Commentary: Transcatheter aortic valve implantation in morphologically complex root-aneurysms.

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The number of transcatheter aortic valve implantation (TAVI) procedures are rapidly increasing worldwide with 270,000 expected procedures in the near future within the European Union and North America [1]. Not only will TAVI inevitably expand towards a low-risk patient population but also target various other subgroups. The morphology of the ascending aorta is of great importance during therapy planning in TAVI patient's. TAVI is currently successfully performed in the presence of an aneurysm of the ascending and descending aorta, but the presence of aneurysmatic aortic root morphology is still widely seen as a contraindication for TAVI for most specialists [2].

As reported before, the entity of aortic valve dysfunction and concomitant aortopathy is, of course, rare yet it must not be neglected. Recent literature describes that up to 13.9% of patients with aortic regurgitation successfully treated with TAVI had a concomitant aortic aneurysm or dilatation [3]. Translated into everyday practice, at least one out of ten patients undergoing a TAVI procedure for aortic regurgitation features significant risk factors for periinterventional aortic complications. The sinus of Valsalva aneurysm is more frequently associated with secondary aortic valve insufficiency due to annuloaortic ectasia rather than aortic valve stenosis. Older patients are commonly unsuited for a combined surgical procedure yet above-described pathologies require immediate treatment to avoid secondary heart failure, substantial loss of quality of life and life expectancy [3,4]. Given the fact that the current evidence in the literature is still quite sparse, TAVI in complex aortic root morphology can only be considered a bailout strategy with the surgical approach remaining the gold standard [5]. The common concomitant connective tissue diseases such as Ehlers-Danlos-Syndrom or Marfan's disease should be taken into account during patient selection and case planning. Such patients warrant an even more cautious approach and additional safeguards as their aortic tissue is exceptionally fragile and prone to iatrogenic dissections and rupture.

As seen in our initial experience, correct valve sizing in patients with aortic root aneurysms is of utmost importance. Most accurate aortic annulus measurements will be derived from a multiplanar reconstruction of contrast-enhanced computed tomography images. Aortic root volume determination needs to be taken into account, especially in so called "border-line" annuli [6]. Additionally, the structural valve dynamics should be assessed by three-dimensional transesophageal echocardiography or cardiac MRI in complex cases. Multimodality imaging is the essential element to prevent various periprocedural complications, especially as this specific patient population is even more susceptible to aortic dissection, rupture, coronary occlusion or valve migration. The selection of the valve itself is an intrinsically skillful balancing act between achieving a stable valve position and complete sealing without the application of excessive radial force in order to minimize the risk for adverse events [3]. Preballooning causes additional wall stress and thus should be avoided if possible. It may be foregone entirely in cases with predominant aortic incompetence or before implantation of newer second or third generation valves. The current development and implementation of non-occlusive hollow-balloon systems may also contribute to additional safety due to its nonrequirement of rapid pacing [3]. In our experience, after meticulous valve selection, retrograde access should be obtained via the right subclavian artery - which also serves as a backup arterial cannulation site in case of conversion to open surgery. TAVI is then performed via the transapical route [3]. The transapical access itself may be used as a last resort for antegrade arterial perfusion in case of extensive and complex dissection of the ascending aorta, the aortic arch, and the proximal cerebrovascular branches.

In summary, an aneurysm of the ascending aorta and the aortic root is usually considered a contraindication for TAVI due to increased risk of adverse events. However, after careful assessment by the multidisciplinary "Heart Team", a transapical TAVI procedure may be considered in patients unsuitable for surgical repair. The success rate highly depends not only on an optimal clinical setting but also on precise risk stratification. The correct valve sizing is of paramount importance, and novel techniques such as aortic root volume determination should be taken into account if available [6].

Additional endovascular treatment of the thoracic aorta (especially the ascending aorta) via the transapical access may be performed with promising outcomes as demonstrated by Ghazy et al. during their initial case series [7].

As highlighted by our group, having various backup strategies at hand is pivotal to the outcome of such a procedure.

Upcoming studies will be needed to conclude on a recommendation for performing TAVI in patients with aortic stenosis and concomitant complex aneurysms of the aortic root or ascending aorta [3].

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