Saiseikai Utsunomiya Hospital

Evaluation of the Safety of Total Arch Replacement with Extended Branched Stented Anastomosis Frozen Elephant trunk Repair (EB-SAFER) for Acute Type A Dissection

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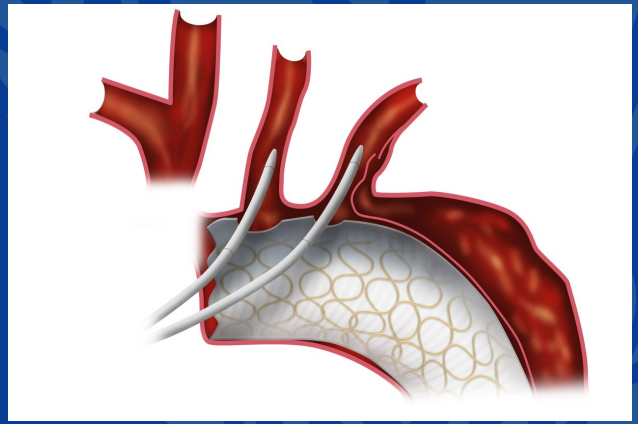
OBJECTIVE

- **To reduce the surgical risk of emergency total arch replacement (TAR) for acute type A aortic dissection (AADA), VIABAHN Open Revascularization TEChnique (VORTEC) of the supra-aortic reconstruction during hybrid aortic arch surgery, reported as a Cleveland Clinic technique, we are performing extended branched stented anastomosis frozen elephant trunk repair (EB-SAFER).**



  - EB-SAFER;JTCVS Techniques 2023;17:1-9
  - IRB September 24, 2020 (#2020-48)

OBJECTIVE

- EB-SAFER does not require exposure of the cervical artery and has reduced operative time and better surgical outcomes, but long-term patency and arch coarctation are also concerns.
- The purpose of this study was to compare the safety of the branch of EB-SAFER with conventional TAR (CTAR) in AADA where the false lumen is patent.

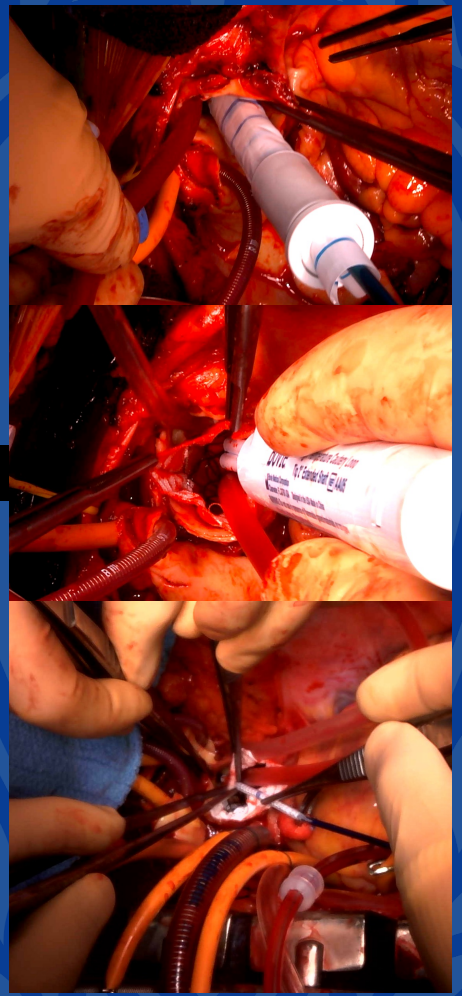
METHODS

- **Surgical procedure**
  - From 2016.1 to 2023.8, 102 patients with Type A dissection underwent emergency TAR.
    - retrospective study
- **Conventional TAR group (~2019.12)**
  - Cervical artery ; graft repair alone
    - Second level sub-bullet
- **EB-SAFER group (2020.1~)**
  - Cervical artery; Viabahn (Gore Medical, Flagstaff, AZ, USA)
    - sutureless direct branch vessel stent grafting
  - Frozen Elephant Trunk ; (Frozenix J Graft(FJG) (Japan Lifeline, Tokyo, Japan)
    - an oval nitinol stent

METHODS

- After the circulatory arrest, the aortic arch was usually transected circumferentially at Zone1 or 2.
- The FET was deployed to the descending aorta and heated with a cautery to fenestrate it. No need to expose the left subclavian artery.
- The Viabahn was delivered into the Cervical branches through the fenestration.

  – Ankle-Brachial Index (ABI) was measured to evaluate aortic coarctation



Demographic Characteristics

		EB-SAFER	CTAR	p-value
Subjects		63	39	
Age (years)	Mean ± SEM	62.6 ± 12.6	58.3 ± 14.0	0.123
Gender, Male	No. (%)	47 (75)	30 (77)	>0.999
Comorbidities	No. (%)			
Diabetes Mellitus		7 (11)	1 (3)	0.150
Dyslipidemia		22 (35)	8 (21)	0.179
Coronary artery disease		1 (2)	1 (2)	>0.999
Cerebrovascular disease		7 (11)	2 (5)	0.476
COPD		4 (6)	3 (8)	>0.999
Hypertension		49 (78)	31 (80)	>0.999
CKD on HD		0 (0)	0 (0)	NA
Marfan syndrome		0 (0)	2 (5)	0.144
Smoking		34 (54)	18 (46)	0.542

CKD: chronic kidney disease

Demographic Characteristics

		EB-SAFER(63)	CTAR(39)	p-value
DeBakey	No. (%)			0.476
I		45 (71)	32 (82)	
II		10 (16)	4 (10)	
III		8 (13)	3 (8)	
Dissection State				
Rupture		3 (5)	2 (5)	>0.999
Malperfusion		15 (24)	8 (21)	0.809
Tamponade		5 (8)	5 (13)	0.500
Partial Thrombosis		42(70)	30 (81)	0.245
Severity				
Euro score		5.2 (7.6)	2.7 (3.3)	0.270
Japan score		9.5 (7.5)	7.7 (9.1)	0.002
Adjunctive procedure				
AVR		3 (5)	0 (0)	0.285
CABG		2 (3)	1 (3)	>0.999
Aortic Root Replacement		2 (3)	1 (3)	>0.999

Result

- **Surgical Outcome** (Technical success: 100%)

	EB-SAFER(63)	CTAR(39)	p-value
Time (Mean ± SEM)			
Estimated arch vessel reconstruction	22.7 ± 13.1	63.0 ± 28.3	<0.001
Total operation	342.1 ± 87.8	465.2 ± 150.4	<0.001
CPB	204.2 ± 55.9	274.8 ± 94.6	0.002
Cardiac arrest	142.8 ± 44.9	183.0 ± 51.6	<0.001
Cerebral perfusion	76.0 ± 25.9	116.8 ± 47.2	<0.001
Circulatory arrest	57.2 ± 20.1	67.1 ± 33.2	0.068

Estimated arch vessel reconstruction : Cerebral perfusion - Circulatory arrest
CPB : Cardio Pulmonary Bypass

Result

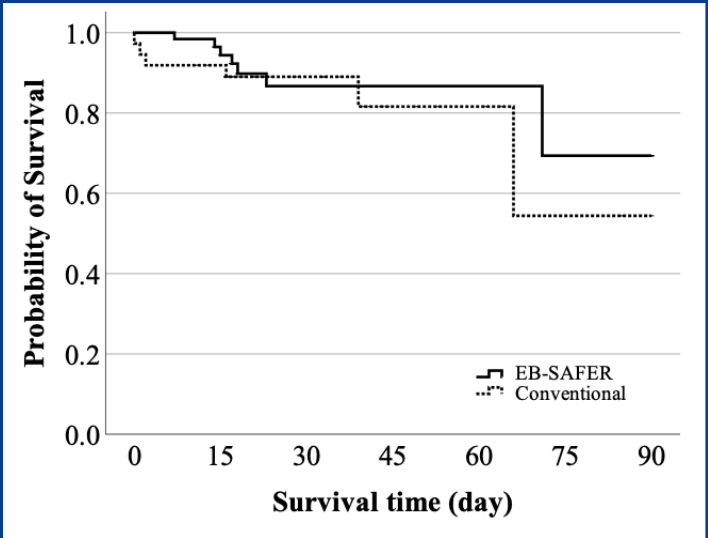
- **Surgical Outcome**

No. (%)	EB-SAFER(63)	CTAR(39)	p-value
Blood products			
RBC	2 (6)	10 (8)	<0.001
FFP	6 (6)	10 (7)	<0.001
PLT	20 (10)	20 (20)	0.006
Ventilator free days (30)	25 (11)	27 (19)	0.842
ICU free days (30)	23 (12)	21 (18)	0.149
Hospital free days (90)	65 (37)	57 (39)	0.244
Mortality			
30-day	6 (10)	4 (11)	>0.999
In-hospital	7 (11)	6 (16)	0.543
Arch vessel related Complication (median)			
Observation period, days	185 (309)	1202 (1980)	
Branch occlusion	0 (0)	1 (3)	>0.999

Result

- **Surgical Outcome**

	No. (%)	EB-SAFER	CTAR
Ankle-Brachial Index (ABI)			
Rt , Lt		1.13 ± 0.11 , 1.12± 0.15	-
Rt , Lt < 0.9		0 (0) , 0 (0)	-
Coarctation sign: Rt <0.9 & Lt <0.9		0 (0)	-



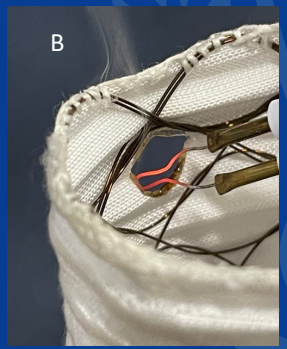
There was no significant difference in survival time between the two groups (P＝0.46)

Discussion

- Use self-expandable stent grafts.
- The balloon-expandable type, which is secured by flaring the proximal side during circulatory arrest, carries the risk of arterial injury without fluoroscopy.
- In contrast, the use of self-expandable stent grafts appears to be a simple method that requires attention to only the length from the origin of the subclavian artery to the vertebral artery. It is believed to contribute to long-term patency.
- ABI for assessment of aortic coarctation due to intra-aortic self-expanding stent graft implantation was also normal in the remote period.

A

B



A: Post implant view showing VIABAHN inserted in the long axis. The proximal end of the VIABAHN is then secured to the FET with a 5-0 polypropylene thread to prevent long-term migration

B: Fenestrations are created within the oval stent skeleton, and the edges of the polyester material are solidified by thermal cauterization.

CONCLUSION

- EB-SAFER improved surgical outcomes, including shorter operative time and reduced use of blood products, without worsening long-term survival and branch-related complications.
- This study demonstrated that EB-SAFER is safe and effective, comparable to CTAR, and can be used for AADA with patent false lumen.