The aorto-ventricular junction in aortic repair

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The surgical correction of aortic insufficiency by circumclusion


First subvalvular aortic annuloplasty
Beating Heart Right thoracotomy
11 patients, rheumatic disease (8/11)
Subcommissural plication stitches
(Cabrol stitches 1966)

Plicating U stitches at the base of the interleaflet triangles
= partial subvalvular annuloplasty

Plicating U stitches at the commissures
= partial supravalvular annuloplasty

Plication of the interleaflet triangles impairing valve dynamics
especially for bicuspid valves
significant gradient
minimal reduction in aortic annular base diameter

Useful to protect a commissural repair or as a bailout technique
Dilated aortic annulus > 25 - 28 mm

Risk factor for failure

Circumferential aortic annuloplasty improves the results

(External ring, proximal suture reimplantation, Annular stitch)

De Kerchove JTCVS 2011
Aortic valve repair, using the re-implantation technique or remodelling with aortic annuloplasty, is recommended in young patients with aortic root dilation and tricuspid aortic valves.

Rate of VSRR remains low over times (15% STS database)

6% of high risk patients
20% of low risk patients

80% of Bental procedure are for dystrophic AI
Physiological and standardized approach to Valve Sparing Root Replacement

Remodeling 1983 Yacoub
Reimplantation 1992 David
Remodeling + Aortic annuloplasty 2003
Reasons for valve sparing failures

- **Cusp prolapse**
  - Remodeling / Reimplantation
  - Reduction of the STJ
  - Symmetrical prolapse
  - eH: -3 to -4 mm

**No eH resuspension** (Eye balling repair)

**Risk factor for AI recurrence Reoperation**

- Schäfers et al., JTCVS 2006
- Jeanmart ATS 2007
- Marom JTCVS 2012
- De Paulis 2010
- Zacek with permission

- Soncini. MEP 2009
- Bierbach E JTCVS 2010
- Oka ATS 2011
- Kunihara JTCVS 2011
1. Dissection of the subvalvular plane
Inspection of cusp lesions
Geometric height

Retracted if <16 mm in tricuspid
and <19 mm in bicupid

Schäfers et al., JTCVS 2013
Standardization based on aortic annulus Ø

<table>
<thead>
<tr>
<th>Valsalva graft® Ø (mm)</th>
<th>Aortic annular base Ø (Hegar dilators, mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25-27</td>
</tr>
<tr>
<td>Valsalva graft® Ø (mm)</td>
<td>26</td>
</tr>
<tr>
<td>Extra aortic ring® Ø (mm)</td>
<td>25</td>
</tr>
</tbody>
</table>

Annuloplasty ring = down size from one size

Lansac et al JTCVS 2009
6 subvalvular « U » stitches
Alignment of cusp free edges prior Remodeling
Remodeling Root repair

3 commissures at same level
Symmetrically at 120°
Cusp resuspension after the Remodeling (effective height 9 mm)

Schäfers et al., JTCVS 2006
Subvalvular ring implantation
Root aneurysms: Bicuspid valves
(Sinus Valsalva $\varnothing \geq 45$ mm)

6 subvalvular « U » stitches

- Alignment of cusp free edges
- Effective height measurement
- Commissures at 180°
- Subvalvular aortic annuloplasty

- Root aneurysms: Bicuspid valves (Sinus Valsalva $\varnothing \geq 45$ mm)
Techniques for aortic annuloplasty
Isolated AI

Need for standardization
Internal annuloplasty ring

**Tricuspid valve**
65 patients with 62% root aneurysm.

10.8% reoperation rate (7 patients) at 2 years FU
(No KM freedom for reop)

**Advantage: place at the nadir**

**Bicuspid valve**
16 patients (43% with ascending/root aneurysm)

12.5% reoperation (2 patients): leaflets tear from annular suture (Mean FU 9 months)

**Drawbacks:** interference with leaflets
Tension on the suture (internal device)
Early results with annular support in reconstruction of the bicuspid aortic valve improve valve stability

Suture Annuloplasty Significantly Improves the Durability of Isolated Bicuspid Aortic Valve Repair. Schneider Ann Thorax Surg 2017

Advantage: fast

Drawbacks: anatomical landmarks? Safety on multicentric use and long term stability?
Functional annulus remodelling using a prosthetic ring in tricuspid aortic valve repair: mid-term results

Advantage: STJ and annulus stabilisation

Drawbacks: interference with leaflets, Tension on the suture (internal annuloplasty ring)
Points de plicature sus et sous commissuraux

Insuffisance aortique isolée (sinus de Valsalva < 40 mm)

Double annuloplastie sus et sous valvulaire aortique externe

Advantage : safe with clear anatomical landmarks

Drawbacks : Right coronary sinus nadir (reimplantation limit)
Importance of deep dissection of sub valvular plane
Double annuloplasty
For Isolated aortic valve repair
(all diameters ≤ 40 mm)

6 subvalvular « U » stitches

Alignment of cusp free edges

Placement of the open subvalvular ring below the coronaries

Cusp resuspension (effective height ≥9 mm)

Final aspect
Standardization based on aortic annulus Ø

<table>
<thead>
<tr>
<th>STJ ring Ø (mm)</th>
<th>25</th>
<th>27</th>
<th>29</th>
<th>31</th>
<th>33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra aortic ring® Ø (mm)</td>
<td>25</td>
<td>27</td>
<td>29</td>
<td>31</td>
<td>33</td>
</tr>
</tbody>
</table>

Aortic ring = down size from one size
Since 2007, calibrated annuloplasty and systematic cusp effective height assessment improve freedom from reoperation up to 98.9%.
Isolated AI repair + open aortic ring
Single or double annuloplasty?

97.4 % Freedom from reoperation at 7 years

Additional ring at STJ level (double sub and supra-valvular annuloplasty) tend to reduce recurrent of AI when compared to single subvalvular annuloplasty

Lansac et al EJTCS sept 2016
Pliable bicuspid and tricuspid valves

Aortic root aneurysm
- Valsalva $\geq 45$ mm

Supra-coronary aneurysm
- Valsalva $<40$ mm

Isolated AI
- all $\varnothing < 40$ mm

Standardized approach according to phenotypes

Remodeling
- Pliable bicuspid and tricuspid valves
  - Standardized approach according to phenotypes
    - Resuspension of cusp effective height
    - Alignment of the cusp free edges

Supra-coronary graft
- + aortic annuloplasty
  - $+$ aortic annuloplasty (annulus $> 25$ mm)

STJ annuloplasty
- aortic annuloplasty (annulus $> 25$ mm)

Cusp repair
- External aortic annuloplasty
Open Prospective International Multicenter Registry

Isolated AI and/or ascending aorta aneurysm Candidates for Aortic valve repair / sparing

Surgical indication

No

Yes

Medical Registry (In process)

Surgical Registry
Aortic valve Repair / sparing and Replacement

Evaluation of the Guidelines

Evaluation of the results

Open to all center, Join us!
AVIATOR@HeartValveSociety.org