

# Decreased Mortality after Total Arch Replacement with Frozen Elephant Trunk in Acute Type A Aortic Dissection: An Analysis of the STS Database

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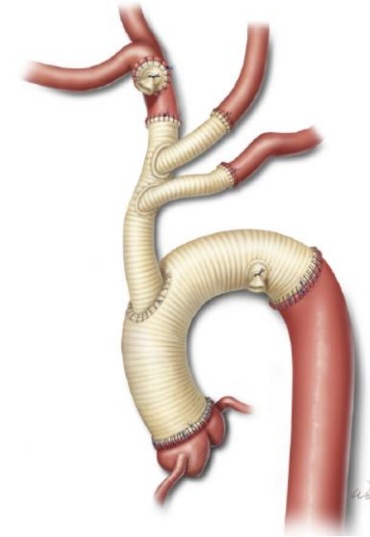
## Disclosures

- None
- The data for this research were provided by The Society of Thoracic Surgeons' National Database Participant User File Research Program. Data analysis was performed at the investigators' institution(s).



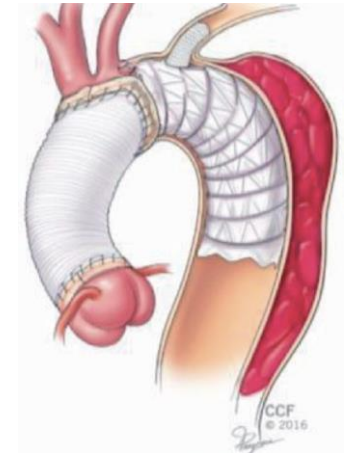
# Acute Type A Aortic Dissection

- Acute Type A Aortic Dissection morbidity and mortality remain high which increases with organ malperfusion
- For dissections greater than zone 2, Total Arch replacement (TAR) and TAR with Frozen Elephant Trunk (FET) are viable surgical options
- There is increased enthusiasm for aggressive arch replacement with FET
  - Provides Landing zone for future endovascular intervention
  - Improve true lumen perfusion and decrease false lumen flow



Total Arch Replacement (TAR)

LeMaire *et al.* *Ann Cardiothorac Surg.* 2013

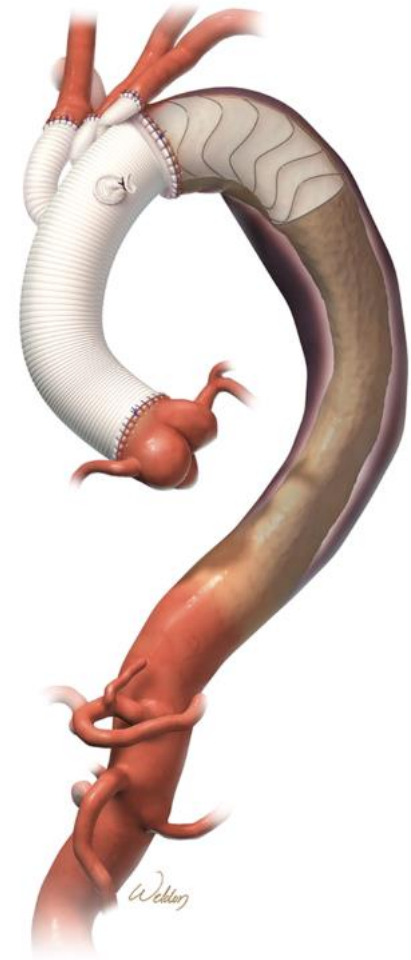


Total Arch Replacement (TAR) with Frozen Elephant Trunk (FET)

Roselli *et al.* *Eur J Cardiothorac Surg.* 2023

# Concerns regarding FET

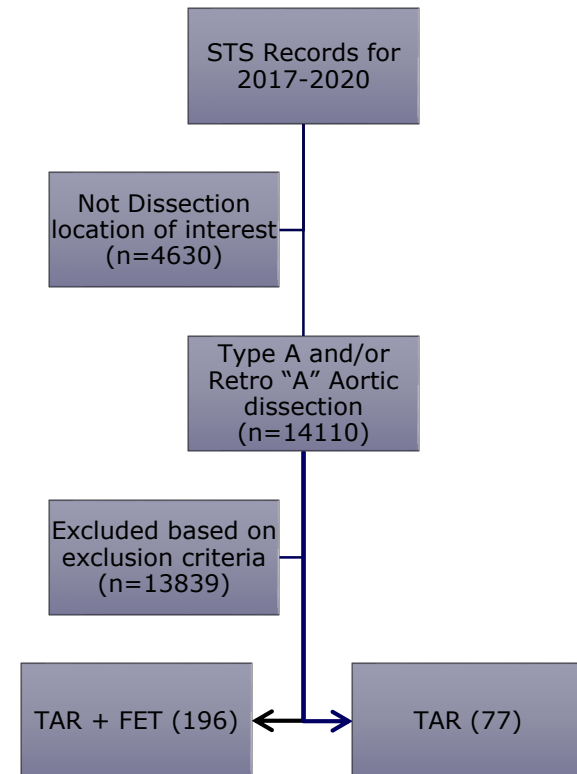
- Technically challenging
- Longer circulatory arrest and cross-clamp times
- Spinal cord ischemia
- Increase risk of complications



Coselli *et al.* *J Thorac Cardiovasc Surg*, 2022

# Study Aims and Patient Selection

- What are the outcomes of patients who underwent either TAR alone or TAR with FET?
- Society of Thoracic Surgeons Database queried between January 2017 to December 2020 (n=18706)
- Inclusion Criteria
  - All patient with distal extent greater than zone 2 were included
- Exclusion
  - Previous cardiac surgery
  - No Arch Repair
  - Dissection >14 days
  - Hemi-Arch Repair or Hemi-Arch Repair with Frozen Elephant trunk
  - missing data such as distal extent information



# Methods

- TAR ± FET (n= 237) were analyzed
  - Groups: TAR without FET (n=77) & TAR with FET (n=196)
- Demographic, intraoperative, and post-operative data were analyzed using descriptive statistics.
- Primary Outcome of interest: 30 Day Mortality presented as odds ratio
- Secondary Outcome of interest: ICU length of stay, Hospital length of stay, Readmissions, Post-operative complications (neurological symptoms, re-operation for bleed, recurrent laryngeal nerve injury, pneumonia, venous thromboembolism, renal failure, liver dysfunction)
- Bias minimization via multiple regression to calculate risk adjusted odds ratio adjusted for preselected variables
  - Pre-selected variables: age, sex, race, high volume center (>30 cases per year), and preoperative malperfusion

# Demographic & Perioperative Data

Variable	Response	TAR alone (n=77)	TAR with FET (n=196)	P-value
Patient age (years)	Median (Q1,Q3)	54 (48,65)	59 (49,66)	0.42
Race (White) N (%)	Yes No	38 (52%) 35 (48%)	118 (65%) 63 (35%)	<b>0.05</b>
Race-(Black/African American) N (%)	Yes No	30 (41%) 43 (59%)	53 (29%) 128 (71%)	0.07
Sex N (%)	Male Female	61 (79%) 16(21%)	146 (74%) 50 (26%)	0.41
<b>Malperfusion</b> N (%)	Yes No	31 (43%) 41 (57%)	104 (58%) 76 (42%)	<b>0.03</b>
<b>Aortic Valve Intervention</b> N (%)	No Yes, planned Yes, unplanned	2 (4%) 43 (91%) 2 (4%)	0 (0%) 115 (91%) 12 (9%)	<b>0.04</b>
Cardiopulmonary bypass time	Median (Q1,Q3)	227.0 (191.0, 298.0)	244.0 (195.0, 302.0)	0.98
Circulatory Arrest N (%)	Yes	73 (95%)	189 (96%)	0.539

# Unadjusted Outcomes

Variable	Response	TAR alone (n=77)	TAR with FET (n=196)	P-value
30-day <b>mortality</b> , N (%)	Alive	51 (66%)	154 (80)	<b>0.02</b>
Readmission	Yes	10 (22%)	17 (4%)	0.255
Length of Stay (days)	N, Median (Q1,Q3)	51, 13 (8, 20)	158, 14 (10, 22)	0.326
Initial ICU Hours	N, Median (Q1,Q3)	70, 116.8 (58.8, 213.6)	184, 137.4 (84.9, 233.8)	0.107
Post-operative <b>Stroke</b> , N (%)	Yes	36 (31%)	76 (21%)	0.147
Post-operative <b>Paralysis</b> , N (%)	Yes	3 (5%)	6 (4%)	0.714
Post-op neuro-transient ischemic attack	Yes	18 (23%)	44 (22,4%)	N/A
Post-operative <b>Pneumonia</b> N(%)	Yes	13 (22%)	23 (15%)	0.232
Post-operative <b>renal failure</b> , N (%)	Yes	19 (32%)	40 (26%)	0.392
Post-operative <b>Liver dysfunction</b> , N (%)	Yes	4 (7%)	11 (7%)	0.908
Post-operative <b>Venous Thromboembolism</b> , N (%)	Yes	4(7%)	9 (6%)	0.816

# 30-Day Mortality Adjusted Analysis

Variable	Odds Ratio	Confidence Interval	P-value
<b>30-day mortality</b>	<b>0.49</b>	<b>0.25-0.98</b>	<b>0.04</b>
Patient Age	1.01	0.98-1.04	0.42
Race – White	0.35	0.11-1.10	0.72
<b>Race – Black/African American</b>	0.24	0.07-0.82	<b>0.02</b>
Sex	0.71	0.35-1.44	0.34
<b>Malperfusion</b>	2.03	1.04-3.95	<b>0.04</b>
<b>Sites volume fewer than 30 cases per year</b>	2.54	1.06-6.08	<b>0.04</b>



# Limitation

- Durability of outcomes were not assessed beyond 30 days
- Large database study without granular data and inability to evaluate decision making process of individual surgeons for one procedure versus another
  - Randomized control trials may be of value.
- Comparatively small sample size preventing propensity matching along with missing data (<10%)

# Conclusion & Future Directions

- Total Arch Replacement with FET is associated with reduced early mortality compared to TAR alone in those presenting with greater than zone 2 TAAD.
- Low-volume centers and those presenting with malperfusion were at increased risk of mortality
- Plan to expand the dataset beyond current date of 2017 to 2020 as the use of FET has increased over time



# Citation

- Roselli EE, Kramer B, Germano E, et al. The modified frozen elephant trunk may outperform limited and extended-classic repair in acute type I dissection. *Eur J Cardiothorac Surg*. 2023;63(6):ezad122. doi:10.1093/ejcts/ezad122
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