Long-Term Results of Valve Sparing Aortic Root Replacement: Reimplantation Technique

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Disclosure Statement

• Nothing to disclose
Indication for Valve Sparing Procedures

- Aneurysms of the aortic root/ascending aorta and aortic insufficiency
- Two Methods
  - Reimplantation Technique - Tirone David Procedure
  - Remodeling Technique - Yacoub Procedure
Aortic Valve Reimplantation

- 19 pat. Reimplantation; 26 remodeling of the aortic root;
  - Repair remains stable up to 58 month
  - These type of repair provided excellent clinical results
Operative Technique

• Dissection of the aortic root
• As low as possible
• Anatomic limit: plane passing through the nadir of leaflet insertion
Isolation of Coronary Arteries

- Harvest right coronary artery
- Isolate RCA before external dissection of right sinus
Sizing of the Graft

- **Feindel-David formula:** \[ \text{height} \times 2 \times 2/3 + (2 \times \text{thickness of aortic wall}) \]
- **El Khoury technique:** 
  \text{Height of interleaflet triangle} = L/N \text{ coronary sinus}
- **De Paulis approach:** 
  \text{Annulus diameter} + 5 \text{ mm}
- **Vienna approach:** 
  \text{length of the free margin of the cusp minus 20\%}
Sizing of the graft is crucial
(I always take 28mm !?)

- Diameter of the Dacron prosthesis depends on the length of the free margin of the cusps / size of the annulus
- The longer the free margin of the cusps - the bigger the diameter of the prosthesis!
- Mismatch in sizing will result in:
  - Prolaps of the cusps: long cusps – small prosthesis
  - Central insufficiency: small cusps – big prosthesis
Subvalvular Proximal Suture Line

- Placement of subannular sutures with pledges
- R/N coronary commissure: stitches higher up to avoid heart block
- Tailoring of the tubular prosthesis recommended
Dacron Graft Implantation

- Placement of the prearranged sutures through the free margin of the Dacron prosthesis
Re-Implantation of the Valve

- Firmly pull the 3 commissures
- Attach high on the tube graft
- 4-0 polypropylene running suture around valve apparatus
Intra-OP Aspect
Coronary Button Reimplantation

- Cave: atypical location of right coronary artery in patients with root aneurysms
- Reimplantation with 6-0 polypropylene suture
- Reinforcement with strip of autologous pericardium in patients with friable tissue
Operative Result
Reimplantation of the aortic valve at 20 years

Tirone E. David, MD, Carolyn M. David, BN, Christopher M. Feindel, MD, and Cedric Manlihot, PhD

- Follow-up (mean duration): 10.3 ± 6.8 years
- Mean age: 46 ± 5 years (78% male); Marfan Syndrome: 124 patients; bicuspid aortic valve: 45 patients; type A dissection: 28 patients
- Early mortality: 1.9%; late mortality: 10.5%
- Survival rate after 15 years: 77.9%, 20 years: 72.4%
- Freedom from re-operation at 20 years: 96.9%
- Conclusion: aortic valve re-implantation provides excellent clinical results and stable aortic valve function during the second decade of observation

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Outcomes of Aortic Valve-Sparing Operations in Marfan Syndrome

Tirone E. David, MD, Carolyn M. David, BN, Cedric Manlriot, BSc, Jack Colman, MD, Andrew M. Crean, MD, Timothy Bradley, MB, ChB

- 1988-2012: valve sparing operation in 146 patients; reimplantation technique in 121 pat.; remodeling technique in 25 pat.; mean age: 35.7 years
- Mortality at 15 years: 6.8%
- Aortic insufficiency at 15 years: 7.9%; higher for remodeling than for reimplantation technique
- Valve sparing operations in patients with Marfan syndrome were associated with low rates of valve-related complications in long-term follow-up
Aortic cusp repair with Gore-Tex sutures during aortic valve–sparing operations

Tirone E. David, MD, and Susan Armstrong, MSc, Toronto, Ontario, Canada

- 1994-2007: out of 267 valve sparing procedures 64 patients had repair of one or more cusps
- Freedom from valve insufficiency > mild
  - 1 year: 100%
  - 5 years: 96.4%
  - 10 years: 86.7%
- Cusp repair by plication or Gore-tex suture had no negative effect on durability
Prolaps of a single leaflet

- Repair of prolapsing aortic leaflet with 6-0 Gore-Tex suture (mild-to-moderate prolapse)
- Triangular resection at the central area of the leaflet
- Plication of the free margin of the cusps at the central area
Survival and reoperation pattern after 20 years of experience with aortic valve–sparing root replacement in patients with tricuspid and bicuspid valves

Stefan Klotz, MD, Silke Krüger, MD, Michael Petersen, MD, Ulrich Stierle, MD, and Roland Schiele, MD

- 315 patients; mean age: 55.9 years; (225 tricuspid, 89 bicuspid)
  - Reimplantation technique: 215
  - Remodeling technique: 101

- 30 day mortality: reimplantation: 1.4%; remodeling: 2%

- No difference in long-term survival between both groups, comparable with normal population

- Reoperation at 10 years: 5.8% for reimplantation; 11.7% for remodeling

Conclusion:
- Both techniques show excellent long-term results
- Risk of reoperation might be increased in the bicuspid group (after 10 years)
Rationale of Valsalva Prosthesis

- **Mimics the natural shape of the aortic sinuses**
- **Creates** compliant aortic sinuses
- **Enables** physiologic „pulsation” of sinuses
- **Prevents contact** of the aortic leaflets with the wall of the prosthesis during opening process
Role of Sinuses of Valsalva

- Compliant nature of the Sinuses of Valsalva
- Allows commissural movement, which is critical in the mechanism of valve opening
- Important role in valve closure
- Minimizes the stresses in the leaflet
- Impact on longevity of aortic cusps
T. David’s comment to Sinus Valsalva Prosthesis

• Further complicates the performance of this operation
• Sinuses are spherical and will deform the aortoventricular junction
• Height of the sinuses may not coincide with the height of the native aortic valve commissures
• relatively high re-operation rate (10% at 10 years) is published using the Gelweave Valsalva graft.
Bentall Operation versus Valve-Sparing Aortic Root Replacement

Conclusion

• Aortic valve reimplantation technique demonstrates excellent long-term results
• Can be performed in Marfan patients
• Cusp repair has no negative effect on durability
• Reimplantation technique in patients with bicuspid valves may have higher reoperation rate after 10 years
• Remodeling technique may result in higher reoperation rate due to the lack of annular stabilization