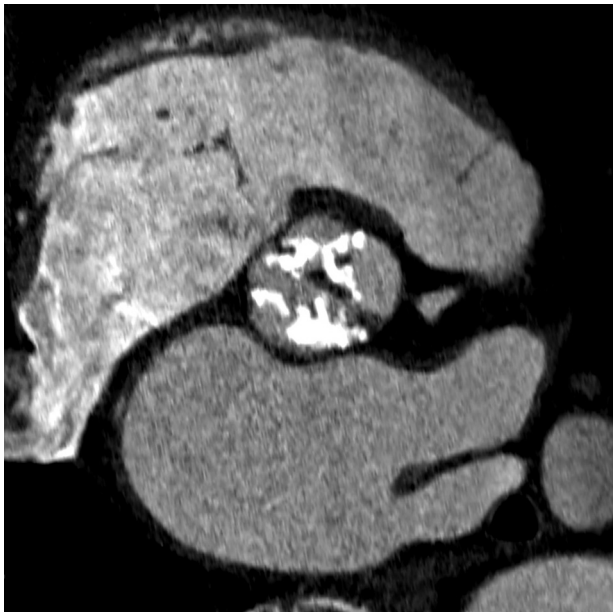

Fig. 2 – BAV type Sievers 1 RCC-LCC presented in CT. Massive calcifications within raphe and cusps visible.