

Supplementary Table 1. Operative profiles in the bioprosthetic AVR group: conventional versus sutureless/RD valve

Variable	Conventional bioprosthesis (n=492)	Sutureless/RD valve (n=104)	p-value	SMD (%)
Minimally invasive approach	83 (16.9)	66 (63.5)	<0.001	108.0
CPB time (min)	119.7±46.2	88.4±32.5	<0.001	78.4
ACC time (min)	78.4±30.4	51.5±17.6	<0.001	108.3
Concomitant procedure				
CABG	98 (19.9)	15 (14.4)	0.245	14.6
Surgical AF ablation	20 (4.1)	9 (8.7)	0.084	18.9
Ascending aorta replacement	60 (12.2)	6 (5.8)	0.084	22.6
Congenital correction	12 (2.4)	3 (2.9)	1.000	2.8

Values are presented as number (%) or mean±standard deviation unless otherwise indicated.

AVR, aortic valve replacement; RD, rapid-deployment; SMD, standardized mean difference; CPB, cardiopulmonary bypass; ACC, aortic cross-clamp; CABG, coronary artery bypass grafting; AF, atrial fibrillation.

Supplementary Table 2. Baseline characteristics according to prosthetic valve type in patients aged 50 to 65 years

Variable	Original				IPTW	
	Mechanical AVR (n=848)	Bioprosthetic AVR (n=237)	p-value	SMD (%)	Mechanical AVR (n=848)	Bioprosthetic AVR (n=237)
Baseline demographics						
Age (yr)	58.6±4.4	61.7±3.4	<0.001	79.9	59.2±4.4	59.6±4.2
Female	328 (38.7)	88 (37.1)	0.720	3.2	38.7	43.1
Body mass index (kg/m ²)	24.6±3.2	24.2±3.2	0.071	13.4	24.6±3.2	24.2±3.3
Baseline comorbidities						
Hypertension	411 (48.5)	126 (53.2)	0.228	9.4	49.1	46.2
Diabetes mellitus	147 (17.3)	55 (23.2)	0.050	14.6	17.8	15.7
Dyslipidemia	303 (35.7)	78 (32.9)	0.467	5.9	35.8	35.3
eGFR <30 mL/min/1.73 m ²	19 (2.2)	25 (10.5)	<0.001	34.5	3.3	3.7
Dialysis	14 (1.7)	20 (8.4)	<0.001	31.4	2.1	2.8
Stroke or TIA	26 (3.1)	11 (4.6)	0.328	8.2	3.4	3.1
Coronary artery disease	128 (15.1)	50 (21.1)	0.035	15.6	16.2	17.8
Previous PCI	31 (3.7)	13 (5.5)	0.282	8.8	3.7	3.1
Atrial fibrillation	69 (8.1)	17 (7.2)	0.727	3.6	7.9	5.7
Chronic lung disease	103 (12.1)	28 (11.8)	0.979	1.0	11.7	9.1
NYHA fc III or IV	167 (19.7)	41 (17.3)	0.463	6.2	19.2	15.4
Previous cardiac surgery	22 (2.6)	4 (1.7)	0.571	6.3	2.5	3.6
Hemoglobin (g/dL)	13.4±1.6	12.9±1.8	<0.001	29.7	13.3±1.7	13.1±1.6
AV pathology			0.162	13.1		
Stenosis	495 (58.4)	147 (62.0)			59.3	60.1

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Supplementary Table 2. Continued

Variable	Original				IPTW	
	Mechanical AVR (n=848)	Bioprosthetic AVR (n=237)	p-value	SMD (%)	Mechanical AVR (n=848)	Bioprosthetic AVR (n=237)
Insufficiency	227 (26.8)	54 (22.8)			26.1	26.4
Steno-insufficiency	126 (14.9)	35 (14.8)			14.6	13.3
Echocardiographic data						
Bicuspid AV	491 (57.9)	107 (45.1)	<0.001	25.7	55.4	52.2
Rheumatic pathology	68 (8.0)	17 (7.2)	0.771	3.2	8.1	8.4
LVEF (%)	57.2±11.7	57.7±12.2	0.578	4.0	57.4±11.5	58.4±11.0
LVEDD (mm)	37.2±11.6	35.5±10.8	0.043	15.2	36.7±11.3	35.8±11.1
LVEDD (mm)	55.5±10.8	54.3±9.9	0.145	11.0	55.2±10.7	54.6±10.3
LA diameter (mm)	41.6±7.4	41.9±7.2	0.675	3.1	41.6±7.3	41.3±7.6
Peak RV-RA PG (mm Hg)	26.8±10.0	26.4±10.2	0.529	4.1	26.5±9.8	26.2±10.4
Significant MR ^{a)}	26 (3.1)	13 (5.5)	0.116	12.0	3.3	3.0
Significant TR ^{b)}	7 (0.8)	5 (2.1)	0.187	10.7	0.9	0.9

Values are presented as mean±standard deviation, number (%), or % unless otherwise indicated.

IPTW, inverse-probability-of-treatment weighting; AVR, aortic valve replacement; SMD, standardized mean difference; eGFR, estimated glomerular filtration rate; TIA, transient ischemic attack; PCI, percutaneous coronary intervention; NYHA fc, New York Heart Association functional class; AV, aortic valve; LVEF, left ventricle ejection fraction; LVESD, left ventricle end-systolic dimension; LVEDD, left ventricle end-diastolic dimension; LA, left atrium; RV, right ventricle; RA, right atrium; PG, pressure gradient; MR, mitral regurgitation; TR, tricuspid regurgitation.

^{a)}Moderate to severe mitral regurgitation. ^{b)}Moderate to severe tricuspid regurgitation.

Supplementary Table 3. Operative profiles according to prosthetic valve type in AVR patients aged 50 to 65 years

Variable	Original			IPTW		
	Mechanical AVR (n=848)	Bioprosthetic AVR (n=237)	p-value	Mechanical AVR (n=848)	Bioprosthetic AVR (n=237)	SMD (%)
Emergency or urgency	24 (2.9)	5 (2.1)	0.846	2.6	1.2	12.3
Minimally invasive approach	117 (13.8)	72 (30.4)	<0.001	17.4	21.0	9.1
CPB time (min)	121.2±53.9	111.3±47.4	0.010	121.2±53.3	113.2±50.5	15.5
ACC time (min)	76.5±32.7	73.2±31.9	0.168	76.4±31.9	76.0±35.4	1.3
Concomitant procedure						
CABG	107 (12.6)	45 (19.0)	0.017	13.7	13.5	0.4
Surgical AF ablation	27 (3.2)	10 (4.2)	0.566	3.3	2.8	3.3
Ascending aorta replacement	141 (16.6)	30 (12.7)	0.167	15.7	14.6	3.2
Congenital correction	22 (2.6)	5 (2.1)	0.851	2.6	5.4	14.6

Values are presented as number (%), %, or mean±standard deviation unless otherwise indicated.

AVR, aortic valve replacement; IPTW, inverse-probability-of-treatment weighting; SMD, standardized mean difference; CPB, cardiopulmonary bypass; ACC, aortic cross-clamp; CABG, coronary artery bypass grafting; AF, atrial fibrillation.

Supplementary Table 4. Clinical outcomes of mechanical versus bioprosthetic AVR groups in patients aged 50 to 65 years

Outcomes ^{a)}	Original				IPTW			
	No. of events (rate)		OR or HR (95% CI)	p-value	No. of events (rate)		OR or HR/sHR (95% CI)	p-value
	Mechanical AVR (N=848)	Bioprosthetic AVR (N=237)			Mechanical AVR (N=848)	Bioprosthetic AVR (N=237)		
Early outcomes, no. (%)								
Early death	8 (0.9)	5 (2.1)	2.26 (0.73–6.98)	0.155	0.9	1.3	1.38 (0.37–5.20)	0.633
Bleeding requiring exploration	30 (3.5)	9 (3.8)	1.08 (0.50–2.30)	0.849	3.8	3.9	1.03 (0.49–2.17)	0.941
LCOS requiring MCS ^{b)}	10 (1.2)	4 (1.7)	1.44 (0.45–4.63)	0.542	1.2	0.9	0.76 (0.17–3.38)	0.721
Stroke	18 (2.1)	11 (4.6)	2.24 (1.04–4.82)	0.038	2.0	2.3	1.12 (0.42–2.97)	0.821
New onset dialysis	8 (0.9)	2 (0.8)	0.89 (0.19–4.24)	0.887	1.0	0.5	0.47 (0.07–3.28)	0.450
Sternal wound infection	10 (1.2)	3 (1.3)	1.07 (0.29–3.94)	0.914	1.1	1.5	1.29 (0.37–4.44)	0.689
Overall outcomes, no. (%/PY)								
All-cause death	167 (1.7)	55 (3.1)	2.11 (1.54–2.88)	<0.001	1.8	2.5	1.58 (1.07–2.35)	0.022
Stroke	83 (1.2)	5 (0.3)	0.28 (0.11–0.70)	0.006	1.1	0.2	0.13 (0.08–0.22)	<0.001
Anticoagulation-related bleeding	101 (1.4)	8 (0.5)	0.37 (0.18–0.77)	0.007	1.4	0.4	0.13 (0.09–0.20)	<0.001
Operated valve endocarditis	17 (0.2)	4 (0.3)	1.14 (0.38–3.43)	0.814	0.3	0.3	1.12 (0.43–2.90)	0.817
AV reintervention	38 (0.5)	15 (1.0)	2.62 (1.42–4.82)	0.002	0.5	0.8	3.54 (1.81–6.92)	<0.001
Readmission due to cardiac cause	216 (3.4)	42 (3.2)	0.91 (0.65–1.26)	0.564	3.4	2.7	1.19 (0.71–1.99)	0.515

Values are presented as number (%) or number (% per patient-year) unless otherwise indicated.

Early outcomes are presented as ORs. Overall outcomes are presented as HRs or sub-distributional HRs.

AVR, aortic valve replacement; IPTW, inverse-probability-of-treatment weighting; OR, odds ratio; HR, hazard ratio; CI, confidence interval; sHR, sub-distributional hazard ratio; LCOS, low cardiac output syndrome; MCS, mechanical circulatory support; PY, patient-year; AV, aortic valve.

^{a)}Outcomes captured using the primary diagnosis during a visit to the emergency department or using any primary or secondary diagnosis during hospitalization. ^{b)} Included extracorporeal membrane oxygenation, intra-aortic balloon pump, and ventricular assist device.

Supplementary Table 5. Baseline characteristics according to prosthetic valve type in patients without concomitant CABG

Variable	Original			IPTW			
	Mechanical AVR (n=849)	Bioprosthetic AVR (n=483)	p-value	SMD (%)	Mechanical AVR (n=849)	Bioprosthetic AVR (n=483)	SMD (%)
Baseline demographics							
Age (yr)	59.6±5.2	65.4±4.1	<0.001	125.4	61.4±5.4	62.2±5.4	13.6
Female	332 (39.1)	191 (39.5)	0.921	0.9	39.0	40.2	2.6
Body mass index (kg/m ²)	24.6±3.2	24.5±3.3	0.839	1.2	24.5±3.1	24.4±3.3	5.0
Baseline comorbidities							
Hypertension	412 (48.5)	259 (53.6)	0.083	10.2	50.8	49.7	2.3
Diabetes mellitus	130 (15.3)	105 (21.7)	0.004	16.6	16.8	15.8	2.6
Dyslipidemia	280 (33.0)	184 (38.1)	0.068	10.7	34.3	35.1	1.7
eGFR <30 mL/min/1.73 m ²	19 (2.2)	27 (5.6)	0.002	17.4	3.2	3.2	<0.1
Dialysis	15 (1.8)	23 (4.8)	0.003	16.9	2.5	2.7	1.3
Stroke or TIA	28 (3.3)	26 (5.4)	0.087	10.2	4.1	3.7	1.8
Coronary artery disease	47 (5.5)	51 (10.6)	0.001	18.5	6.9	8.7	6.9
Previous PCI	19 (2.2)	20 (4.1)	0.070	10.8	2.4	2.6	1.5
Atrial fibrillation	78 (9.2)	45 (9.3)	1.000	0.4	8.9	8.2	2.4
Chronic lung disease	113 (13.3)	55 (11.4)	0.352	5.8	13.8	11.9	5.6
NYHA fc III or IV	168 (19.8)	92 (19.0)	0.798	1.9	19.8	17.5	5.8
Previous cardiac surgery	22 (2.6)	6 (1.2)	0.147	9.9	2.1	1.5	4.1
Hemoglobin (g/dL)	13.4±1.6	12.9±1.7	<0.001	30.9	13.3±1.7	13.1±1.6	9.1
AV pathology			0.002	20.1			2.1
Stenosis	502 (59.1)	299 (61.9)			60.5	61.4	

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Supplementary Table 5. Continued

Variable	Original			IPTW			
	Mechanical AVR (n=849)	Bioprosthetic AVR (n=483)	p-value	SMD (%)	Mechanical AVR (n=849)	Bioprosthetic AVR (n=483)	SMD (%)
Insufficiency	224 (26.4)	91 (18.8)			24.6	24.3	
Steno-insufficiency	123 (14.5)	93 (19.3)			14.9	14.3	
Echocardiographic data							
Bicuspid AV	505 (59.4)	232 (48.0)	<0.001	22.9	56.1	54.0	4.2
Rheumatic pathology	68 (8.0)	40 (8.3)	0.939	1.0	8.1	7.9	0.6
LVEF (%)	57.5±11.6	58.1±11.7	0.341	5.4	57.9±11.3	58.4±11.1	4.8
LVESD (mm)	36.9±11.5	35.4±10.7	0.015	14.0	36.2±11.2	35.4±10.8	6.8
LVEDD (mm)	55.2±10.7	53.8±9.5	0.021	13.4	54.7±10.3	54.1±10.1	5.4
LA diameter (mm)	41.7±7.4	41.9±7.2	0.626	2.8	41.7±7.3	41.2±7.5	7.1
Peak RV-RA PG (mm Hg)	26.9±9.7	27.0±9.3	0.816	1.3	26.7±9.6	26.4±9.4	3.9
Significant MR ^{a)}	27 (3.2)	18 (3.7)	0.709	3.0	3.5	3.1	2.5
Significant TR ^{b)}	6 (0.7)	7 (1.4)	0.300	7.2	0.7	0.8	1.0

Values are presented as mean±standard deviation, number (%), or % unless otherwise indicated.

CABG, coronary artery bypass grafting; AVR, aortic valve replacement; IPTW, inverse-probability-of-treatment weighting; SMD, standardized mean difference; eGFR, estimated glomerular filtration rate; TIA, transient ischemic attack; PCI, percutaneous coronary intervention; NYHA fc, New York Heart Association functional class; AV, aortic valve; LVEF, left ventricle ejection fraction; LVESD, left ventricle end-systolic dimension; LVEDD, left ventricle end-diastolic dimension; LA, left atrium; RV, right ventricle; RA, right atrium; PG, pressure gradient; MR, mitral regurgitation; TR, tricuspid regurgitation.

^{a)}Moderate to severe mitral regurgitation. ^{b)}Moderate to severe tricuspid regurgitation.

Supplementary Table 6. Operative profiles according to prosthetic valve type in patients without concomitant CABG

Variable	Original			IPTW			
	Mechanical AVR (n=849)	Bioprosthetic AVR (n=483)	p-value	SMD (%)	Mechanical AVR (n=849)	Bioprosthetic AVR (n=483)	SMD (%)
Emergency or urgency	26 (3.1)	10 (2.0)	0.260	9.6	2.6	1.6	7.4
Minimally invasive approach	129 (15.2)	148 (30.6)	<0.001	37.4	21.0	27.2	14.4
CPB time (min)	116.5±48.7	107.5±40.6	0.001	20.0	116.4±47.7	108.7±41.8	17.2
ACC time (min)	74.3±31.0	70.5±27.8	0.026	12.9	74.5±31.0	72.8±29.6	5.6
Concomitant procedure							
Surgical AF ablation	34 (4.0)	28 (5.8)	0.175	8.3	4.6	5.0	1.8
Ascending aorta replacement	135 (15.9)	55 (11.4)	0.029	13.2	14.0	13.2	2.4
Congenital correction	21 (2.5)	14 (2.9)	0.773	2.6	3.0	4.5	7.9

Values are presented as number (%), %, or mean±standard deviation unless otherwise indicated.

CABG, coronary artery bypass grafting; IPTW, inverse-probability-of-treatment weighting; AVR, aortic valve replacement; SMD, standardized mean difference; CPB, cardiopulmonary bypass; ACC, aortic cross-clamp; AF, atrial fibrillation.

Supplementary Table 7. Clinical outcomes of mechanical versus bioprosthetic AVR groups in patients without concomitant CABG

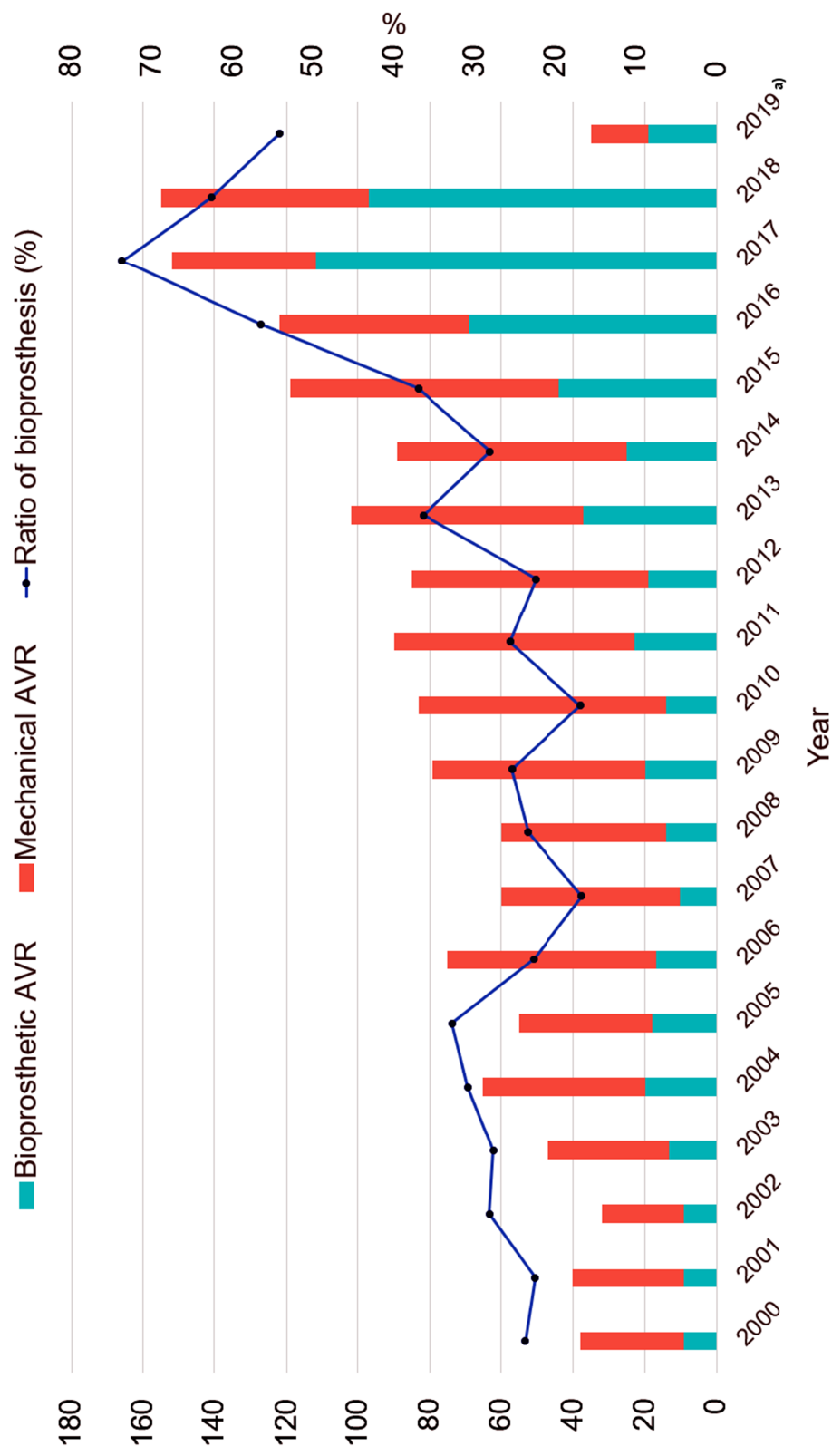
Outcomes ^{a)}	Original				IPTW			
	No. of events (rate)		OR or HR (95% CI)	p-value	No. of events (rate)		OR or HR/sHR (95% CI)	p-value
	Mechanical AVR (N=849)	Bioprosthetic AVR (N=483)			Mechanical AVR (N=849)	Bioprosthetic AVR (N=483)		
Early outcomes, no. (%)								
Early death	8 (0.9)	8 (1.7)	1.77 (0.66–4.75)	0.256	0.8	1.2	1.69 (0.55–5.15)	0.356
Bleeding requiring exploration	27 (3.2)	22 (4.6)	1.45 (0.82–2.58)	0.202	3.4	3.8	1.15 (0.64–2.09)	0.639
LCOS requiring MCS ^{b)}	9 (1.1)	8 (1.7)	1.57 (0.60–4.10)	0.355	0.9	1.1	1.28 (0.41–4.00)	0.665
Stroke	17 (2.0)	16 (3.3)	1.68 (0.84–3.35)	0.143	2.0	2.3	1.17 (0.54–2.52)	0.695
New onset dialysis	6 (0.7)	4 (0.8)	1.17 (0.33–4.18)	0.805	0.9	0.6	0.59 (0.15–2.36)	0.456
Sternal wound infection	8 (0.9)	5 (1.0)	1.10 (0.36–3.38)	0.868	0.8	1.1	1.50 (0.47–4.79)	0.494
Overall outcomes, no. (%/PY)								
All-cause death	172 (1.8)	110 (2.9)	1.92 (1.50–2.46)	<0.001	2.1	2.4	1.26 (0.93–1.71)	0.139
Stroke	83 (1.2)	24 (0.8)	0.66 (0.41–1.04)	0.070	1.3	0.5	0.42 (0.24–0.72)	0.002
Anticoagulation-related bleeding	92 (1.3)	20 (0.7)	0.50 (0.31–0.82)	0.006	1.3	0.5	0.40 (0.24–0.67)	<0.001
Operated valve endocarditis	20 (0.3)	8 (0.3)	0.90 (0.39–2.06)	0.808	0.3	0.3	1.00 (0.34–2.95)	0.999
AV reintervention	39 (0.5)	23 (0.8)	1.73 (1.02–2.94)	0.042	0.5	0.7	4.41 (2.09–9.28)	<0.001
Readmission due to cardiac cause	215 (3.5)	80 (2.9)	0.81 (0.63–1.05)	0.117	3.5	2.5	1.08 (0.67–1.75)	0.755

Values are presented as number (%) or number (% per patient-year) unless otherwise indicated. Early outcomes are presented as odds ratios.

Overall outcomes are presented as hazard ratios or sub-distributional hazard ratios.

AVR, aortic valve replacement; CABG, coronary artery bypass grafting; IPTW, inverse-probability-of-treatment weighting; OR, odds ratio; HR, hazard ratio; CI, confidence interval; sHR, sub-distributional hazard ratio; LCOS, low cardiac output syndrome; MCS, mechanical circulatory support; PY, patient-year; AV, aortic valve.

^{a)}Outcomes captured using a primary diagnosis during a visit to the emergency department or using any primary or secondary diagnosis during hospitalization. ^{b)}Included extracorporeal membrane oxygenation, intra-aortic balloon pump, and ventricular assist device.



Supplementary Fig. 1. Number of isolated aortic valve replacements (AVRs) per year in patients aged 50 to 70 years. ^{a)}In 2019, results are reported up to March 31st.