



Matteo Pettinari, Peter Verbrugge, and Laurent de Kerchove

## **Impact of preoperative aortic regurgitation and leaflet repair on immediate and long term outcomes of valve sparing root replacement in patient with TAV**

### **Objective**

We sought to analyze in a large multicentric registry (AVIATOR) the rate, distribution and factors influencing leaflet repair in patient with tricuspid aortic valve (TAV) having valve sparing root replacement procedure (VSRR).

We sought also to analyze the role of preoperative aortic regurgitation (AR) and leaflet repair on immediate postoperative outcomes and follow-up (if available).

These new data from a large multicentric database will precise the role and impact of AR and leaflet repair in patients undergoing VSRR procedure. These data can serve to refine indication and techniques but also help surgeons in planning VSRR surgery. Finally, this study can provide objective data to stratify VSRR complexity and help surgeon to identify cases the most adapted to their expertise level.

### **Background**

Valve sparing root replacement either with the remodeling or the reimplantation technique is an excellent surgical option to treat patient with aortic root aneurism and functional aortic valve (AV).[1] The indications of VSRR have also been extended by several experimented centers to patients with root aneurism plus aortic regurgitation (AR) with relatively similar results compared to patients without preoperative AR.[2-4]

While the use of VSRR is nowadays widely adopted by the surgical community in patients with root aneurism and functional AV; however, in the presence of AR, VSRR is much less used especially because of the lack of surgeon's expertise in leaflet repair and the belief that preoperative AR jeopardize long term AV function.



Experience has shown that leaflet repair is a necessary adjunct technique in many cases of VSRR not only in patients with preoperative AR but also in patients without AR. Effectively, the combination of root size reduction and resuspension of enlarged leaflets (due to root dilatation) can induce inadequate valve configuration after VSRR procedure with low coaptation or leaflet(s) prolapse.[5-7] Those cases will lead to early recurrent AR if appropriate leaflet repair is not applied.[8] Therefore, it is widely recommended to check systematically valve configuration after any VSRR procedure even in absence of preoperative AR. Principle of leaflet repair is to increase the coaptation height to the normal level (corresponding to an effective height of ~9 mm) and to align all leaflet's free margins to a similar level.[7, 9] The repair will consist in most of the cases in free margin shortening by central plication. In specific situations, other techniques like running suture of goretex or pericardial patching can also be used to improve valve coaptation, reinforce the free margin or close a fenestration.

The rate of leaflet repair in VSRR has been reported in many studies, but this overall rate of leaflet repair vary widely from one study to another and the factors influencing that rate were not yet analyzed in details.

The impact of preoperative AR and leaflet repair on immediate and long term outcomes of VSRR is still controversial. Large multicentric study on these topic are necessary to elucidate those important questions.

### **Study endpoints**

- To determine the parameters influencing the necessity of leaflet repair in valve sparing root replacement surgery in patient with TAV.
- To determine distribution of leaflet repair in valve sparing root replacement surgery in patient with TAV.
- To determine the rate of leaflet repair for the different degree of preoperative AR.
- To determine the impact of preoperative AR and leaflet repair on postoperative AR (intraop TEE, discharge TTE, Follow-up) and AV reoperation

### **Study design**

Source of data: Patients enrolled in AVIATOR registry.

Study design: multicentric, retrospective analysis of prospectively collected data.



Inclusion criteria: patients with TAV operated for aortic root dilatation  $\geq 45\text{mm}$  with or without AR by valve sparing reimplantation or remodeling technique.

Exclusion criteria: Acute aortic dissection, aortic valve calcification, endocarditis, other valve sparing root replacement technique than reimplantation or remodeling.

### **Analyzed parameters**

- Age
- Gender
- Connective tissues disorder
- Indication for surgery (aneurism, aneurism+AR)
- Grade of AR (0 – 1 – 2 – 3 – 4)
- Jet eccentricity
- Annulus, Root (Valsalva), sinotubular junction, ascending aorta diameter
- Ejection fraction
- Endsystolic and enddiastolic left ventricular diameters
- Leaflet geometric height (gH, for each leaflet)
- Leaflet prolapse (which one(s))
- Leaflet fenestration (which one(s))
- VSRR technique (Remodeling/ Reimplantation)
- Graft size
- Graft type
- External ring annuloplasty (+ type and ring size)
- Suture annuloplasty
- Internal ring annuloplasty (+ type and size)
- Leaflet repair by plication (which one(s))



- Leaflet repair by triangular resection (which one(s))
- Leaflet repair by running suture of goretex (which one(s))
- Leaflet repair by patch (which one(s), type of patch, patch location)
- Intraoperative eH measure
- eH on intraop TEE
- AR grade on intraop TEE, discharge TTE and on follow-up TTE
- AV reintervention
- Deaths informations

### **Statistical analysis**

- Descriptive analysis (rate of leaflet repair, distribution of leaflet repair, number of cusp repair, rate of leaflet repair for different degree of AR,...)
- Predictors of leaflet repair in VSRR,
- Impact of preoperative AR and leaflet repair on postoperative AR and reoperation,

### **Bibliography**

1. David TE, Feindel CM, David CM, Manlhiot C: A quarter of a century of experience with aortic valve-sparing operations. J Thorac Cardiovasc Surg 2014, 148(3):872-879; discussion 879-880.
2. Lansac E, Di Cetta I, Sleilaty G, Lejeune S, Berrebi A, Zacek P, Debauchez M: Remodeling root repair with an external aortic ring annuloplasty. J Thorac Cardiovasc Surg 2017, 153(5):1033-1042.
3. Mastrobuoni S, de Kerchove L, Navarra E, Watremez C, Vancraeynest D, Rubay J, Noirhomme P, El Khoury G: Long-term experience with valve-sparing reimplantation technique for the treatment of aortic aneurysm and aortic regurgitation. J Thorac Cardiovasc Surg 2018.
4. Schafers HJ, Raddatz A, Schmied W, Takahashi H, Miura Y, Kuniyara T, Aicher D: Reexamining remodeling. J Thorac Cardiovasc Surg 2015, 149(2 Suppl):S30-36.



5. Thubrikar MJ, Labrosse MR, Zehr KJ, Robicsek F, Gong GG, Fowler BL: Aortic root dilatation may alter the dimensions of the valve leaflets. *Eur J Cardiothorac Surg* 2005, 28(6):850-855.
6. Tamer S, Mastrobuoni S, van Dyck M, Navarra E, Bollen X, Poncelet A, Noirhomme P, Astarci P, El Khoury G, de Kerchove L: Free margin length and geometric height in aortic root dilatation and leaflet prolapse: implications for aortic valve repair surgery. *Eur J Cardiothorac Surg* 2019.
7. Bierbach BO, Aicher D, Issa OA, Bomberg H, Graber S, Glombitza P, Schafers HJ: Aortic root and cusp configuration determine aortic valve function. *Eur J Cardiothorac Surg* 2010, 38(4):400-406.
8. Pethig K, Milz A, Hagl C, Harringer W, Haverich A: Aortic valve reimplantation in ascending aortic aneurysm: risk factors for early valve failure. *Ann Thorac Surg* 2002, 73(1):29-33.
9. Schafers HJ, Bierbach B, Aicher D: A new approach to the assessment of aortic cusp geometry. *J Thorac Cardiovasc Surg* 2006, 132(2):436-438