

Valve-sparing versus bio-Bentall aortic root replacement in sexagenarians: short and long-term outcomes

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Background

- Valve-sparing root replacement (VSRR) with the David technique is an established therapy for aortic root pathology.
- Valve preservation in VSRR is challenging, however the benefits of maintaining the native valve are numerous, especially in young patients.
- Limited data is available comparing VSRR and conventional aortic root replacement (ARR) with a bio-Bentall technique in older patients.
- The aim of this study was to evaluate both short and long-term outcomes between the David procedure and ARR with a biological valved conduit in sexagenarians.

Patients

- A multicenter retrospective study
- 299 consecutive patients with aortic root pathology and treated with either the David or the bio-Bentall technique, from 2002 to 2022, were identified and individually reviewed (*Figure 1*).

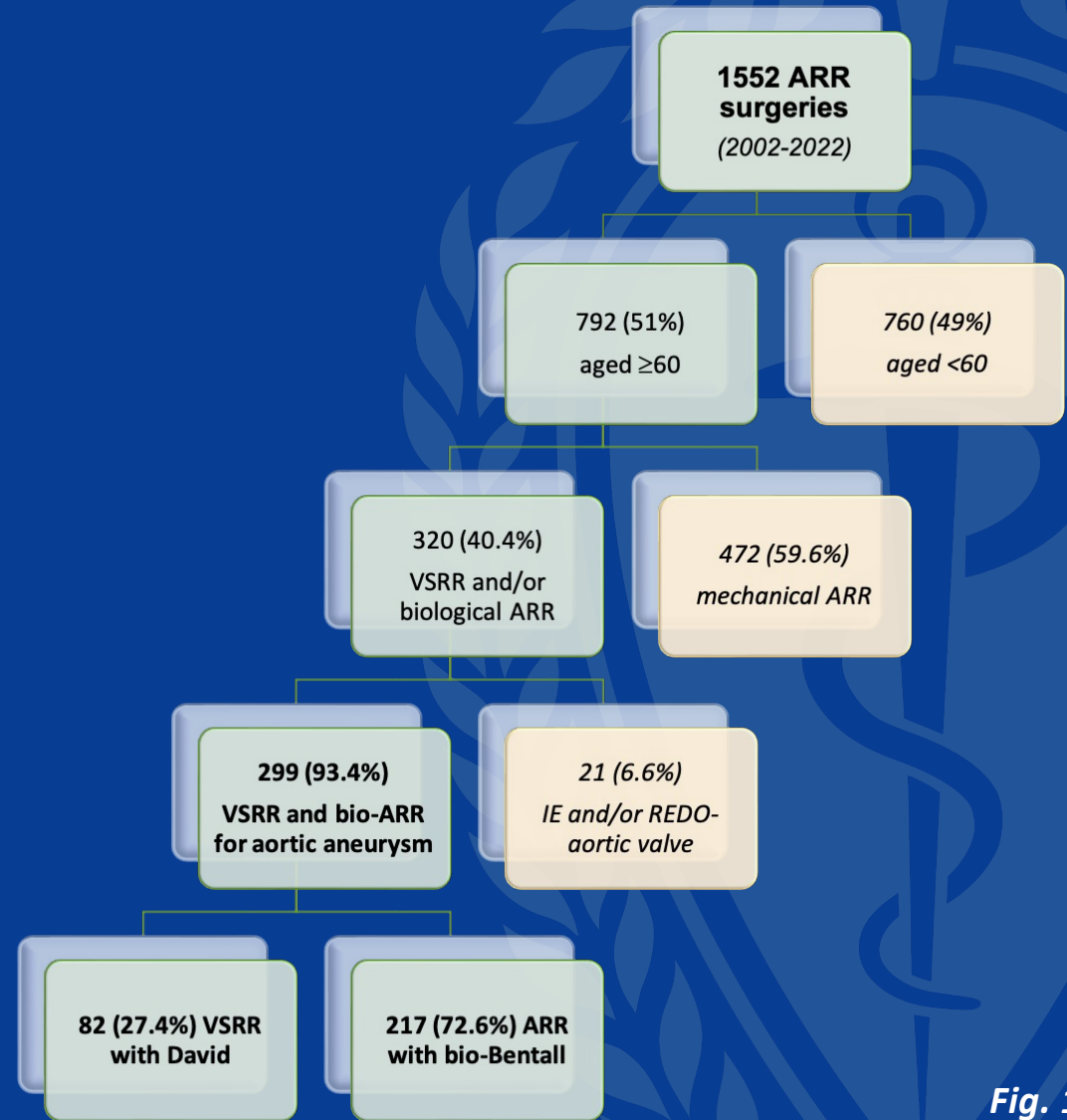


Fig. 1

Methods

- Preoperative and postoperative characteristics were entered into a dedicated database;
- Clinical and echocardiographic follow-ups were performed either in our Institutional outpatient clinics or patients were reached via telephone calls and were asked recent echocardiographic data (<6 months);
- Follow-up was 98% complete (median 15 years [12-18], longest follow-up time was 18 years);
- Inverse probability of treatment weighting (IPTW) was applied as a propensity score methodology → limit selection bias, balance baseline characteristics and avoid excessive trimming of both groups
 - Balance was compared using standardized mean difference (SMD)
 - Optimal balance $\leq 20\%$
 - Optimal balance was obtained for all variables except age (0.32), dyslipidemia (0.61), chronic kidney disease (0.39) and previous cardiac surgery (0.28)
- Kaplan-Meier survival curves were used for estimating long-term survival since operation, and long-rank test was used to assess intergroup comparisons.

Results

Table 1.

Characteristics	David N= 82	bio-Bentall N=217	Unadjusted SMD	Adjusted SMD
Sex (F)	16 (20%)	35 (16%)	-0.09	-0.07
Age (years)	67 [63-71]	72 [68-76]	0.79	0.32
Smoke	12 (15%)	10 (4.6%)	-0.47	-0.14
Dyslipidemia	43 (52%)	70 (32%)	-0.44	-0.61
Diabetes	7 (8.5%)	16 (7.4%)	-0.04	-0.08
Hypertension	75 (91%)	211 (97%)	0.35	0.19
Ischemic heart disease	12 (15%)	27 (12%)	-0.06	-0.05
NYHA Class			0.22	0.06
• I	22 (27%)	26 (12.5%)		
• II	42 (51%)	145 (67%)		
• III	17 (21%)	43 (20%)		
• IV	1 (1.2%)	3 (1.4%)		
CKD	4 (4.9%)	47 (22%)	0.47	0.39
COPD	16 (20%)	56 (26%)	0.15	-0.06
REDO	4 (4%)	40 (23%)	0.27	0.28
Marfan syndrome	1 (1.2%)	5 (2.3%)	0.07	-0.0006
Familial aortopathy	3 (3.7%)	23 (11%)	0.22	0.15
Acute aortic dissection	1 (1.2%)	15 (6.9%)	0.22	0.17
Chronic aortic dissection	3 (3.7%)	10 (4.6%)	0.05	0.12
Aortic Regurgitation			0.06	0.04
• 0+	1 (1%)	7 (3%)		
• 1+	10 (12%)	23 (10%)		
• 2+	15 (18%)	39 (18%)		
• 3+	22 (27%)	37 (17%)		
• 4+	34 (42%)	111 (51%)		
Bicuspid aortic valve	4 (4.9%)	42 (19%)	0.36	0.18
LVEF			-0.55	-0.17
• <30%	0 (0%)	5 (2%)		
• 30-50%	12 (15%)	87 (40%)		
• >50%	70 (85%)	125 (58%)		

- Baseline clinical characteristics are reported in *Table 1*.

- Patients undergoing the David procedure had:
 - Relatively low chronic kidney disease and previous cardiac surgeries
 - Mostly tricuspid valves (95%)

In-hospital results

- Emergency surgery for acute aortic syndromes was more frequent in the bio-Bentall group (7% vs. 1% in David, $p=0.043$).
- Following IPTW, there was no significant difference in **in-hospital mortality** between groups (1.2% vs. 4.6%, $p=0.3$).
- Despite slightly longer CPB and XC times, and higher rate of residual mild AR at discharge, patients in the **David** group had **higher postoperative LVEF** ($p<0.001$).
- The incidence of **neurologic complications** ($p=0.003$) and **permanent pacemaker implantation** ($p=0.022$) was significantly higher in the **bio-Bentall** group.

Characteristics	David N=82	Bio-Bentall N=217	p-value
Intraoperative Details			
Indication			0.043
• Elective	81 (99%)	196 (90.3%)	
• Urgent	0 (0%)	6 (2.8%)	
• Emergent	1 (1%)	15 (6.9%)	
CPB time (min)	143 [122-167]	134 [108-143]	0.004
XC time (min)	114 [103-136]	101 [90-113]	<0.001
Hemiarch replacement	4 (4.9%)	13 (6%)	>0.9
Circulatory arrest	7 (8.5%)	18 (8.3%)	>0.9
Additional aortic leaflet repair	35 (42.7%)	0 (0%)	...
Additional surgical procedure	26 (31.7%)	50 (23%)	0.4
In-hospital results			
Death	1 (1.2%)	10 (4.6%)	0.3
Myocardial infarction	1 (1.2%)	2 (0.9%)	>0.9
Neurological complications	0 (0%)	22 (10%)	0.003
Pulmonary complications	9 (11%)	36 (17%)	0.2
Acute kidney injury	2 (2.4%)	11 (5.1%)	0.5
Surgical re-exploration	3 (3.7%)	10 (4.6%)	0.13
PPM implantation	2 (2.4%)	23 (11%)	0.022
Predischarge TTE			
• LVEF (%)	55 [50-60]	50 [45-56]	<0.001
• Residual AR			
• AR 0+	60 (73%)	216 (99%)	<0.001
• AR 1+	21 (26%)	1 (1%)	
• AR 2+	1 (1%)	0 (0%)	

Long-term results

At 10 years follow-up there were 45 late deaths

- 11 (13.4%) in the David group
- 34 (15.7%) in the bio-Bentall group

Long-term overall survival was:

88.6±4.4% David vs. 80.3±3.7% bio-Bentall ($p=0.176$) (*Fig. 2*)

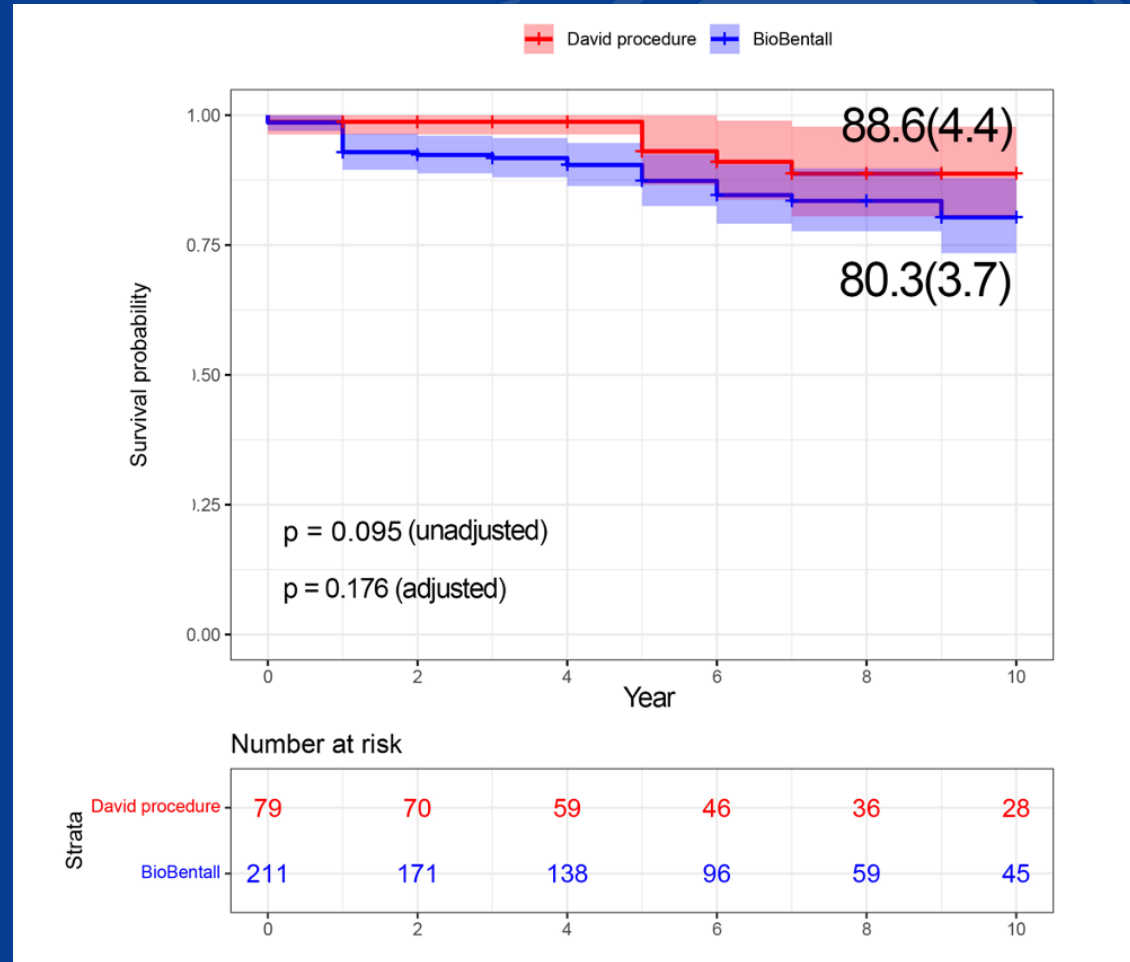
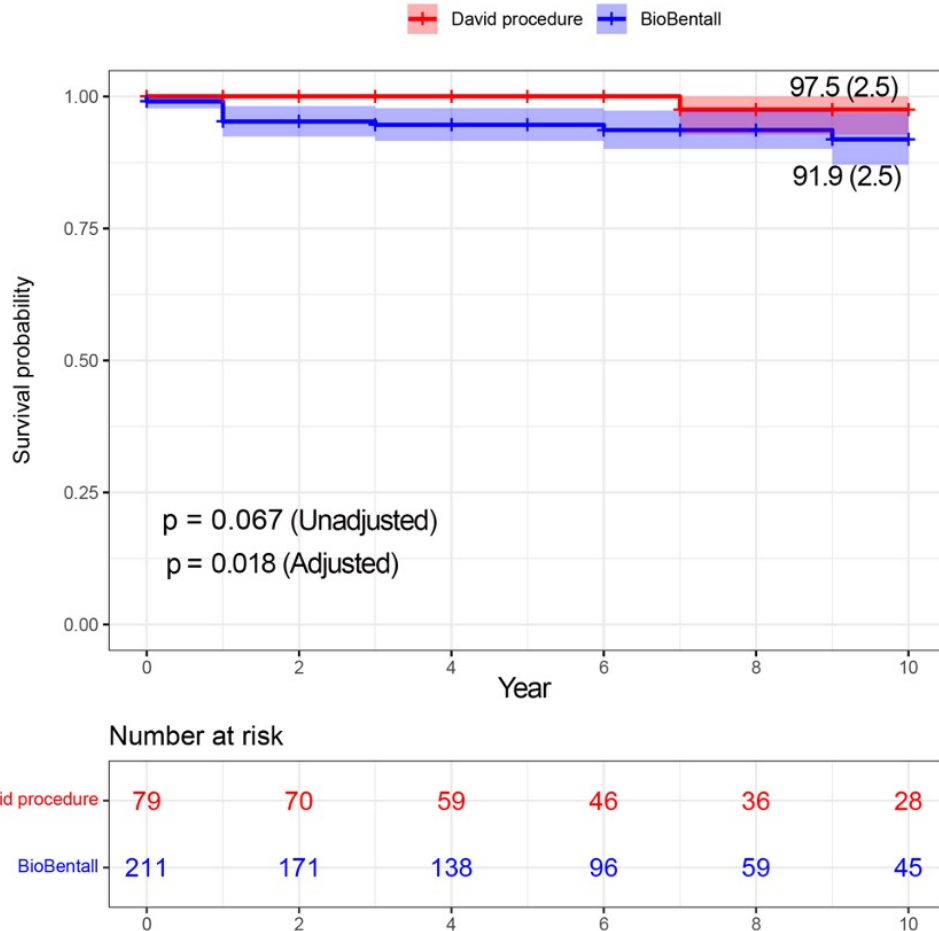


Fig. 2

Long-term results



Only 14 were **cardiac-related**:

- 0 (0%) in the David group
- 14 (6.5%) in the bio-Bentall group [7 infective endocarditis, 5 end-stage HF, 2 arrhythmias]

At 10 years, **cardiac survival** was:
97.5±2.5% David vs. 91.9±2.5% bio-Bentall ($p=0.018$) (*Fig 3.*)

Fig. 3

Long-term results

Reintervention:

- Only 1 patient (0.5%) in bio-Bentall group for endocarditis

Recurrence of $\geq 2+$ AR:

- Trend towards higher recurrence of at least moderate AR in the David group ($p=0.117$) (*Fig. 4*)

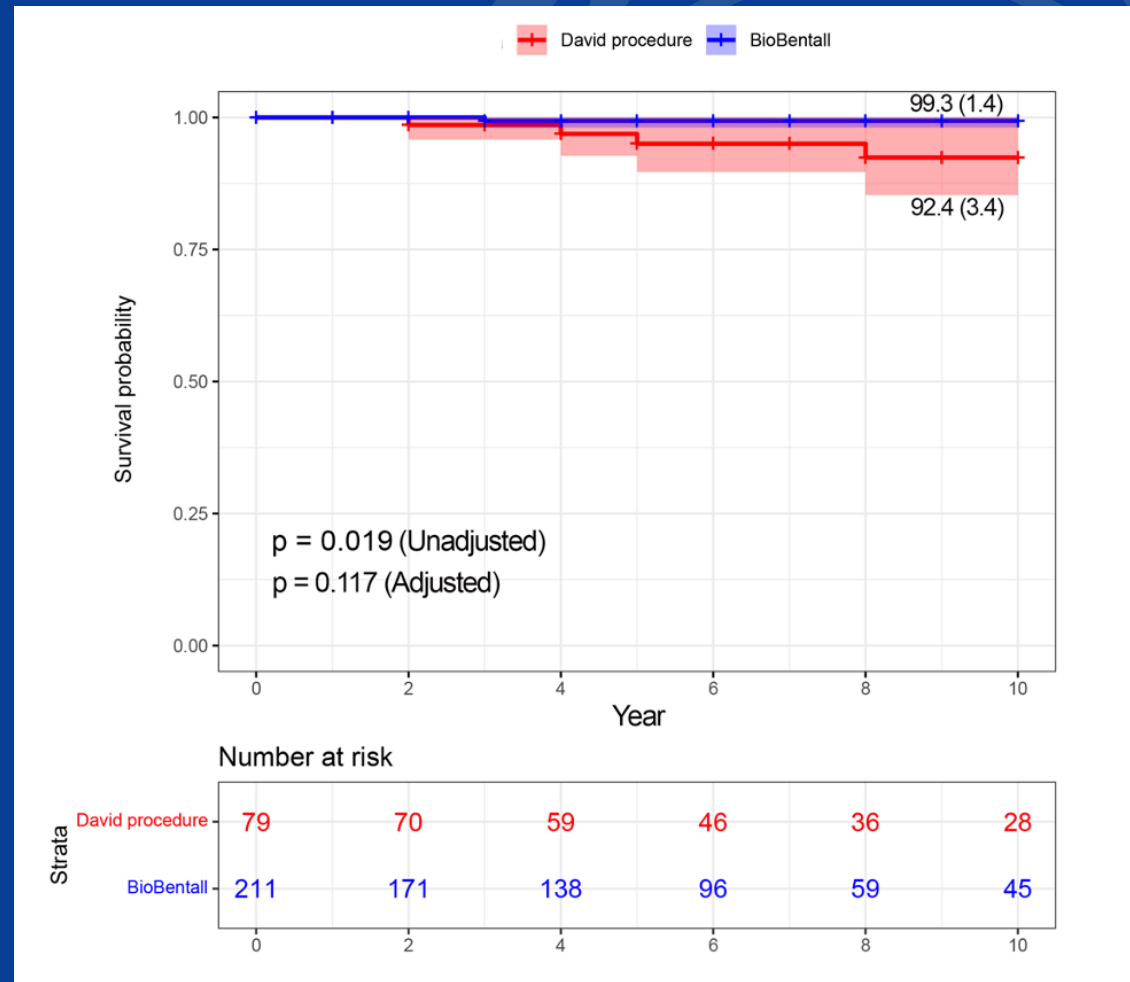


Fig. 4

Conclusions

- Results show **low in-hospital mortality** and **good 10-year survival** in patients aged 60 or older, regardless surgical procedure.
- VSSR with the David procedure → improved **long-term cardiac survival**, with *lower rates of infective endocarditis, PPM implantation and HF episodes*
→ with similar rates of reintervention or recurrence of moderate AR.
- VSSR with the David procedure should still be considered as a **surgical option** in appropriately **selected sexagenarians** with aortic root pathology.