

# Valve-Sparing Aortic Root Replacement and Remodeling with Complex Aortic Valve Reconstruction in Children and Young Adults with Moderate or Severe Aortic Regurgitation

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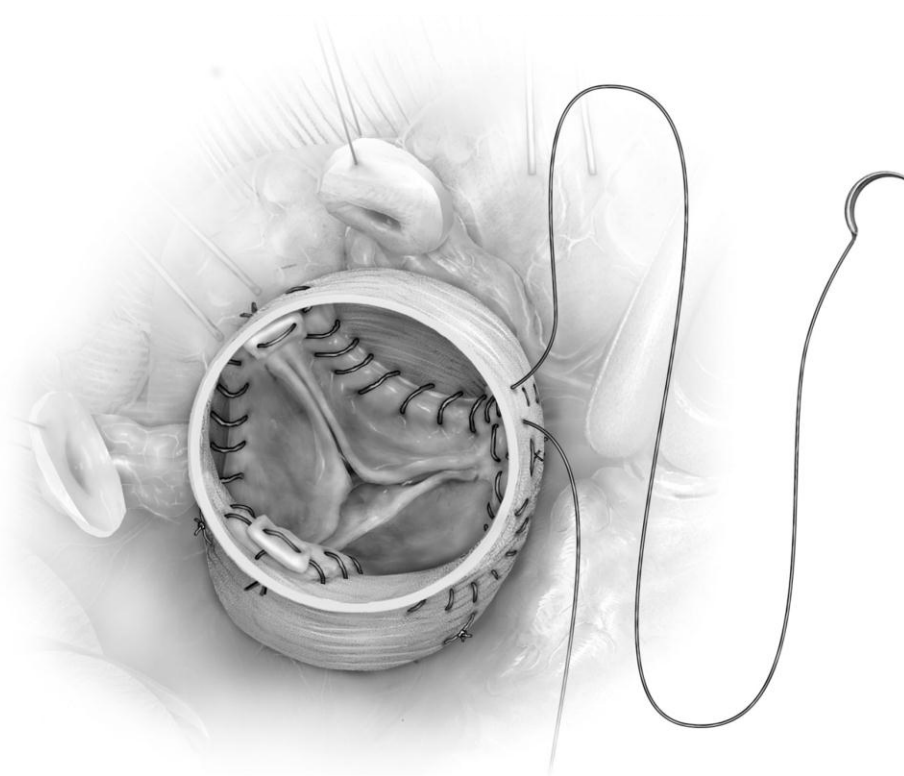


- No conflicts of interest to disclose

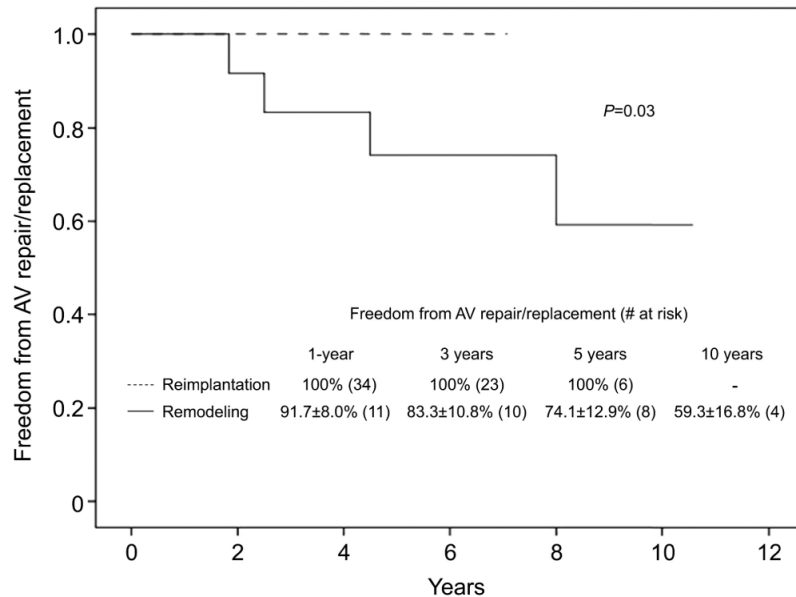
# Background

- Valve-sparing aortic root replacement has obvious advantages over
  - Composite graft root replacement
  - Homograft root replacement
  - Aortic root remodeling
- Excellent long-term results in adults

*David TE et al. JTCVS 2013;145(3  
Suppl):S22–5*



# Background



*Patel ND et al. Int Cardiovasc Thorac Surg 2011;12(3):415–9*

- Little data available in children

*Patel ND et al. Int Cardiovasc Thorac Surg 2011;12(3):415–9*

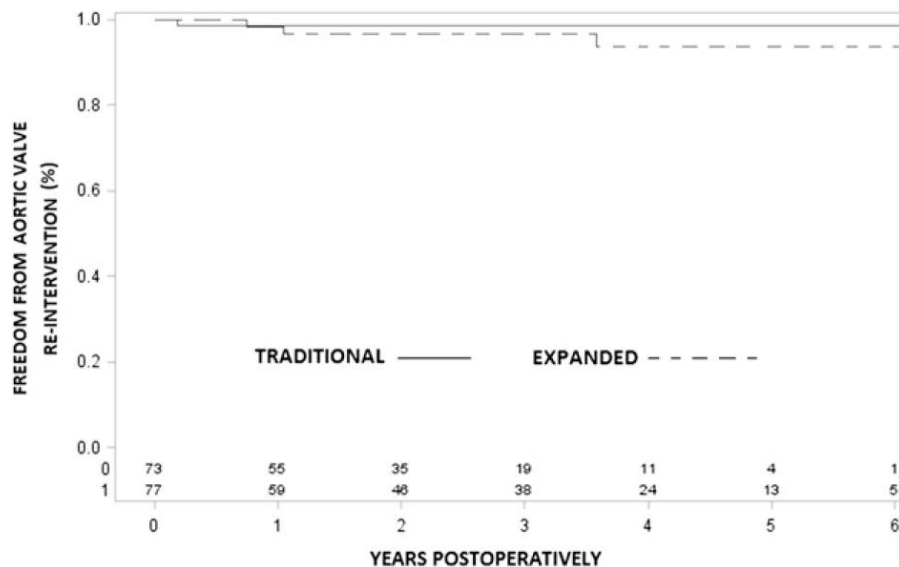
*Roubertie F et al. EJCTS 2009;35(1):136–40*

*Vricella L et al. Ann Thorac Surg 2005;80(5):1622–6*

*Rakhra SS et al. JTCVS 2012;144(4):980–1*

*Myers PO et al. JTCVS 2011;141(1):293–4*

# Background



- Aortic regurgitation or anomalous leaflet anatomy usually precludes valve-sparing aortic root procedures

*Leshnower GL et al. JTCVS 2012;143:879-84*

# Background

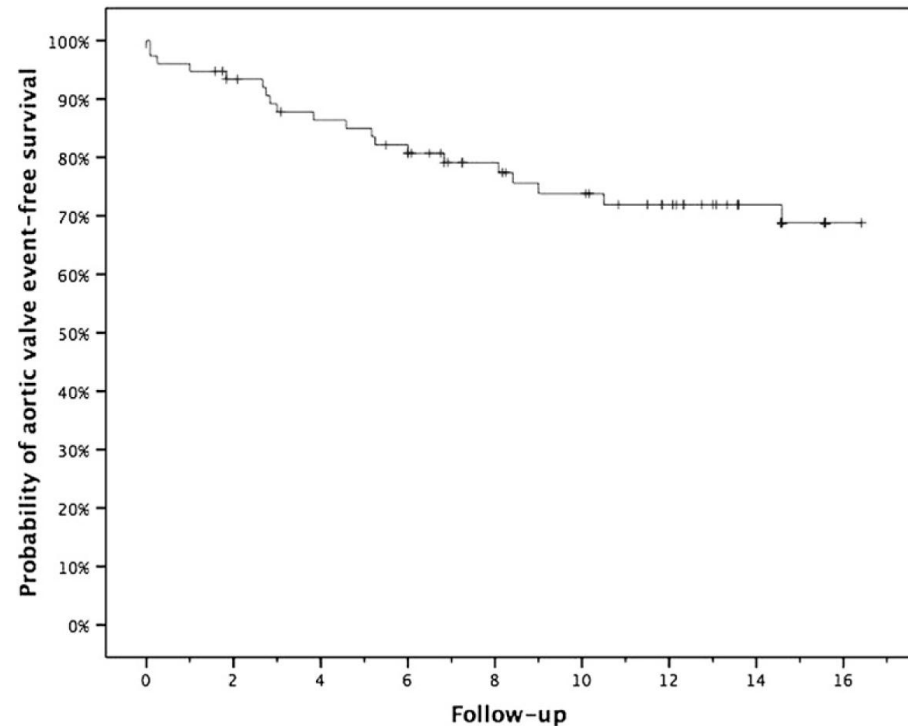
- Avoiding valve replacement in a growing child is desirable
- Aortic valve repair in children has shown excellent long-term results

*Bacha EA et al. JTCVS 2008;135(3):552–9*

*Myers PO et al. JTCVS 2010;140(4):836–44*

*Baird CW et al. Semin Thorac Cardiovasc Surg  
2012;15(1):9–19*

*d'Udekem Y et al. JTCVS 2013;145(2):461–7*



*Myers PO et al. JTCVS 2010;140(4):836-44*



# Background

- Objective
  - Review our initial experience in combined aortic root replacement or remodeling with complex aortic valve reconstruction

# Methods

- Retrospective chart review
- 2000-2012
- IRB approved
- Inclusion criteria
  - All patients with aortic root procedures and AVP beyond resuspension
- Root procedures
  - VSRR: valve-sparing aortic root replacement with reimplantation (David V)
  - VSRr: valve-sparing aortic root remodeling (Yacoub or other)





# Methods

- Primary endpoint: structural valve deterioration (SVD)
  - $\geq$  moderate AR
  - AoV reoperation

# Results

**34 aortic root and valve  
reconstruction procedures**

**13 VSRR**

**21 VSRr**

**5 Yacoub**

**11 sinus reduction or  
resection**

**5 subannular  
reduction and STJ  
stabilization by TG**

## Baseline characteristics

| Variable                   | VSRR      | VSRr       | P value |
|----------------------------|-----------|------------|---------|
| Patients                   | 13        | 21         | -       |
| Age (years)                | 14.6±8.7  | 15.9±8.9   | 0.66    |
| Median AR grade            | Moderate  | Moderate   | 0.48    |
| Connective tissue disorder |           |            |         |
| Marfan syndrome            | 1 (7.7%)  | 2 (9.5%)   | 1.00    |
| Loeys-Dietz syndrome       | 3 (23.1%) | 1 (4.8%)   | 0.27    |
| Congenital heart disease   | 6 (46.2%) | 15 (71.4%) | 0.17    |
| Cono-truncal anomalies     | 2 (15.4%) | 7 (33.3%)  | 0.43    |
| Truncus arteriosus         | 0 (0%)    | 2 (13.3%)  | 0.44    |
| DORV                       | 0 (0%)    | 2 (13.3%)  | 0.44    |
| AoV disease                | 5 (62.5%) | 5 (33.3%)  | 0.44    |
| D-TGA                      | 1 (12.5%) | 1 (6.7%)   | 0.44    |
| HLHS / SV                  | 0 (0%)    | 3 (20%)    | 0.44    |
| ccTGA                      | 1 (12.5%) | 2 (13.3%)  | 0.44    |

## Baseline characteristics

| Variable             | VSRR      | VSRr       | P value |
|----------------------|-----------|------------|---------|
| Patients             | 13        | 21         | -       |
| Aortic valve anatomy |           |            | 0.47    |
| Unicuspid            | 1 (7.7%)  | 0 (0%)     |         |
| Bicuspid             | 6 (46.2%) | 7 (33.3%)  |         |
| Tricuspid            | 6 (46.2%) | 12 (57.1%) |         |
| Quadricuspid         | 0 (0%)    | 2 (9.5%)   |         |

# Surgical techniques

| Variable                   | VSRR       | VSRr       | P value |
|----------------------------|------------|------------|---------|
| Leaflet level-AVP          | 12 (92.3%) | 13 (61.9%) | 0.11    |
| Commissuroplasty           | 8 (61.5%)  | 7 (33.3%)  | 0.16    |
| Commissurotomy             | 5 (38.5%)  | 5 (23.8%)  | 0.45    |
| Leaflet central plication  | 2 (15.4%)  | 1 (4.8%)   | 0.54    |
| Leaflet thinning           | 4 (30.8%)  | 6 (28.6%)  | 1.00    |
| Leaflet patch augmentation | 2 (15.4%)  | 4 (19%)    | 1.00    |
| Subannular reduction       | 2 (15.4%)  | 13 (61.9%) | 0.01    |

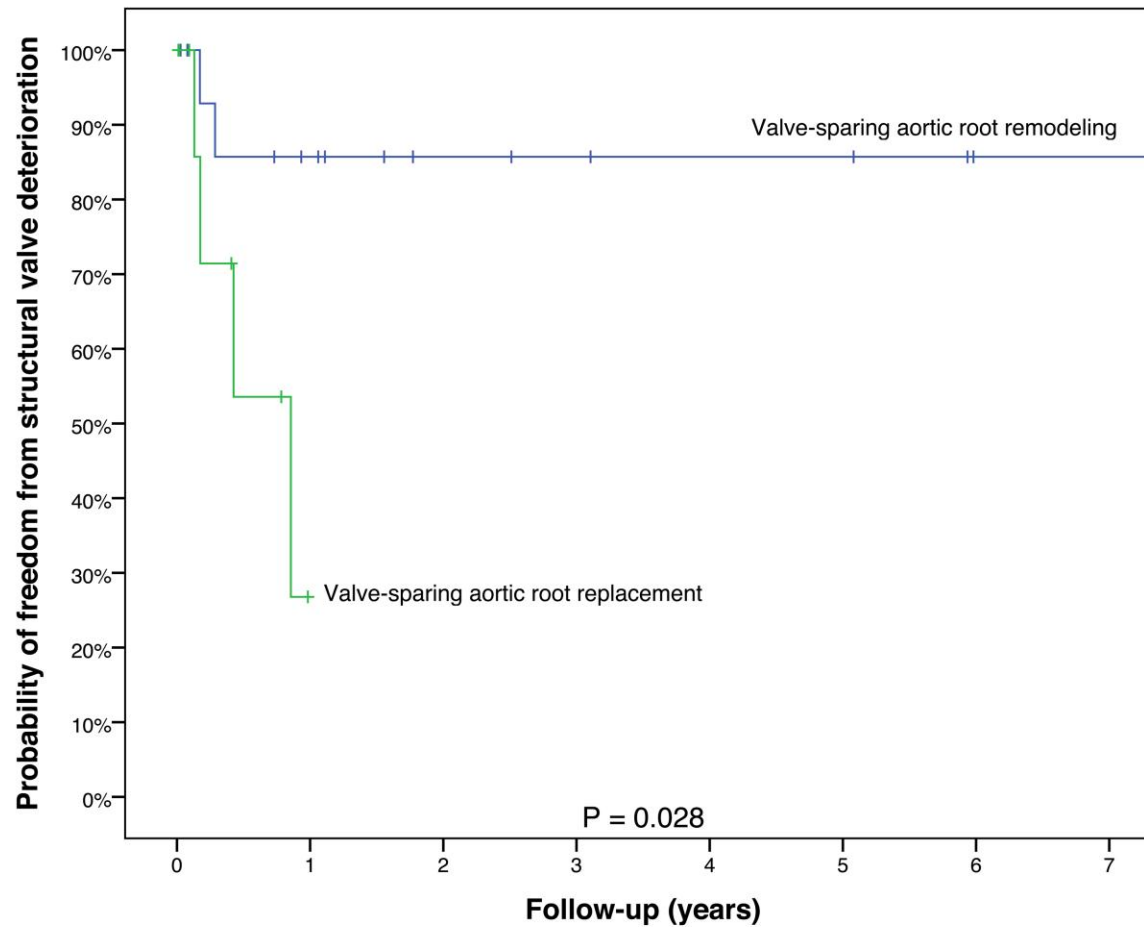
# Surgical techniques

| Variable                               | VSRR       | VSRr       | P value |
|--|------------|------------|---------|
| Aortic root repair                     |            |            |         |
| Annular stabilization                  | 11 (84.6%) | 14 (66.7%) | 0.43    |
| STJ stabilization                      | 13 (100%)  | 13 (61.9%) | 0.01    |
| Combined annular and STJ stabilization | 11 (84.6%) | 9 (42.9%)  | 0.03    |
| Aortic root replacement                | 13 (100%)  | 5 (23.8%)  | < 0.001 |
| Ascending aortic replacement           | 13 (100%)  | 13 (61.9%) | 0.01    |
| Graft size                             | 26 [14-30] | 27 [22-30] | 0.43    |

## Outcomes

- No early deaths
- Mean follow-up:  $14.4 \pm 2.8$  months
- 7 SVD
  - 5 reoperations for AVR for AR
  - 2 patients with  $\geq$  moderate AR
  
  - 4 VSRR (30.8%)
  - 3 VSRr (14.3%,  $P = 0.39$ )

# Outcomes





## Predictors of SVD

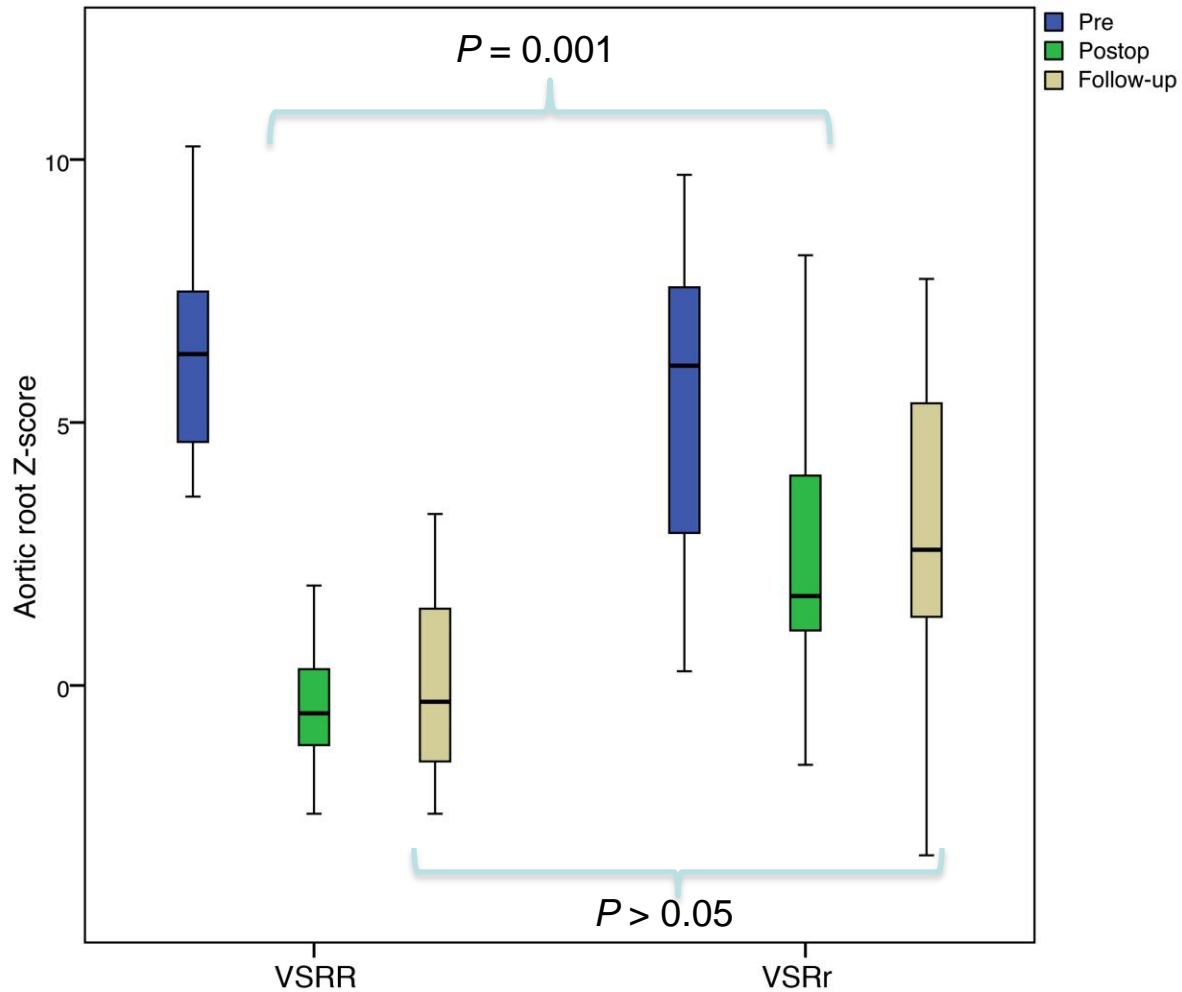
- Graft size relative to native dimensions
  - Graft to aortic root diameter ratio
    - VSRR  $0.62 \pm 0.07$
    - VSRr  $0.72 \pm 0.14$  ( $P = 0.03$ )
  - Graft to annulus and STJ diameter ratios no different between groups ( $P = 0.64$  and  $P = 0.69$ , respectively)



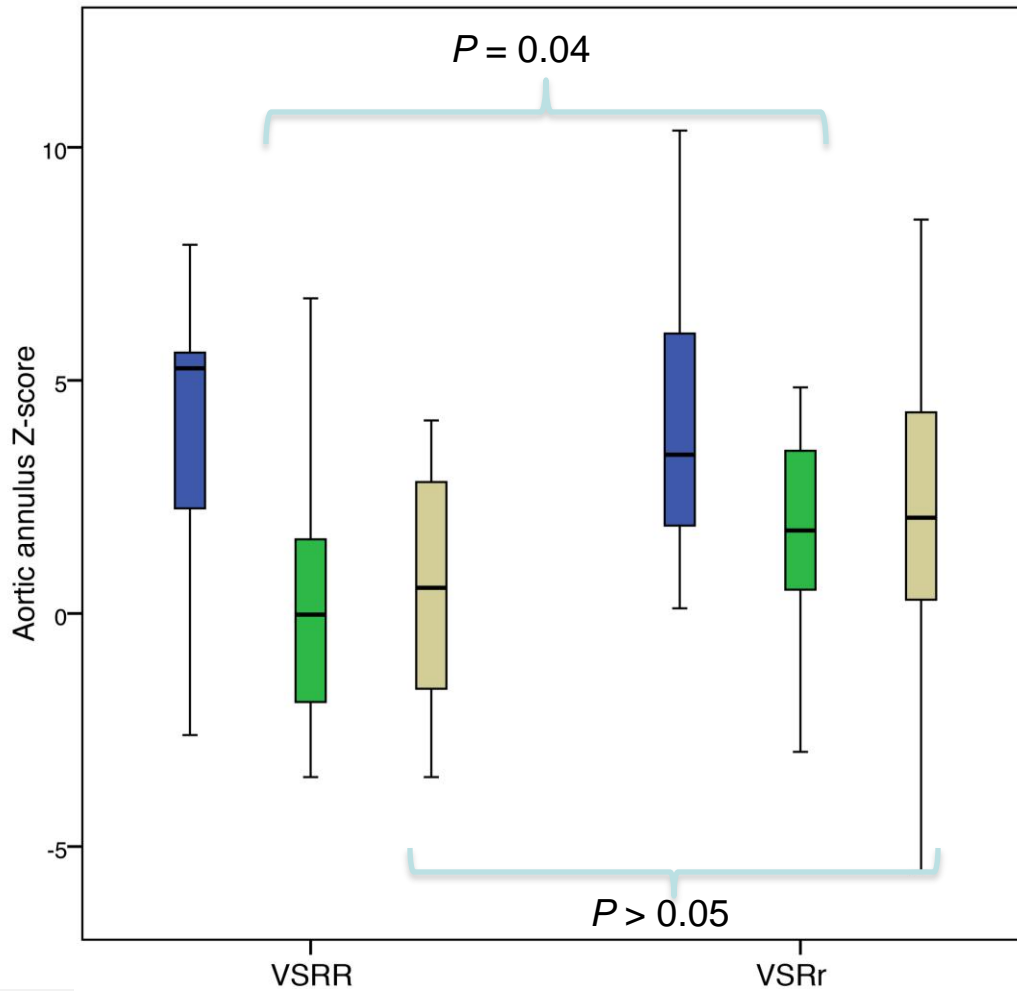
## Predictors of SVD

| Risk factor                         | SVD-free | SVD      | <i>P</i> value |
|-------------------------------------|----------|----------|----------------|
| Aortic regurgitation grade (median) | moderate | severe   | 0.001          |
| Graft to aortic annulus ratio       | 1.1±0.2  | 0.9±0.04 | 0.003          |

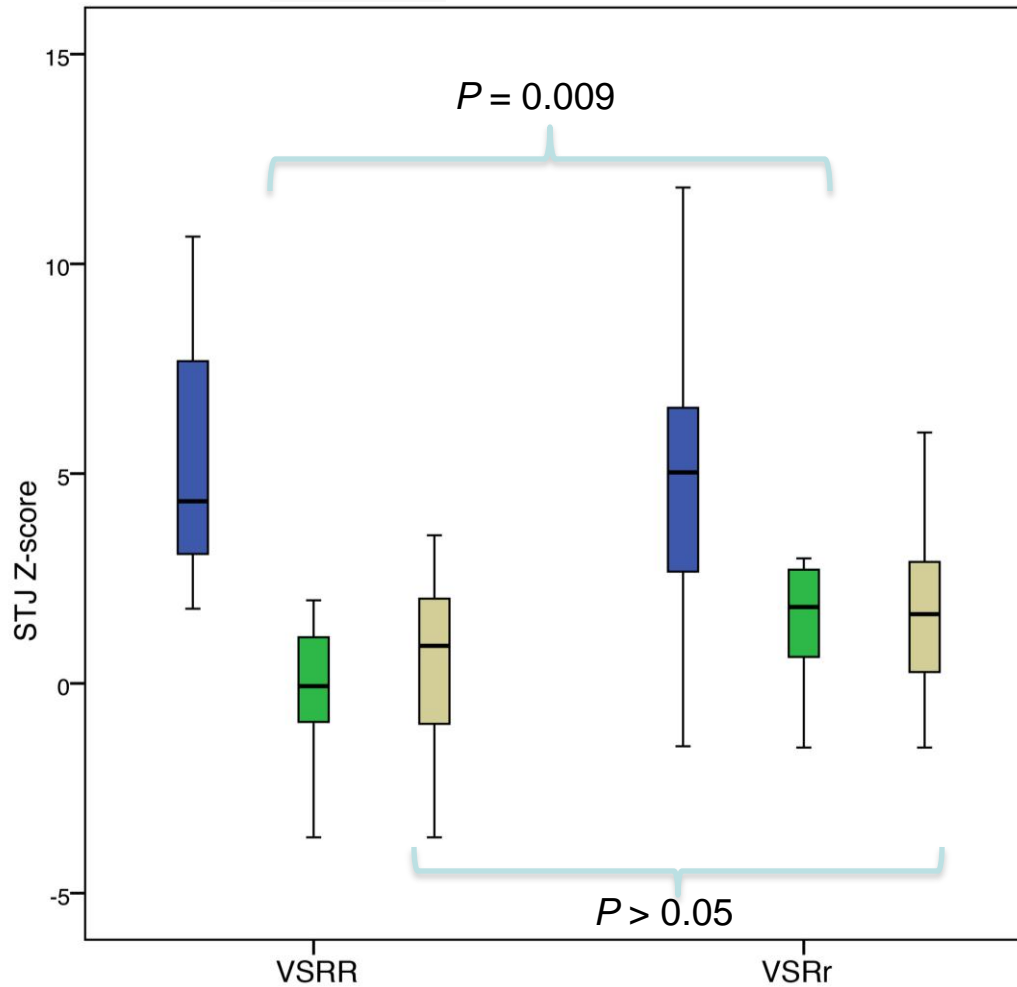
# Aortic root dimensions



# Aortic root dimensions



# Aortic root dimensions



## Conclusions

- Combined valve-sparing root and aortic valve reconstruction
  - Low operative risk
  - Valve preservation in majority at mid-term follow-up
- Prior reports showed better outcomes of VSRR over VSRr in children
  - Caution with AoV reconstruction ?
- Institutional policy
  - Repair the valve at the time of VSRR or VSRr only when minor defects are present

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