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Long-term Outcomes of Primary Surgical Repair for Communicating DeBakey IIIb Chronic Dissecting Aortic Aneurysm

Shuhei Miura, Kei Mukawa, Keitaro Nakanishi, Takakimi Mizuno, Ayaka Arihara, Tsuyoshi Shibata, Junji Nakazawa, Tomohiro Nakajima, Yutaka Iba, Nobuyoshi Kawaharada

Sapporo Medical University, Department of Cardiovascular surgery

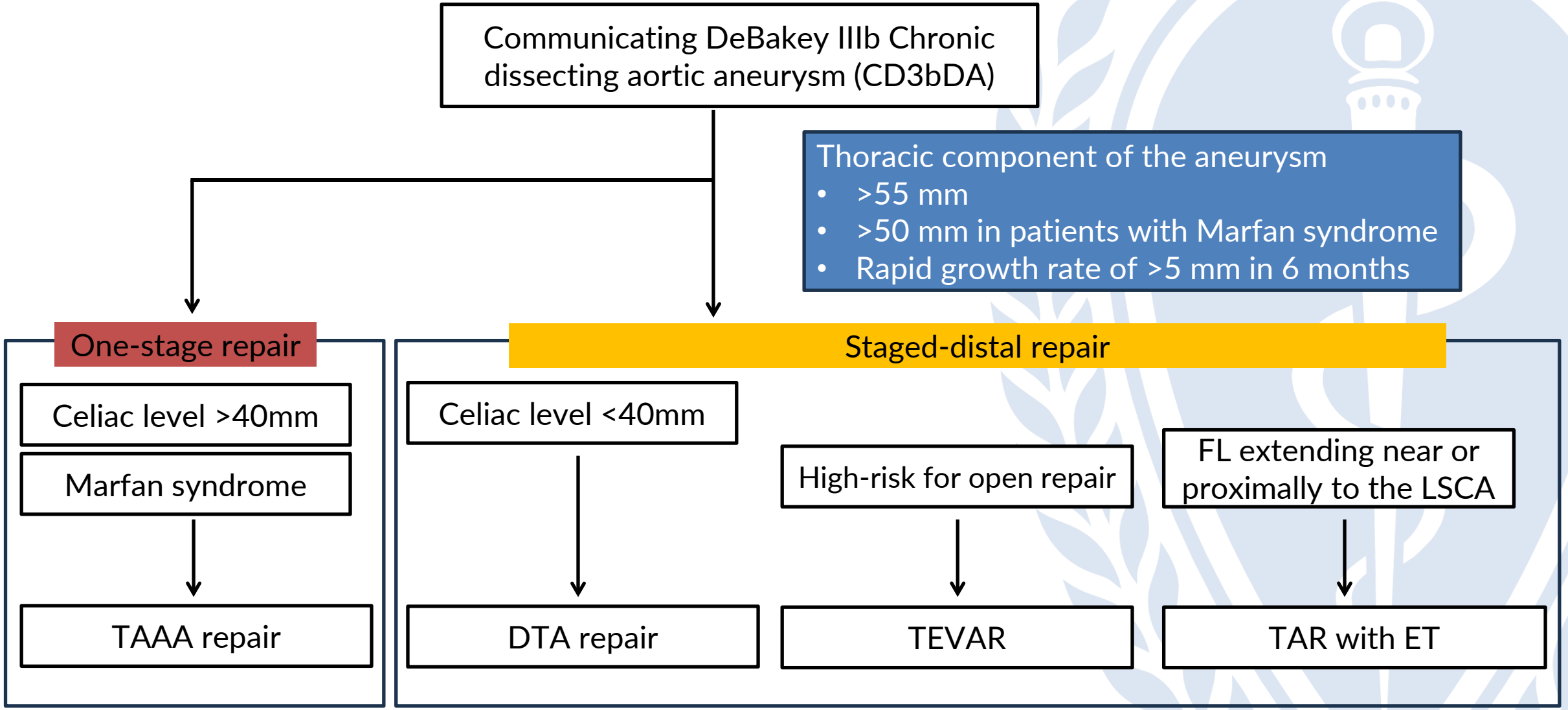
Objectives

- Comprehensive surgical strategies are required for communicating DeBakey IIIb chronic dissecting aortic aneurysm (CD3bDA) in which dissection extends below the visceral arteries.

- Although the treatment of CD3bDA includes several primary surgical repairs to reduce the invasiveness, the optimal option remains controversial.

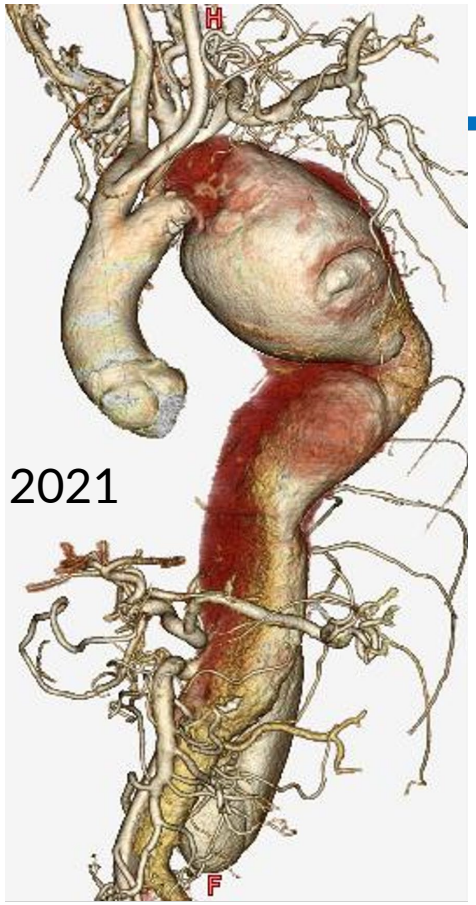
- The aim of this study was to evaluate the 20-year long-term surgical outcomes for CD3bDA and consider the optimal primary treatment option to prevent the incidence of aortic events.

Surgical Strategy for CD3bDA



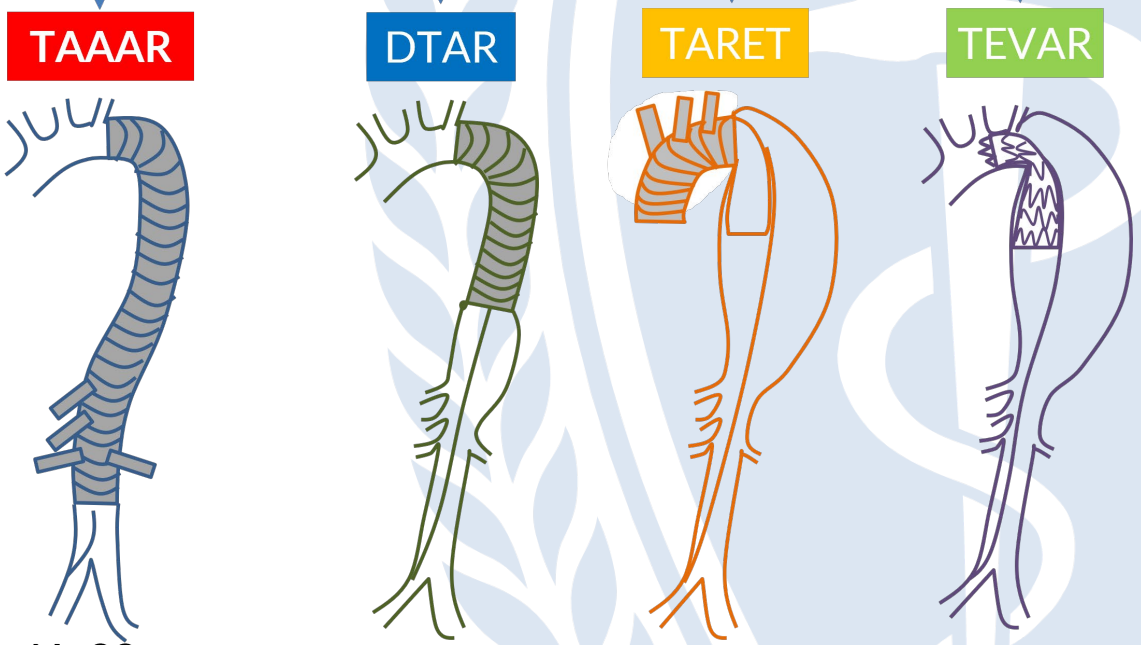
Patient and methods

October 2002 – June 2021



Total : 101

Treatment options of primary surgical repair for CD3bDA



Exclusion Criteria:

- Emergency surgery (Rupture, Malperfusion)
- Previous aortic repair of type A aortic dissection or AAA

Early outcomes (Stroke, Spinal cord injury, In-hospital mortality)

Late outcomes (Overall survival, Aortic event)

Patient characteristics by primary surgical repair

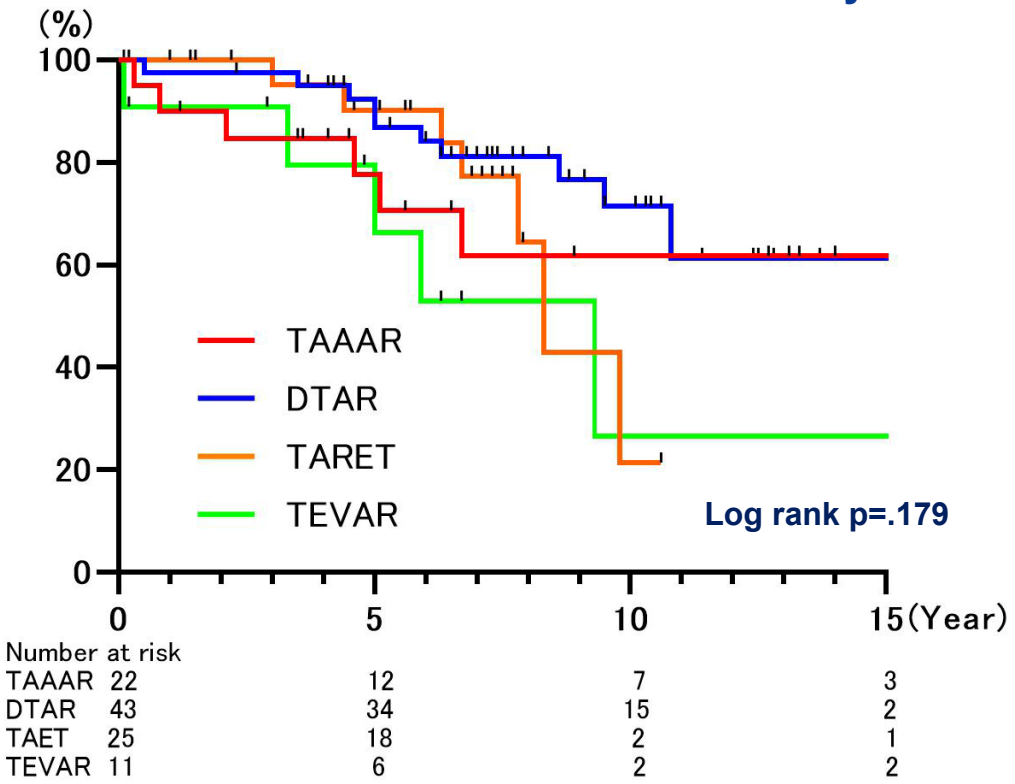
Variable	Total (n=101)	TAAAR (n=22)	DTAR (n=43)	TARET (n=25)	TEVAR (n=11)	*P* value
Interval from onset (month)	64.3±10.6	54.7±25.4	77.9±18.2	48.8±26.1	60.2±34.0	0.785
Aneurysm diameter (mm)	58.5±10.6	60.2±11.5	58.6±10.8	59.3±8.4	56.6±11.7	0.255
Age (year)	59.4±13.7	55.1±15.5	58.1±12.9	62.8±13.4	65.6±10.9	0.092
Gender (male)	84 (83.2)	19 (86.4)	34 (79.1)	22 (88.0)	9 (81.8)	0.775
Marfan syndrome	19 (18.8)	8 (36.4)	8 (18.6)	3 (12.0)	0 (0)	0.027
Hypertension	79 (78.2)	17 (77.3)	35 (81.4)	16 (64.0)	11 (100.0)	0.098
Diabetes mellitus	8 (7.9)	3 (13.6)	5 (11.6)	0 (0)	0 (0)	0.180
CKD (creatinine>1.5 mg/dl)	9 (8.9)	2 (9.1)	3 (7.0)	2 (8.0)	2 (18.2)	0.708
LVEF (%)	62.3±3.7	63.0±2.1	60.8±2.9	61.3±3.1	59.9±2.6	0.331
COPD	39 (38.6)	7 (31.8)	15 (34.9)	13 (52.0)	4 (36.4)	0.459
SVS/STS Classification (zone)						
Proximal dissection extent	3.0±0.9	3.6±0.9	3.1±0.7	2.4±1.0	3.0±0.2	<0.0001
Distal dissection extent	9.4±1.4	8.9±1.5	9.6±1.3	9.4±1.3	9.5±1.2	0.267

Overall outcomes by primary surgical repair

Variable	Total (n=101)	TAAAR (n=22)	DTAR (n=43)	TARET (n=25)	TEVAR (n=11)	*P* value
Perioperative data						
Operation time (min)	527.2±222.3	770.3±165.3	541.7±159.8	449.3±222.3	161.5±107.0	<0.0001
CPB time (min)	206.7±66.6	273.1±59.1	169.9±55.9	211.3±37.9	NA	<0.0001
Deep hypothermia	21 (23.3)	6 (27.3)	13 (30.2)	2 (8.0)	NA	0.100
Preoperative CSF drainage	37 (36.6)	13 (59.1)	22 (51.2)	0 (0)	1 (9.1)	<0.0001
AKA reconstruction	31 (34.4)	15 (68.2)	15 (34.9)	0 (0)	NA	<0.0001
Red blood cells (unit)	18.9±15.0	33.7±13.5	19.1±14.0	12.3±5.9	2.5±1.3	<0.0001
Fresh frozen plasma (unit)	14.6±10.6	25.2±12.4	14.8±6.2	10.4±6.6	1.1±0.3	<0.0001
Platelet (unit)	18.2±10.2	23.9±11.6	19.9±7.1	17.9±6.9	1.4±0.4	<0.0001
Prolonged ventilation (>24hr)	32 (31.7)	12 (54.6)	14 (32.6)	5 (20.0)	1 (9.1)	0.023
Postoperative data						
Stroke (permanent)	4 (3.9)	2 (9.1)	0 (0)	1 (4.0)	1 (9.1)	0.255
Spinal cord injury	8 (7.9)	3 (13.6)	2 (4.7)	2 (8.0)	0 (0)	0.433
In-hospital mortality	4 (3.9)	2 (9.1)	1 (2.3)	0 (0)	1 (9.1)	0.306
Aorta-related reintervention	15 (14.9)	1 (4.5)	6 (13.9)	3 (12.0)	5 (45.5)	0.017

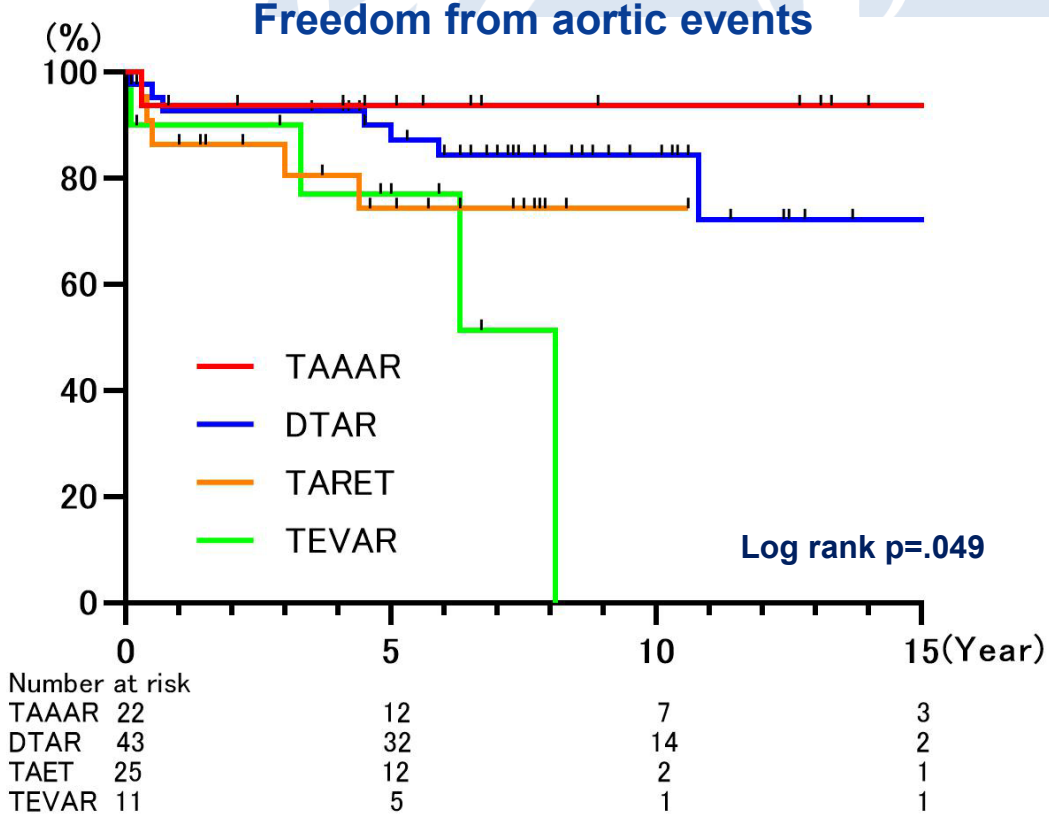
Comparisons of late outcomes by primary surgical repair

Freedom from all-cause mortality



	5 year	10 year	15 year
TAAAR	77.6%	61.8%	61.8%
DTAR	86.9%	71.6%	61.4%
TARET	90.2%	21.5%	NA
TEVAR	66.3%	26.5%	26.5%

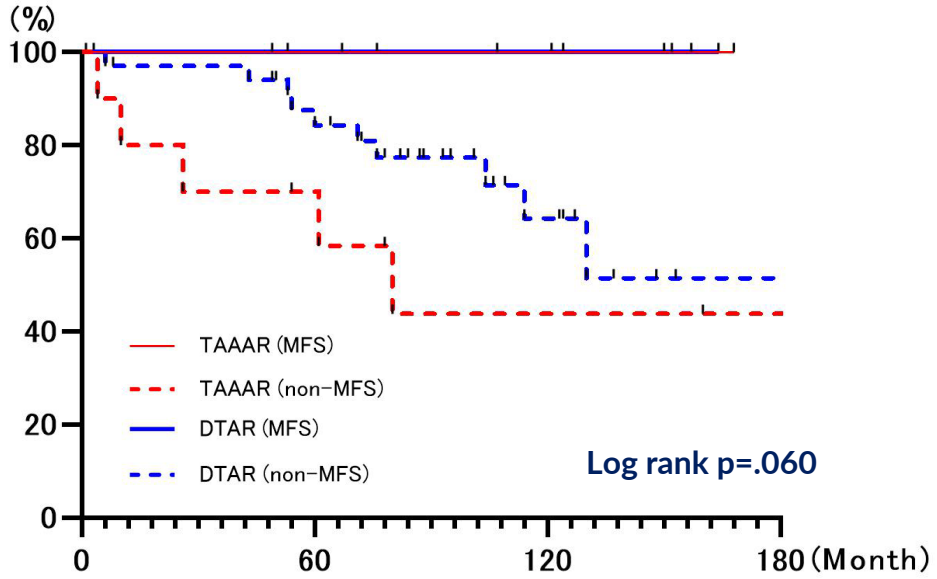
Freedom from aortic events



	5 year	7 year	10 year
TAAAR	93.8%	93.8%	93.8%
DTAR	87.2%	84.3%	84.3%
TARET	74.4%	74.4%	74.4%
TEVAR	77.1%	51.4%	NA

Comparison of late outcomes with or without MFS

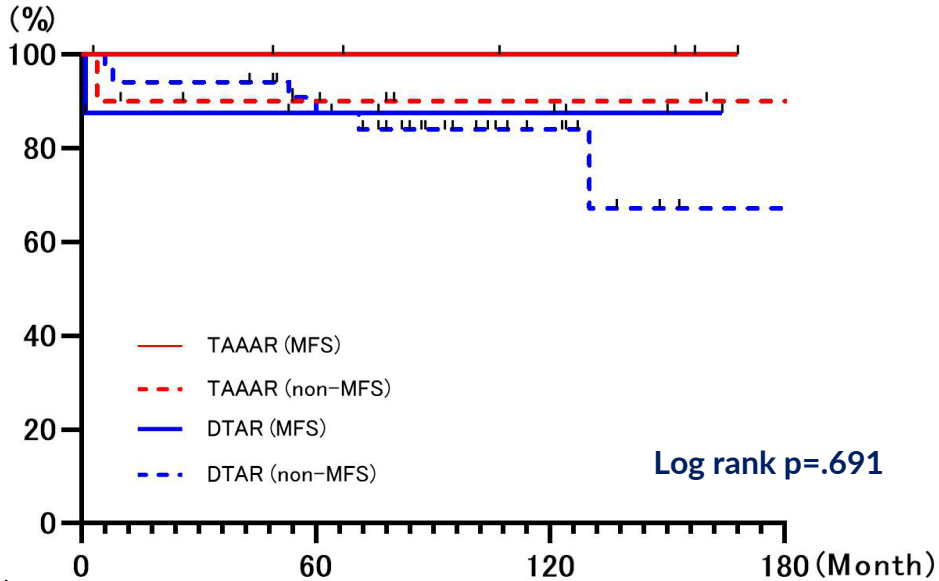
Freedom from all-cause mortality



Number at risk				
TAAAR (MFS)	8	6	4	1
TAAAR (non-MFS)	14	7	4	3
DTAR (MFS)	8	6	4	1
DTAR (non-MFS)	35	27	10	2

	5-year	10-year	15-year
TAAAR (MFS)	100%	100%	100%
TAAAR (non-MFS)	70.0%	43.8%	43.8%
DTAR (MFS)	100%	100%	100%
DTAR (non-MFS)	84.3%	64.3%	51.4%

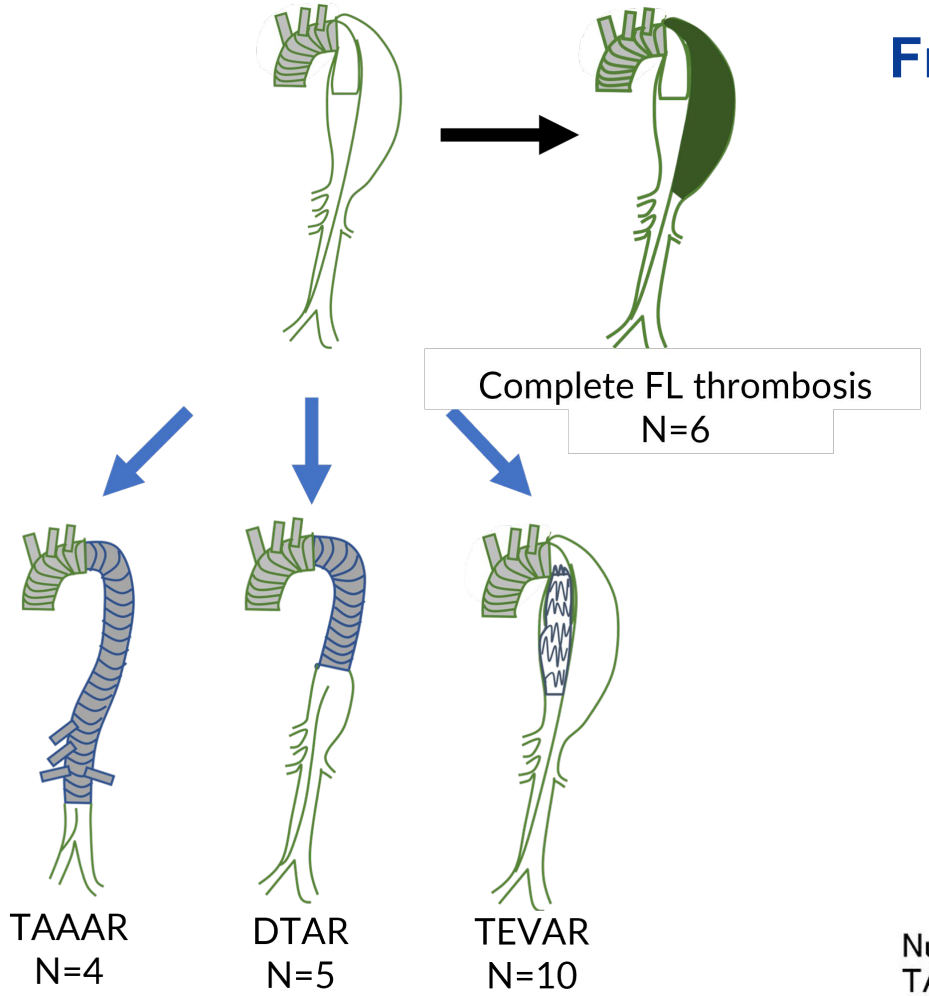
Freedom from aortic events



Number at risk				
TAAAR (MFS)	8	6	4	1
TAAAR (non-MFS)	14	7	4	3
DTAR (MFS)	8	6	4	1
DTAR (non-MFS)	35	27	10	2

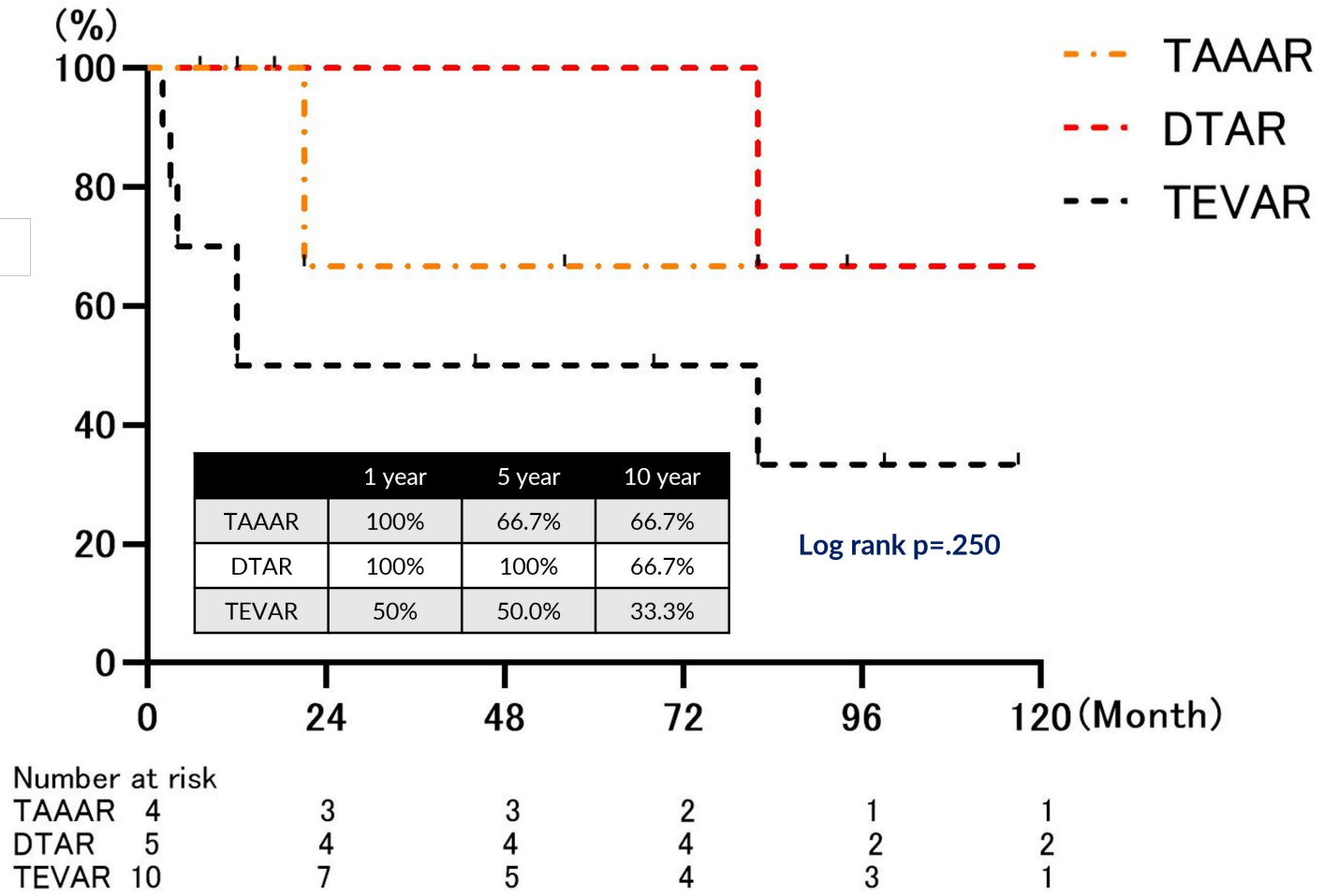
	5-year	10-year	15-year
TAAAR (MFS)	100%	100%	100%
TAAAR (non-MFS)	90.0%	90.0%	90.0%
DTAR (MFS)	87.5%	87.5%	87.5%
DTAR (non-MFS)	87.5%	84.0%	67.2%

Staged-distal repair for dissecting aorta after TARET



Staged-distal repair after TARET

Freedom from aorta-related reintervention after TARET



	1 year	5 year	10 year
TAAAR	100%	66.7%	66.7%
DTAR	100%	100%	66.7%
TEVAR	50%	50.0%	33.3%

Multivariate Cox regression analyses for aortic event

Variable	Univariate			Multivariate		
	HR	95% CI	*P* value	HR	95% CI	*P* value
Marfan syndrome	0.72	0.40-1.31	0.28			
Proximal dissection extent	0.87	0.65-1.18	0.37			
Deep hypothermia	0.80	0.45-1.41	0.44			
AKA reconstruction	0.59	0.35-0.98	0.04	0.75	0.40-1.39	0.36
TAAAR	0.62	0.34-1.14	0.12	0.46	0.18-1.15	0.10
DTAR	0.73	0.46-1.16	0.19	0.52	0.28-0.99	0.05
TARET	1.93	1.09-3.40	0.02	2.27	1.26-4.09	0.007
TEVAR	2.68	1.24-3.44	0.01	3.40	1.53-4.66	0.003

Variables with P<0.2 in the univariate analysis were incorporated into the multivariate analysis.

Summary

- **Although one-stage TAAA repair was associated with high perioperative morbidity and mortality, late outcomes were accomplished with excellent long-term survival and aortic event-free rates, as well as DTA repair.**
- **In both TAAA and DTA repairs, Marfan syndrome (MFS) patients had higher survival and aortic event-free rates compared with non-MFS patients.**
- **TARET and TEVAR did not improve the early and late adverse events.**
- **In particular, intervention with TEVAR may lead to an increase in aortic events during follow-up.**

Conclusion

- **Considering the optimal primary surgical repair based on long-term outcomes, TEVAR was not a durable treatment option to prevent aortic events.**

- **Patient-specific TAAA or DTA repair, such as in MFS patients, may be aggressively adopted rather than defaulting to minimally invasive primary repairs for all patients with CD3bDA.**