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Commentary: The depth of the virtual basal ring

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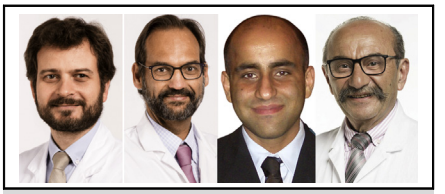

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CENTRAL MESSAGE

Deep dissection of the aortic root is needed to allow for a 360° aortic valve annuloplasty at the true depth of the virtual basal ring.

The anatomic demarcation between the left ventricular outflow tract (LVOT) and the aortic root, and thus the beginning of the arterial system, is the ventriculoaortic junction (VAJ). However, in an anatomic study in human hearts, we have demonstrated that the VAJ is rather curvilinear.[1] It crosses the base and insertion of the right coronary cusp and lays a few millimeters above the virtual basal ring (VBR; defined as the plane passing through the nadirs of each aortic cusp), in between the left/right and the right/noncoronary commissures. Thus, the VAJ is farther away from the VBR, facing the right ventricular outflow tract (RVOT). Nonetheless, it is this muscular portion of the VAJ that becomes dilated in patients with root aneurysms. Although the VAJ has to be supported during repair, it constitutes an anatomic rather than an echocardiographic or surgical landmark. In the reimplantation technique, the vascular graft is anchored to the aortic annulus at the level of the VBR. This circumferential annuloplasty helps to prevent future dilatation, as it includes and supports the VAJ 360°.

Our colleague and friend Ruggero De Paulis and his group[2] in Rome have done much in the past to further our understanding of the aortic root. Here they study and examine the aortic root after surgical intervention, hence a surgically altered anatomy. The authors have devised a clever method to examine the anatomic changes via electrocardiography-gated computed tomography scans. Nevertheless, this also represents a study weakness, as the surgical approach to the reimplantation technique differs from center to center. At our center, Dr el Khoury has taught us the importance of a deep root dissection to achieve a true annuloplasty effect at the level of the VBR (Figure 1). To perform this 360° root dissection, the RVOT is separated from the interventricular septum/LVOT to reach the VBR (El-Khoury maneuver), and the aortic annulus is completely freed and lifted from the surrounding heart, except in the area of the membranous septum.[3] With these maneuvers, the Valsalva graft can be safely seated at the level of the VBR with 12 pledgeted horizontal mattress sutures in tricuspid aortic valves. These sutures, from inside the aortic annulus, contribute to the annuloplasty effect just as much as the Dacron graft outside of the aortic annulus. It is the combination of the two that provides the annuloplasty.

The authors demonstrate that without this deep root dissection anteriorly, the graft will be seated a few millimeters above the VBR, with a tilted angle between the proximal anastomosis and the sinotubular junction, resulting in a somewhat distorted neo-aortic root. Although the authors examined patients who underwent the reimplantation technique, this is likely to occur in cases of external ring or suture annuloplasty as well.

We have demonstrated that deep root dissection with a more symmetric seating of the annuloplasty is safe and feasible.[4] Nonetheless, there currently are no data on the difference in height of the proximal Dacron graft and the impact on valve function and durability.

We have learned that mitral valve annuloplasty is an essential element of mitral valve repair, and although we do not always agree on the annuloplasty ring, we all agree

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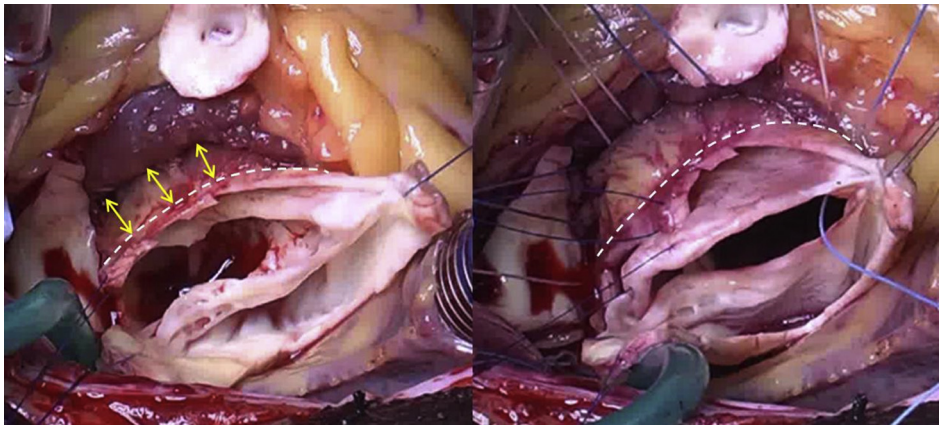

FIGURE 1. Deep root dissection: El Khoury maneuver. Separation of the right ventricular outflow tract (RVOT) from the left ventricular outflow tract (LVOT), to allow for a 360° annuloplasty at the level of the virtual basal ring (VBR; *dotted line*). The intraventricular septum is denoted by *yellow arrows*.

that the ring should sit on the mitral annulus rather than on the left atrium. *Mutatis mutandis*, we believe that the aortic valve annuloplasty should sit at the level of the VBR. This notion is particularly important in young patients with connective tissue disorders, in whom we strive to not leave any diseased tissues behind.

Herein we have concentrated mainly on aortic annular enlargement. However, aortic root enlargement also can occur in the absence of aortic annular enlargement. Our means to remedy this include remodeling or reimplantation techniques. These procedures do not necessarily fail in the future because of recurrent annular enlargement but can very well fail simply due to recurrent root enlargement with the remodeling technique, as diseased tissues at the commissures and interleaflet triangles in connective tissue disorders are left behind, increasing the risk of dilatation in the future. Thus, these patients require close clinical surveillance.

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