Bicuspid Aortic Valve Repair with “Lansac” Style Ring Without Root Reimplantation

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**Case Background**

- 48 y.o. man
- 6'3", 94 kg., BMI 26 kg./m²
- **Presentation**
  - **PMH**
    - Known Asc. Ao. Aneurysm, BAV dx. 2 years earlier, followed by echo exams
    - HTN, Hyperlipidemia, anxiety, narcolepsy-no medical treatment, pleural based pulmonary nodules
  - **PSH**-non contributory
  - **Social**-15 pack year smoking history
- **Pre-op TTE**
  - LV EF 45-50%, LVEDD 5.8 cm, LVESD 4.2 cm., BAV, Mod. AI,
  - Ao root 4.3 cm. Asc. Ao 4.5 cm
- **CT with contrast**
  - Asc. Ao 4.0 cm., Ao arch 2.4 cm., DTA 2.2 cm.
  - Pleural based pulmonary nodules
- **EKG & Labs unremarkable**
- **Medications**-ASA, statin, B-blocker
Intraoperative TEE Pre-repair

AV gradients: peak 5 mm Hg; mean 3 mm Hg

Sievers Type I BAV,
Intraoperative TEE Pre-repair

No cusp prolapse
Moderate, central AI
Aortic Root Dimensions

Annulus: 33 mm
Sinus: 40 mm
STJ: 39 mm
Asc Ao: 42 mm

Proposed surgical management strategy for BAV AI repair

Aortic Annulus

- Dilated (≥ 28mm)
  - Aneurysmal Root (Sinus/ STJ) → Root Reimplantation
  - Nonaneurysmal Root (Sinus/ STJ) → Root Reimplantation Or Remodeling

- Normal (≤ 27mm)
  - Aneurysmal Root (Sinus/ STJ) → Subcommissural Annuloplasty/ Other Annuloplasty Techniques
  - Nonaneurysmal Root (Sinus/ STJ) → Subcommissural Annuloplasty/ Other Annuloplasty Techniques

External Annuloplasty Ring
Bicuspid Aortic Valve Repair

• Surgical Procedure
• Goals of Leaflet Repair:
  1. Free margin equalization (plication or resection)
  2. Optimization of coaptation zone
  3. Raphe release
  4. Annular stabilization and reduction
  5. Debridement of annular or leaflet calcification, if necessary for mobility
Bicuspid Aortic Valve Repair
Free-Margin Assessment

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Bicuspid Aortic Valve Repair
Leaflet Debulking

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Cleft Closure

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Raphae Release

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Coronary Dissection

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Bicuspid Aortic Valve Repair
Subannular Sutures, Ring Placement

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Predictive Value of TEE for Aortic Valve Repair

- TEE is strongly and independently predictive of aortic valve repairability and immediate post-op outcome

- TEE predictive of post-aortic valve repair patients at increase risk of late repair failures

le Polain de Waroux, J-B. Circulation 2007;116S1: 264-269

le Polain de Waroux, J-B. J Am Coll Cardiol Img 2009;2:931-9
Echo Evaluation of BAV Repair

• Annular Diameter reduction of 15%

• Coaptation Zone Length (≥ 5 mm, best is 10 mm)

• Level of coaptation 5-8 mm above the nadir of the cusp insertion (above the annulus)

• STJ > Annular Ratio = 1.2
  • (1.1-1.3)

• Description of residual AI jet(s)
  • Central vs. eccentric
  • < 2+ AI

• LVESd/LVEDd

le Polain de Waroux. JACC Imaging 2009;8:932-39
Intraoperative TEE Post-repair On-CPB
Intraoperative TEE Post-repair

Gradients: peak 9 mm Hg, mean 5 mm Hg
Intraoperative TEE Post-repair

Ao annulus: 26 mm  (33 mm pre)  cL:  9.4 mm

Post-operative Course

- Extubated POD #0, inotropes off POD #1
- Post-op course complicated by adynamic ileus
- Transferred to stepdown unit POD #3
- Discharged to home POD #6

- Pre-discharge TTE:
  - Unchanged LV & RV function
  - LVEDd 5.0 cm
    - Preop 5.5 cm
  - LVESd 3.6 cm
    - Preop 4.96 cm
  - Trace AI
Case Background

- 20 y.o. male, college student
- 6’1”, 90 kg., BMI 26 kg./m²
  - Palpitations, decreased exercise tolerance playing racquetball
  - Atypical CP-work-up → no ischemia
  - TTE: AI moderate, BAV, LVEDD 5.7 cm., LVESD 4.4 cm., EF 55%
  - Chest CT & MRA-no coarctation, no sign. root dilatation
- Past Medical History: Migraine headaches
- Past Surgical History: non-contributory
- Medications: ASA, B-blocker
- Social History: unremarkable
- Physical Exam
  - III/VI diastolic murmur
Intraoperative TEE Pre-repair

Sievers Type I BAV,
Peak gradient 6 mmHg.
Intraoperative TEE Pre-repair

Superior (anterior) cusp prolapse
Eccentric moderate AI
Aortic Root Dimensions

- Annulus: 32 mm
- Sinus: 35 mm
- STJ: 29 mm
- Asc Ao: 32 mm

AI VC: 0.55
Moderate

Supracoronary aneurysm vs All diameters < 4.0 cm

Adapted from Lansac, E. Eur J Cardio-Thorac Surg 2008;33:872-8
Bicuspid Aortic Valve Repair

• Surgical Procedure
  • Bicuspid aortic valve and annular repair
    • El-Khoury leaflet repair
    • Sub-annular Lansac style ring-28 mm, 360° subcoronary ring
  • S-plasty Ascending Aortoplasty

• Goals of Leaflet Repair:
  1. Free margin equalization (plication or resection)
  2. Optimization of coaptation zone
  3. Raphe release
  4. Annular stabilization and reduction
  5. Debridement of annular or leaflet calcification, if necessary for mobility
Intraoperative TEE Post-repair
Intraoperative TEE Post-repair
Intraoperative TEE Post-repair

Ao annulus 24 mm
(32 mm pre-op)

Coaptation length 6.5 mm

le Polain de Waroux. JACC Imaging 2009:8.932-39
Intraoperative TEE Post-repair
Post-operative Course

- Extubated POD 0
- Transferred to step-down unit POD 1
- Post-operative–transfused 1 UPRBC, HGB dropped <7.5, anterior mediastinal thrombus, persistent tachycardia (120’s BPM)
- Hospital discharge POD 7
Bicuspid Aortic valve Repair Concepts

- Even the free margin lengths: Plicate (or cut) the prolapsed cusp
- Annular Reduction (15%) and Stabilization with either Re-implantation (or Sub-Annular technique)
- Increase height (decrease length) of Free margin (gore-tex) ….if leaflet belly below annular plane.
- **Bottom line:** “Any purely insufficient valve with enough leaflet surface area can be repaired”
Dilemma: Is the valve & root worth saving?

“No, let’s toss it in the bucket!”

“Yes, let’s save it. What are you—a man or a mouse?!”
Bileaflet BAV repair (R/L Sievers 1) with subannular external ring stabilization in a non-aneurysmal root

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Pre-operative TEE
Pre-operative TEE
Pre-operative TEE
Raphe release
Valve analysis and free margin equalization
Cleft closure
Leaflet debulking
Dissection around the coronary arteries
Subannular sutures and ring
Post-repair TEE
Coaptation
Bicuspid Aortic Valve Repair