

Early Results of Physician Modified Inner Branched Endovascular Repair for Complex Abdominal Aortic Aneurysms

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Purpose

To report the midterm outcomes of
physician-modified inner branched endovascular repair
(PMiBEVAR)
for pararenal aortic aneurysms (PRAAs)
and thoracoabdominal aortic aneurysms (TAAAs)

Methods

From Dec 2020 to Sep 2023
34 cases of PMiBEVAR
Multi center, retrospective

Results

Baseline characteristics

Variable	Overall (n=34)
	No. (%), mean \pm SD
Age (years)	78.2 \pm 7.6
Male	26 (76.5)
Hypertension	29 (85.3)
Dyslipidemia	18 (52.9)
Diabetes mellitus	6 (17.6)
Chronic kidney disease (eGFR < 59)	21 (61.8)
Dialysis	5 (14.7)
Coronary artery disease	13 (38.2)
Cerebrovascular disease	6 (17.6)
Chronic obstructive pulmonary disease	11 (32.4)
Previous aortic surgery	20 (58.8)
ASA score \geq 3	23 (67.6)
ASA score \geq 4	6 (17.6)

Variable	Overall (n=34)
	No. (%), mean \pm SD
Aneurysm type	
PRAA	7 (20.6)
Crawford extent I	1 (2.9)
Crawford extent II	7 (20.6)
Crawford extent III	10 (29.4)
Crawford extent IV	5 (14.7)
Crawford extent V	4 (11.8)
Aneurysm diameter (mm)	64.1 \pm 12.6
Rupture	7 (20.6)
Impending rupture	5 (14.7)

Procedure details

Variable	Overall (n=34)
	No. (%), median, or IQR (25%-75%)
Modified main device	34
Relay Plus	18 (52.9)
Zenith alpha thoracic	7 (20.6)
Zenith alpha abdominal	5 (14.7)
Tx2	2 (5.9)
Valiant Navion	2 (5.9)
Main device outer size, Fr	23 (20-24)
Inner branch device	72
Viabahn	39 (54.2)
Endurant leg	33 (45.8)
Bridging stent device	72
VBX	64 (88.9)
LIFESTREAM	8 (11.1)
Type of incorporation	98
Inner branches	72 (73.5)
Fenestrations	10 (10.2)
Chimney	1 (1.0)
Debranch	4 (4.1)
Coverage	11 (11.2)

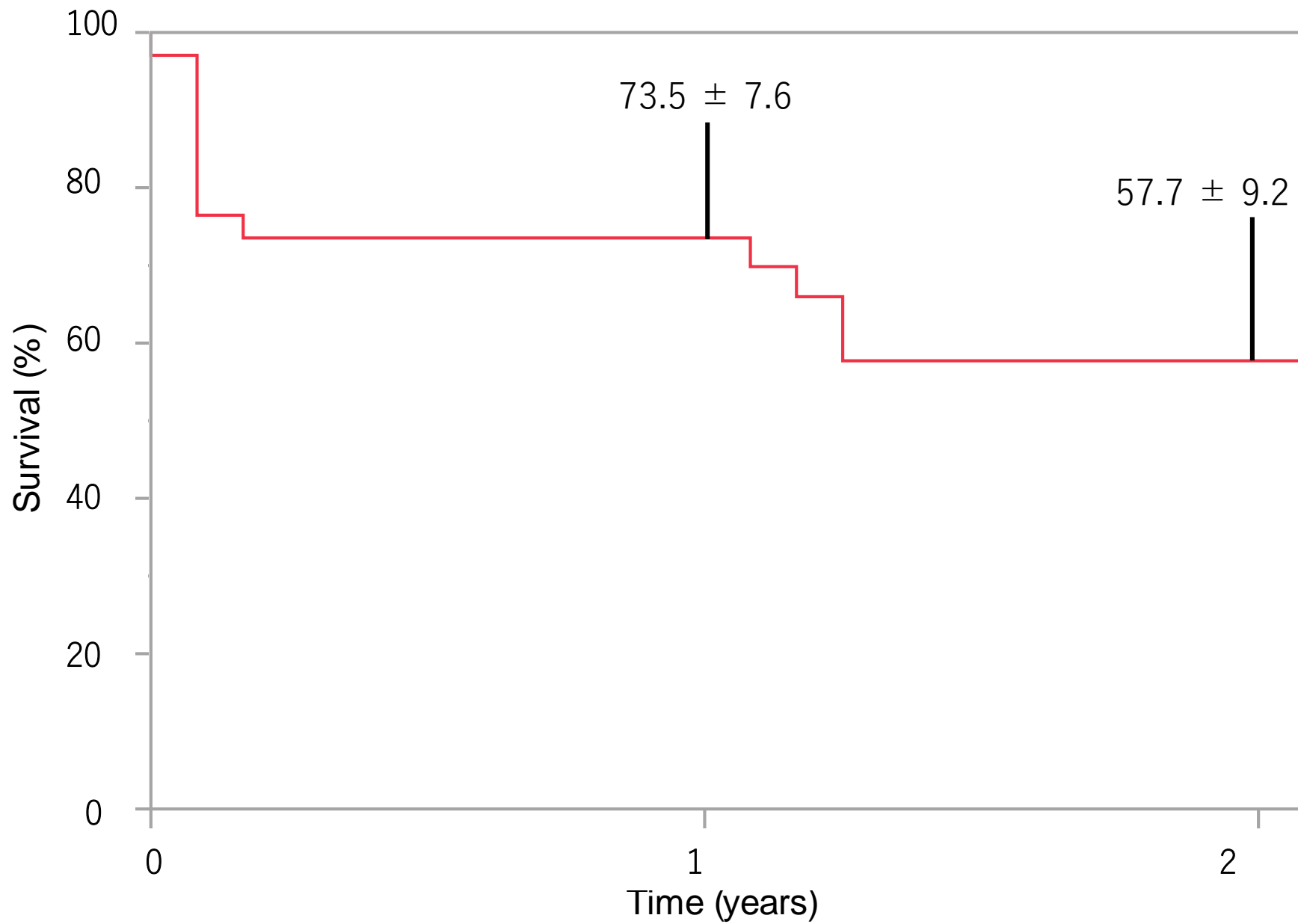
Variable	Overall (n=34)
	No. (%), median, or IQR (25%-75%)
Custom time, min	90 (60-100)
Contrast volume, mL	152 (106-250)
Fluoroscopy time, min	128 (71-184)
Total radiation dose, mGy	2533 (1238-4572)
Total operative time, min	346 (279-436)
Estimated blood loss, mL	465 (200-724)
Technical success	32 (94.1)

Postoperative outcomes

<i>Variable</i>	Overall (n=34)
	No. (%), median, or IQR (25%-75%)
In-hospital death	6 (17.6)
Any MAE	9 (26.5)
Myocardial infarction	0 (0)
Stroke	0 (0)
New-onset dialysis	3 (8.8)
Respiratory failure	3 (8.8)
Bowel ischemia	1 (2.9)
Paraplegia	1 (2.9)
Length of in hospital stay, d	12 (9-26)
Length of ICU stay, d	2 (1-5)
Postoperative endoleak	
Type Ia+b+c	0 (0)
Type II	4 (11.8)
Type IIIa	1 (2.9)
Type IIIb	1 (2.9)
Type IIIc	2 (5.9)
Type IV	1 (2.9)

All in-hospital death cases

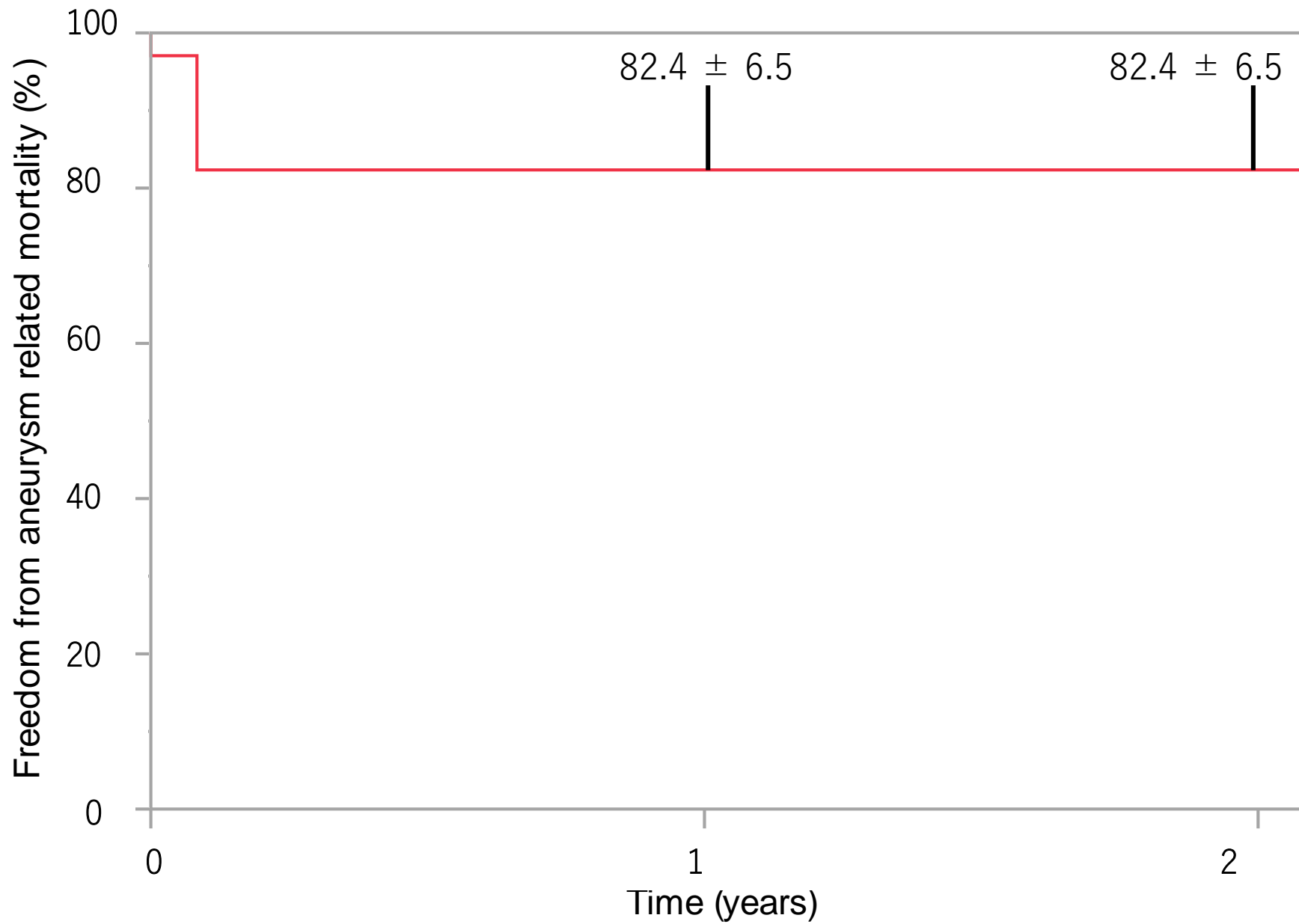
<i>Patient</i>	<i>Age</i>	<i>Type of aneurysm</i>	<i>ASA score</i>	<i>Modification design</i>	<i>Rupture</i>	<i>Operative time, min</i>	<i>Reason for death</i>	<i>Length of hospital stay, d</i>
1	86	Extent II	4	1 inner branch	Yes	314	Sepsis	25
2	87	PRAA	3	2 inner branches and 1 fenestration	No	324	NOMI	13
3	63	Extent III	3	3 inner branches	No	342	NOMI	33
4	73	Extent IV	4	3 inner branches	Yes	385	Rupture	16
5	81	Extent III	3	2 inner branches	No	771	Iatrogenic IVC injury during bi. RA debranching	12
6	84	PRAA	3	1 inner branches	No	468	Rhabdomyolysis	2



No. at risk
34

20

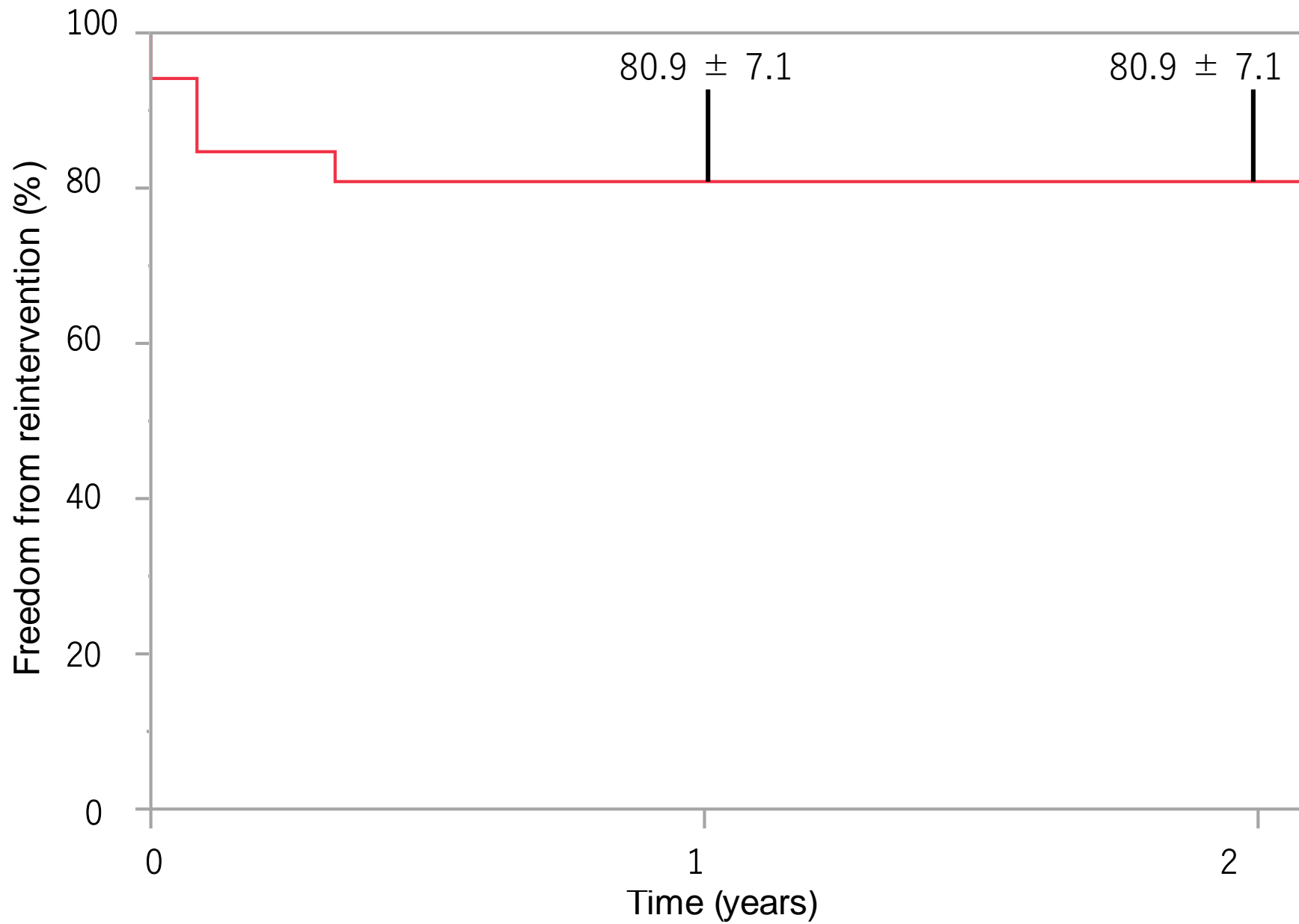
13



No. at risk
34

24

13



No. at risk
34

19

11

80.9 ± 7.1

80.9 ± 7.1

All reintervention cases during follow-up

<i>Patient</i>	<i>Type of aneurysm</i>	<i>Modification design</i>	<i>Timing of secondary intervention, d</i>	<i>Reason for secondary intervention</i>	<i>Detail of secondary intervention</i>	<i>Follow-up term, month</i>
1	Extent III	3 inner branches and 1 fenestration	25	TIIIcEL from innerbranch for rt RA	Coiling for inner branch	13
2	Extent III	2 inner branches and 2 fenestrations	6	TIIIcEL from fenestration for rt RA	Coiling for perigraft	12
3	Extent III	3 inner branches	111	TIc EL	Additional bridge stent	36
4	Extent IV	3 inner branches	8	Rupture due to TIaEL	Open repair	1
5	Extent II	2 inner branches	20	TIaEL	TEVAR	15
6	Extent II	3 inner branches	12	TIIIaEL	TEVAR	36

Limitations

- This was a small study of a series of retrospective design.
- Selection bias may exist, as patients classified as very frail are less likely to undergo surgery due to their compromised general health and functional status.



This study offers lessons that can be applied to treat complex aneurysms.

Conclusions

- PMiBEVAR proves to be a viable approach for treating PRAA or TAAAs in patients at high surgical risk, demonstrating acceptable outcomes at the 2-year mark.
- This technology allows surgeons to tailor surgery to a patient's specific anatomy without geographic restrictions and manufacturing time delay.
- However, the long-term durability of this approach remains uncertain, necessitating further large-scale and long-term studies.