

# Efficacy of Aortic Valve Resuspension for Aortic Regurgitation Following Dissection of Aortic Root in Acute Type A Aortic Dissection

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# Objects

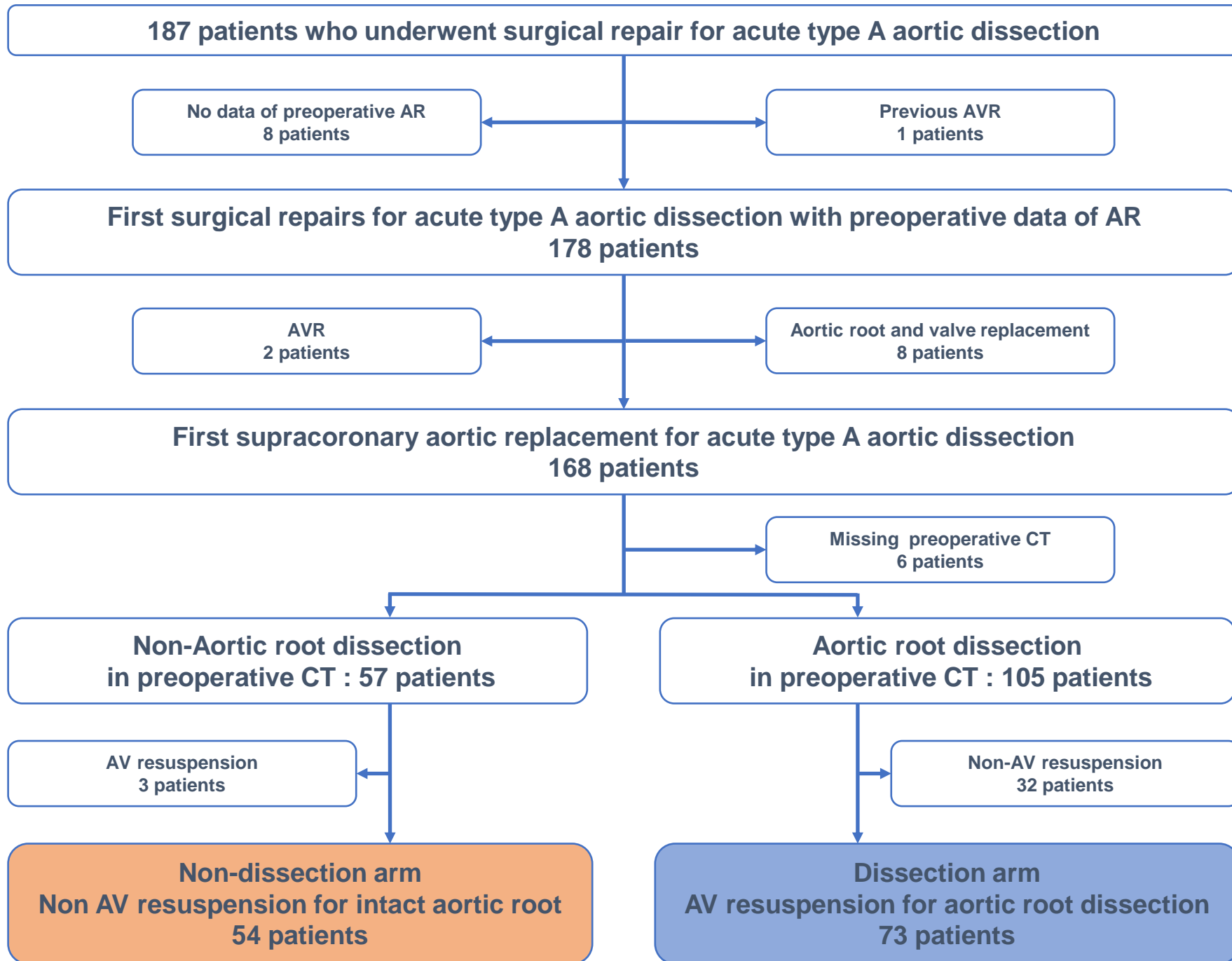
- To evaluate the long-term outcomes after aortic valve resuspension in patients with acute type A aortic dissection (ATAAD).

## Material and Method

- Patients with supracoronary aortic replacement for ATAAD
- Endpoints  
The primary outcome measure: All-cause death  
The secondary outcome measures: Cardiac death, Aorta related death, Hospitalization for heart failure, Major bleeding, Reoperation for aortic regurgitation (AR), Deterioration of AR  $\geq$  moderate, A composite of cardiac death / Heart Failure / Reoperation for AR.
- Cox proportional hazard model adjusting for 3 variates (Age, DM, CKD)

# Surgical Procedures

- Approximation of the stump in dissected aorta were performed using surgical adjuncts (gelatin-resorcin-formalin (GRF) glue, BioGlue or fibrin glue).
- If all of the three sinuses of Valsalva were affected by the dissection and there was no significant aortic valve leaflet pathology, aortic valve resuspension was performed using a pledgeted U-stitch just at each top of aortic valve commissures.
- If the sinuses of Valsalva were affected partially by the dissection, the approximation was only performed without the resuspension.



Lesion and procedural characteristics	Non-dissection (n=54)	Dissection (n=73)	P value
<b>(A) Clinical characteristics</b>			
Age (years)*	73.1±10.9	69.8±10.1	0.08
Men	16 (29.6%)	37 (50.7%)	0.02
Body mass index	22.5±4.3	23.1±3.7	0.36
Hypertension	35 (64.8%)	56 (76.7%)	0.14
Dyslipidemia	8 (14.8%)	18 (24.7%)	0.17
Diabetes mellitus*	5 (9.3%)	7 (9.6%)	0.95
Current smoker	11 (20.4%)	16 (21.9%)	0.08
Heart failure (prior and current)	2 (3.7%)	1 (1.4%)	0.39
Prior myocardial infarction	0	2 (2.7%)	0.13
Prior stroke (symptomatic)	6 (11.1%)	6 (8.2%)	0.58
eGFR <60 (ml/min/1.73m <sup>2</sup> )*	33 (61.1%)	43 (58.9%)	0.80
Hemodialysis	1 (1.9%)	1 (1.4%)	0.83
Chronic obstructive pulmonary disease	0	2 (2.7%)	0.13
Asthma	1 (1.9%)	2 (2.7%)	0.74
Liver cirrhosis	0	1 (1.4%)	0.29

Lesion and procedural characteristics	Non-dissection (n=54)	Dissection (n=73)	P value
<b>(A) Clinical characteristics</b>			
Preoperative AR on presentation			
No AR	31 (54.7%)	17 (23.3%)	
Trivial AR	13 (24.1%)	21 (28.8%)	
Mild AR	9 (16.7%)	18 (24.7%)	
Moderate AR	1 (1.9%)	13 (17.8%)	
Severe AR	0	4 (5.5%)	<0.001
Preoperative AR $\geq$ moderate	1 (1.9%)	17 (23.3%)	<0.001
Malperfusion on presentation			
Coronary	0	3 (4.1%)	0.07
Cerebral	3 (5.6%)	7 (9.6%)	0.40
Spinal Cord	1 (1.9%)	0	0.19
GI tract	3 (5.6%)	1 (1.4%)	0.18
Renal	3 (5.6%)	5 (6.9%)	0.77
Upper Extremity	6 (11.1%)	2 (2.7%)	0.054
Lower Extremity	1 (1.9%)	1 (1.4%)	0.83
Disturbed consciousness within 24 hours	9 (16.7%)	7 (9.6%)	0.24
Tamponade on presentation	29 (53.7%)	27 (37.0%)	0.06
Cardiogenic shock on presentation	15 (27.8%)	14 (19.2%)	0.26
CPR within 1 hour of surgery	4 (7.4%)	2 (2.7%)	0.22

Lesion and procedural characteristics	Non-dissection (n=54)	Dissection (n=73)	P value
<b>(B) Procedural characteristics</b>			
Concomitant procedures			
CABG	2 (3.7%)	4 (5.5%)	0.64
Femoro-femoral bypass	0	3 (4.1%)	0.07
Aortobifemoral bypass	0	1 (1.4%)	0.29
Operation time (minutes)	386±108	463±107	<0.001
CPB time (minutes)	211±74	249±64	0.003
Cardiac arrest time (minutes)	137±42	153±39	0.02
Circulatory arrest time (minutes)	62.1±21.2	66.9±15.5	0.14
Lowest temperature at bladder (°C)	25.7±1.6	25.9±2.0	0.68
Brain protection			
ACP	53 (100%)	73 (100%)	
RCP	35 (64.8%)	68 (93.2%)	
ACP+RCP	16 (29.6%)	3 (4.1%)	
	3 (5.6%)	2 (2.7%)	<0.001
Range of replacing the aorta			
Ascending aortic replacement only	39 (72.2%)	34 (46.6%)	
Ascending and hemiarch replacement	5 (9.3%)	18 (24.7%)	
Ascending and total arch replacement	10 (18.5%)	21 (28.8%)	0.01
Graft size (mm)			
20	0	1 (1.4%)	
22	3 (5.6%)	7 (9.6%)	
24	8 (14.8%)	9 (12.3%)	
26	21 (38.9%)	27 (37.0%)	
28	17 (31.5%)	25 (34.3%)	
30	5 (9.3%)	4 (5.5%)	0.76
Aortic root approximation	-	71 (95.3%)	
Surgical adjuncts			
GRF		5 (7.0%)	
BioGlue		40 (56.3%)	
Fibrin glue		26 (36.6%)	

Degree of AR	Non-dissection N of patients N=34	Dissection N of patients N=66	P value
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### Degree of preoperative AR

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No AR	16 (47.1%)	15 (22.7%)	
Trivial AR	9 (26.5%)	20 (30.3%)	
Mild AR	8 (23.5%)	17 (25.8%)	
Moderate AR	1 (2.9%)	10 (15.2%)	
Severe AR	0	4 (6.1%)	0.02
AR ≥ moderate	1 (2.9%)	14 (21.2%)	0.007

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### Degree of postoperative AR

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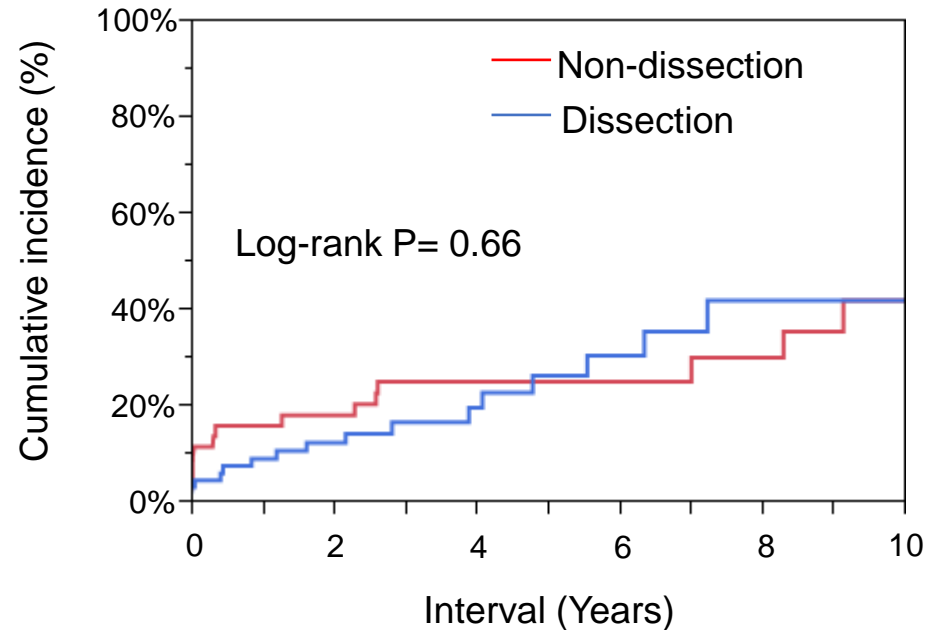
No AR	8 (23.5%)	12 (18.2%)	
Trivial AR	17 (50.0%)	27 (40.9%)	
Mild AR	9 (26.5%)	25 (37.9%)	
Moderate AR	0	1 (1.5%)	
Severe AR	0	1 (1.5%)	0.51
AR ≥ moderate	0	2 (3.0%)	0.19

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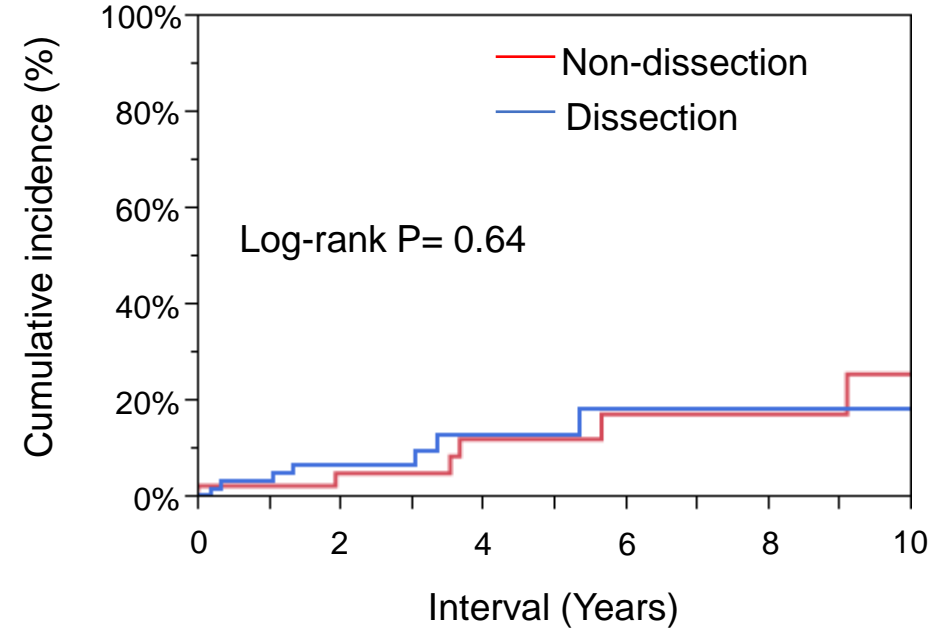
# Kaplan-Meier analysis

**(A) All-cause death**



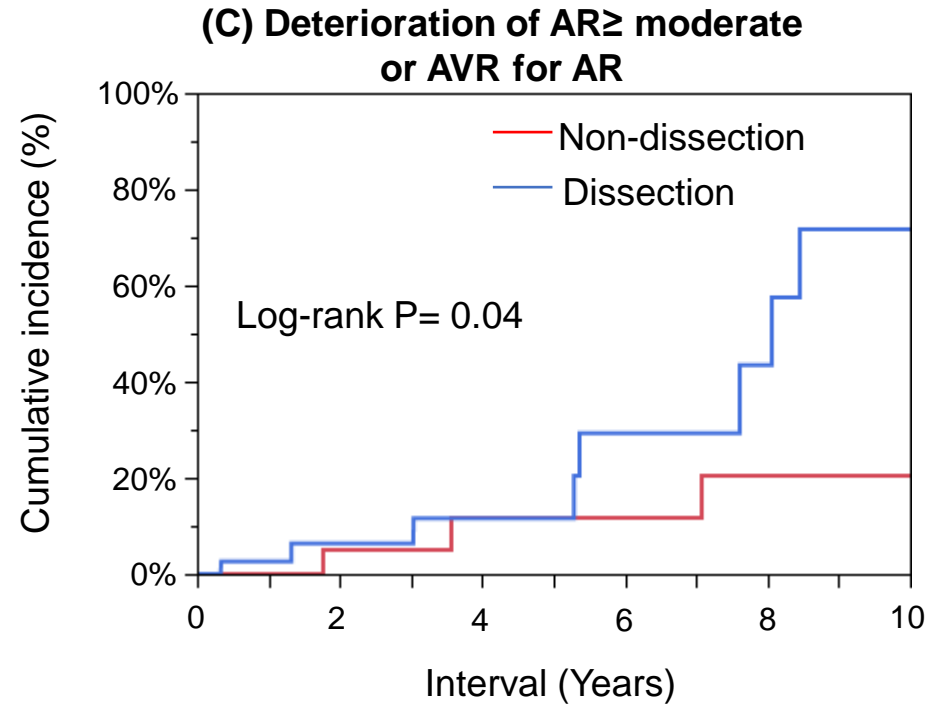
Interval	0 day	2 year	4 years	6 years	8 years	10 years
<b>Non-dissection</b>						
N of patients with at least one event	0	9	12	12	13	15
N of patients at risk	54	38	27	20	14	10
Cumulative incidence probability	0%	17.7%	24.6%	24.6%	29.6%	41.5%
<b>Dissection</b>						
N of patients with at least one event	0	8	11	14	16	16
N of patients at risk	73	50	27	16	7	4
Cumulative incidence probability	0%	12.0%	19.3%	30.0%	41.5%	41.5%

**(B) Cardiac death, HF, or reoperation for AR**



Interval	0 day	2 year	4 years	6 years	8 years	10 years
<b>Non-dissection</b>						
N of patients with at least one event	0	2	4	5	5	6
N of patients at risk	54	37	25	17	12	10
Cumulative incidence probability	0%	4.5%	11.6%	16.8%	16.8%	25.1%
<b>Dissection</b>						
N of patients with at least one event	0	3	5	6	6	6
N of patients at risk	73	47	25	13	5	4
Cumulative incidence probability	0%	5.2%	11.4%	17.0%	17.0%	17.0%

# Kaplan-Meier analysis



Interval	0 day	2 year	4 years	6 years	8 years	10 years
<b>Non-dissection</b>						
N of patients with at least one event	0	1	2	2	3	3
N of patients at risk	34	18	14	12	8	4
Cumulative incidence probability	0%	5.3%	12.0%	12.0%	20.8%	20.8%
<b>Dissection</b>						
N of patients with at least one event	0	1	2	4	5	7
N of patients at risk	66	24	15	9	5	2
Cumulative incidence probability	0%	3.8%	9.2%	27.4%	41.9%	70.9%

Endpoints	Non-dissection N of patients with events (Cumulative incidence) N=54	Dissection N of patients with events (Cumulative incidence) N=73	Crude HR (95%CI)	P value	Adjusted HR (95%CI)	P value
<b>Clinical outcomes at 10-year</b>						
All-cause death	18 (33.3%)	16 (21.9%)	0.86 (0.43-1.72)	0.67	1.12 (0.52-2.37)	0.78
Cardiac death	3 (5.6%)	1 (1.4%)	0.39 (0.04-3.98)	0.42	-	-
Aorta related death	1 (1.9%)	3 (4.1%)	2.64 (0.27-25.8)	0.40	-	-
Stroke beyond 30 days after the procedure	3 (5.6%)	1 (1.4%)	0.27 (0.03-2.62)	0.26	-	-
Hospitalization for heart failure	4 (7.4%)	3 (4.1%)	0.75 (0.16-3.50)	0.71	-	-
Major bleeding except reoperation for bleeding	4 (7.4%)	4 (5.5%)	0.75 (0.19-3.02)	0.69	-	-
Reoperation for sinus of Valsalva aneurysm	0	2 (2.7%)	-	1.00	-	-
Reoperation for deterioration of AR	1 (1.9%)	4 (5.5%)	5.45 (0.61-48.9)	0.13	-	-
Deterioration of AR $\geq$ moderate or AVR for AR	4/34 (11.8%)	9/66 (13.6%)	3.74 (0.99-14.2)	0.052	20.7 (1.99-214)	0.01
A composite of cardiac death / HF / Reoperation for AR	7 (13.0%)	8 (11.0%)	1.28 (0.45-3.70)	0.64	1.32 (0.41-4.21)	0.64

# Limitations

- Observational study without randomization
- Small sample and single center study
- Loss of data of echocardiography during follow up in some patients
- Difficult estimation of preoperative AR due to unstable hemodynamics or cardiac tamponade
- Ununiform technique of approximation of the stump  
(GRF glue, BioGlue, fibrin glue)

# Conclusion

- Aortic valve resuspension for AR following aortic root dissection could improve valve competency in short-term and overall long-term survival rate is comparable with that in patients without aortic root dissection.
- However, aortic root dissection repaired with aortic valve resuspension is associated with significant higher risk of deterioration of AR in long-term follow-up.
- Aortic valve resuspension seemed an acceptable option for selected patients with AR following aortic root dissection.