

# Can We Stratify the Operative Risk of TEVAR?

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## *Disclosures*

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## ***Risk Stratification TEVR***

- Aortic intervention undertaken - balance of risks
- Natural history thoracic aortic disease – limited knowledge
  - Evidence base on TEVR outcomes improving
  - Risk stratification – aid patient selection

## ***Risk Stratification TEVR***

- Stratification 30-d outcomes mortality / stroke(TAA)
  - Estimation of long term mortality (TAA)
    - Pathology specific outcomes

# Medtronic Thoracic Endovascular Registry (MOTHER)

## Cardiovascular Surgery

### Aortic Pathology Determines Midterm Outcome After Endovascular Repair of the Thoracic Aorta Report From the Medtronic Thoracic Endovascular Registry (MOTHER) Database

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**Background**—Endovascular repair of the thoracic aorta has become an increasingly utilized therapy. Although the short-term mortality advantage over open surgery is well documented, late mortality and the impact of presenting pathology on long-term outcomes remain poorly reported.

**Methods and Results**—A database was built from 5 prospective studies and a single institutional series. Rates of perioperative adverse events were calculated, as were midterm death and reintervention rates. Multivariate analysis was performed with the use of logistic regression modeling. Kaplan-Meier survival curves were drawn for midterm outcomes. The database contained 1010 patients: 670 patients with thoracic aortic aneurysm, 195 with chronic type B aortic dissection, and 114 with acute type B aortic dissection. Lower elective mortality was observed in patients with chronic dissections (3%) compared with patients with aneurysms (5%). Multivariate analysis identified age, mode of admission, American Society of Anesthesiologists grade, and pathology as independent predictors of 30-day death ( $P < 0.05$ ). In the midterm, the all-cause mortality rate was 8, 4.9, and 3.2 deaths per 100 patient-years for thoracic aortic aneurysm, acute type B aortic dissection, and chronic type B aortic dissection, respectively. The rates of aortic-related death were 0.6, 1.2, and 0.4 deaths per 100 patient-years for thoracic aortic aneurysm, acute type B aortic dissection, and chronic type B aortic dissection, respectively.

**Conclusions**—This study indicated that the midterm outcomes of endovascular repair of the thoracic aorta are defined by presenting pathology, associated comorbidities, and mode of admission. Nonaortic mortality is high in the midterm for patients with thoracic aortic aneurysm, and managing modifiable risk factors appears vital. Endovascular repair of the thoracic aorta results in excellent midterm protection from aortic-related mortality, regardless of presenting pathology. (*Circulation*. 2013;127:24-32.)

**Key Words:** acute aortic syndrome ■ aneurysm ■ aortic dissection ■ endovascular surgery ■ pathology

The advent of endovascular repair of the thoracic aorta (thoracic endovascular aortic repair [TEVAR]) has altered the management algorithm for pathologies that affect the aortic arch and descending thoracic aorta. In recent years, the number of thoracic endovascular procedures has risen.<sup>1,2</sup> The increased use of TEVAR has been driven by the early mortality advantage reported when endovascular therapy is compared with open surgical treatment of the thoracic aorta.<sup>3,4</sup> TEVAR is now considered the first-line therapy for isolated aneurysms of the descending thoracic aorta and acute complicated type B aortic dissections.<sup>2,5-8</sup> In the abdominal aorta, the early mortality advantage associated with endovascular repair of abdominal aneurysms was lost as a result of late aortic rupture.<sup>9</sup> It has been suggested that long-term durability may be related to individual preoperative aneurysm morphology.<sup>10</sup> There is a concern that a

similar “catch-up” phenomenon might affect procedures in the thoracic aorta. At present, midterm to long-term data regarding the fate of patients treated with thoracic endografts are sparse, and it remains difficult to define whether TEVAR offers a durable solution to prevent aortic-related death. The fate of the aorta after endovascular treatment for chronic type B aortic dissection is of particular concern, and some experts suggest that TEVAR is not a viable alternative to open surgical repair in this pathology.<sup>11</sup>

#### Editorial see p 5 Clinical Perspective on p 32

Given the spectrum of different pathologies that affect the descending thoracic aorta, it is important to define whether the outcome of TEVAR is pathology specific to refine procedural technique and endograft design. Careful analysis of long-term

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- Registry of > 1000 TEVR
- Prospective data collection
- Risk modelling
- Binary logistic regression
- Cox proportional hazards

## *Early Outcomes – 30-day*

<b>Elective</b>	<b>TAA (n- 625)</b>	<b>Chronic (n-180)</b>	<b>Acute (n-0)</b>
<b>Death (%)</b>	<b>33 (5%)</b>	<b>6 (3%)</b>	<b>-</b>
<b>Stroke (%)</b>	<b>34 (5%)</b>	<b>3 (2%)</b>	<b>-</b>
<b>SCI – transient/ permanent (%)</b>	<b>30 (5%)</b>	<b>6 (3%)</b>	<b>-</b>

<b>Non-Elective</b>	<b>TAA (n- 38)</b>	<b>Chronic (n-15)</b>	<b>Acute (n-114)</b>
<b>Death (%)</b>	<b>7 (18%)</b>	<b>2 (13%)</b>	<b>13 (11%)</b>
<b>Stroke (%)</b>	<b>2 (5%)</b>	<b>1 (7%)</b>	<b>7 (6%)</b>
<b>SCI – transient/ permanent (%)</b>	<b>4 (11%)</b>	<b>0 (0%)</b>	<b>2 (2%)</b>

## *Multiple Logistic Regression (30-day) - TAA*

Death	OR	p
Age	1.088	0.034
MI	2.730	0.055
Renal failure	2.074	0.174
Access artery tortuosity	1.459	0.205
Distal neck length	0.986	0.026
Aneurysm length	0.995	0.183

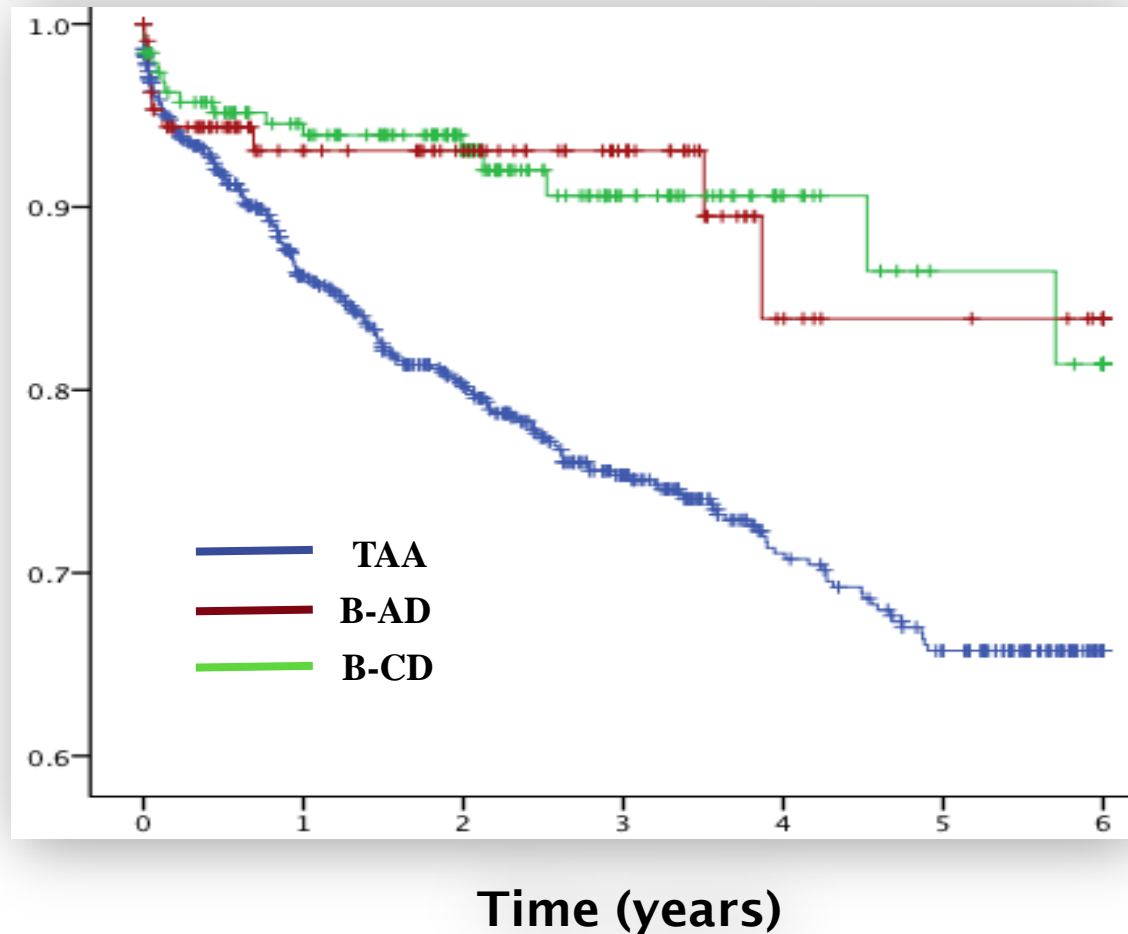
## TEVR - Non Aortic Related Mortality

All Cause Mortality

TAA - 8 per 100 p/y

AAD - 4.9 per 100 p/y

CAD - 3.2 per 100 p/y

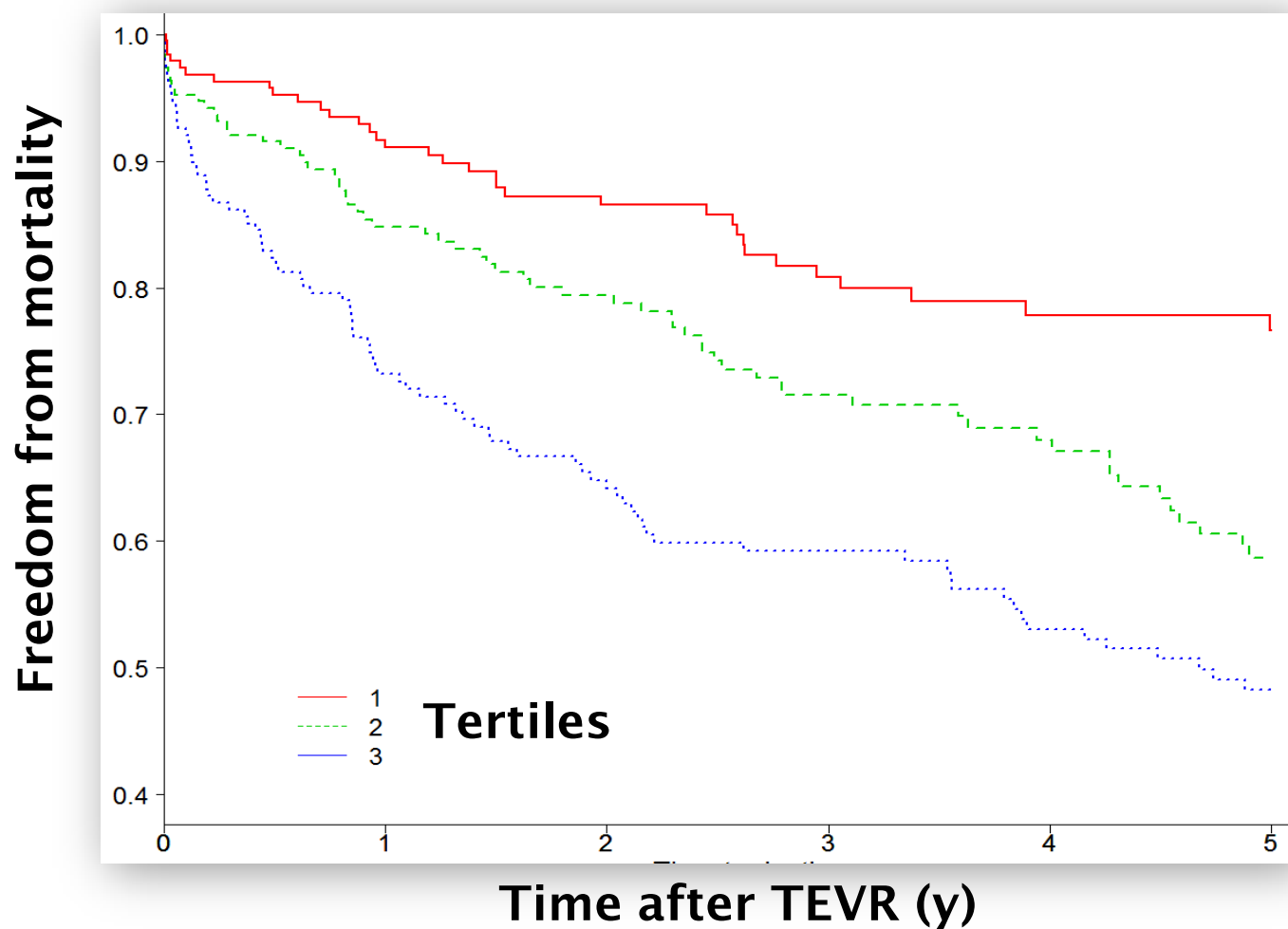




## *Long Term Mortality - TAA*

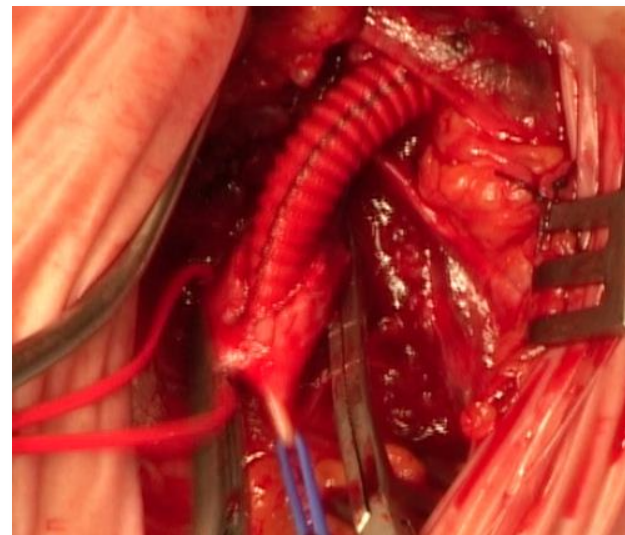
<b>Variable</b>	<b>Hazard Ratio</b>	<b>95% CI</b>
<b>Age</b>	<b>1.035</b>	<b>1.016-1.54</b>
<b>Renal insufficiency</b>	<b>1.664</b>	<b>1.208-2.288</b>
<b>CVA</b>	<b>1.473</b>	<b>1.045-2.75</b>
<b>Number of devices</b>	<b>1.183</b>	<b>1.067-1.311</b>
<b>TAA max diameter</b>	<b>1.015</b>	<b>1.004-1.027</b>

## Long Term Mortality - TAA



## *Long Term All Cause Mortality*

- **Significantly higher all cause mortality TAA – non aortic**
- **Implications for patient selection – diameter threshold for chronic TAD lower than for TAA**
- **Able to stratify TAA cohorts – risk benefit analysis**

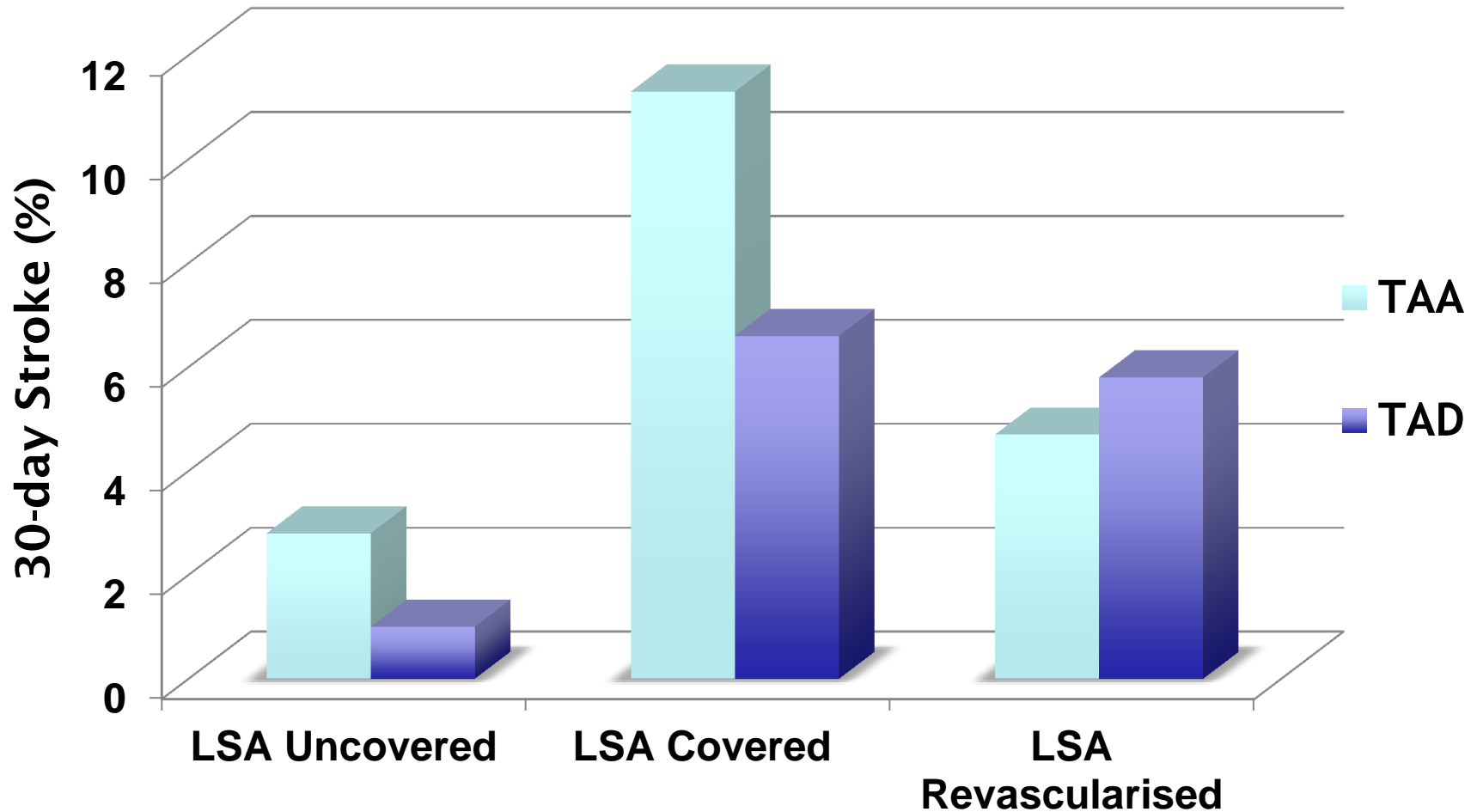


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## Analysis by management of LSA

	Not Covered (n=537)	Covered Not revascularised (n=322)	Covered revascularised (n=143)	P - value
Death (%)	31 (5.8)	22 (6.8)	10 (7)	0.769
Stroke (%)	12 (2.2)	29 (9)	7 (4.9)	0.000
SCI (%)	7 (5)	13 (4)	2 (1.4)	0.155

## *Effect of Management LSA – TAA and TAD*



## *Logistic regression – stroke (TAA)*

Covariate	P-value	OR	Upper CI	Lower CI
Female gender	0.024	2.4	1.1	5.3
Renal insufficiency	0.036	2.1	1.1	4
Previous CVA	0.013	2.9	1.3	6.5
Coverage of the LSA without revascularisation	0.002	3.3	1.6	7.2
Number of devices	<0.001	1.2*	1.3	2.0

## ***Risk Stratification TEVR***

- **Aneurysm morphology influences outcomes of TAA repair**
  - **Pathology specific differences in long term survival**
    - **Implications for patient selection**
  - **Pathology defines stroke risk from LSA coverage**
- **LSA coverage only modifiable risk factor in stroke after TAA**