Endovascular therapy for Ischemic versus Non-ischemic complicated acute type B aortic dissection (cATBAD).

AS. Eleshra, MD¹, T. Kölbel, MD, PhD¹, F. Rohlffs, MD¹, N. Tsilimparis, MD, PhD¹,²

Ahmed Eleshra

Aortic fellow, German Aortic Center, Department of Vascular Medicine University Heart Center, Hamburg
Disclosure

I do not have any disclosure or conflict of interest
Ahmed Eleshra
Endovascular repair for Type B Aortic dissection

Endovascular stent–graft placement in type B-AD is technically feasible with success rates of 95% in selected cohort.
Objective: This study analyzed 1-year outcome after thoracic endovascular aortic repair (TEVAR) in patients with complicated type B aortic dissection (cTBAoD) who had rupture or malperfusion and symptom onset ≤14 days (acute), 15 to 30 days (subacute), and 31 to 90 days (chronic) until required intervention. The main focus of this report is primarily on the acute cohort.

Methods: Clinical data were systematically collected from five physician-sponsored investigational device exemption (IDE) clinical trials between 2000 and 2008 using standardized definitions and forms. Adverse events were reported early (≤30 days) and late (>30 days) by body system. Major adverse events included death, stroke, myocardial infarction, renal failure, respiratory failure, paralysis, and bowel ischemia.

Results: There were 99 cTBAoD patients: 85 were acute, 11 were subacute, and 3 were chronic. Among the acute patients, 31.8% had rupture and 71.8% had malperfusion, including 55.7% lower extremity, 36.1% renal, 19.7% visceral, 8.2% other, and 3.3% spinal cord (patients may have more than one source). Rupture and malperfusion were both reported for three acute patients. Additional findings for the acute cohort included pain (76.5%), hypertension (43.5%), and bleeding (8.2%); comorbidities included hypertension (83.5%), current/past smoking history (69.8%), and diabetes (12.9%). The main focus of this analysis was the acute cohort (n = 85). Age averaged 59 years (72.9% male). Early adverse events included pulmonary (36.5%), vascular (28.2%), renal (25.9%), and neurologic (23.5%). Early major adverse events occurred in 37.6% of patients, including death (10.6%), stroke (9.4%), renal failure (9.4%), and paralysis (9.4%); late adverse events included vascular (15.8%), cardiac (10.5%), gastrointestinal (6.6%), and hemorrhage (5.3%). The point-estimate mortality rate was 10.8 (95% confidence interval [CI], 4.1-17.5) at 30 days and 29.4 (95% CI, 18.4-40.4) at 1 year, when 34 patients remained at risk.

Conclusions: Emergency TEVAR for patients with cTBAoD provided acceptable mortality and morbidity results out to 1 year. Manufacturers can use this 30-day mortality point-estimate of 10.8 (95% CI, 4.1-17.5) for the acute cohort to establish a performance goal for use in single-arm commercial IDE trials if the Food and Drug Administration and other regulatory bodies concur. (J Vase Surg 2011;53:1082-90.)
Patients

Retrospective analysis of TEVAR database (November 2010 and December 2017).

Acute Type B aortic dissection.

Patients were grouped in two cohorts; Non-ischemic cATBAD and Ischemic cATBAD.

- Aneurysmal dilatation
- False lumen rupture
- Unrelenting pain
- Uncontrolled hypertension

Aortic dissection was defined as acute within 14 days of the onset of acute symptoms.
Preoperative CTA

Left kidney malperfusion

Rt. Kidney, mesentric and extremity malperfusion

Ruptured FL
Planning of procedure

Branch vessel malperfusion

I. Reperfusion after TEVAR
II. Adjunctive branch vessel stenting
III. Intimal flap fenestration

TEVAR
Landing zones
FL occlusion with candy plug
Non Ischemic cATBAD

Pre operative CTA with acute type B AD with progressive dilatation and intractable pain

Post-operative 6 months follow up CTA after TEVAR
Malperfusion of both renal arteries
Results

Indication for treatment in non-malperfusion:
- Pain: 3 (7.6%)
- Aneurysm: 3 (7.6%)
- Rupture: 8 (20.5%)
- HTN: 1 (2.5%)

Distribution of Malperfusion:
- Extremity: 4 (16%)
- Renal: 15 (60%)
- Spinal: 1 (4%)
- Visceral: 2 (8%)
## Patients Demographics and characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Non-ischemic group n=39 (%)</th>
<th>Ischemic group n=25 (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ( Mean±SD)</td>
<td>66.33±13.10</td>
<td>62.44±11.50</td>
<td>0.229</td>
</tr>
<tr>
<td>Males</td>
<td>28 (71)</td>
<td>21 (84)</td>
<td>0.261</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAD</td>
<td>4 (10)</td>
<td>4 (16)</td>
<td>0.523</td>
</tr>
<tr>
<td>HTN</td>
<td>29 (74)</td>
<td>17 (68)</td>
<td>0.581</td>
</tr>
<tr>
<td>DM</td>
<td>10 (39)</td>
<td>0 (0)</td>
<td>0.098</td>
</tr>
<tr>
<td>Stroke</td>
<td>2 (5)</td>
<td>2 (8)</td>
<td>.643</td>
</tr>
<tr>
<td>CABG</td>
<td>1 (2)</td>
<td>1 (4)</td>
<td>0.747</td>
</tr>
<tr>
<td>COPD</td>
<td>2 (5)</td>
<td>2 (8)</td>
<td>0.643</td>
</tr>
<tr>
<td>Stroke</td>
<td>2 (5)</td>
<td>2 (8)</td>
<td>0.643</td>
</tr>
<tr>
<td>Renal insufficiency</td>
<td>3 (8)</td>
<td>8 (32)</td>
<td>0.012</td>
</tr>
<tr>
<td>Smoking</td>
<td>6 (15)</td>
<td>4 (16)</td>
<td>0.947</td>
</tr>
<tr>
<td>CTD</td>
<td>1 (2)</td>
<td>1 (4)</td>
<td>0.747</td>
</tr>
<tr>
<td>PAD</td>
<td>1 (2)</td>
<td>2 (8)</td>
<td>0.315</td>
</tr>
<tr>
<td>Previous Aortic repair</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ascending aorta open</td>
<td>4 (10)</td>
<td>1 (4)</td>
<td>0.363</td>
</tr>
<tr>
<td>Arch, descending open</td>
<td>3 (8)</td>
<td>2 (8)</td>
<td>0.964</td>
</tr>
<tr>
<td>AAA open</td>
<td>1 (2)</td>
<td>1 (4)</td>
<td>0.747</td>
</tr>
<tr>
<td>EVAR</td>
<td>0 (0)</td>
<td>1 (4)</td>
<td>0.208</td>
</tr>
</tbody>
</table>
## TEVAR DATA

<table>
<thead>
<tr>
<th>Variables</th>
<th>Non-ischemic group n=39 (%)</th>
<th>Ischemic-Group n=25 (%)</th>
<th>P Value</th>
<th>Total Group n=64 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 24 hours</td>
<td>21 (54)</td>
<td>19 (76)</td>
<td>0.094</td>
<td>40 (62.5)</td>
</tr>
<tr>
<td>Time to intervention</td>
<td>7.5±9.9</td>
<td>2.3±3.9</td>
<td>0.007</td>
<td>5.5±8.4</td>
</tr>
<tr>
<td>Aortic endograft Number(Mean±SD)</td>
<td>1.63±0.55</td>
<td>1.46±0.66</td>
<td>0.294</td>
<td>1.6±0.6</td>
</tr>
<tr>
<td>Proximal Landing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone 1</td>
<td>1 (2)</td>
<td>0 (0)</td>
<td>1 (1.5)</td>
<td></td>
</tr>
<tr>
<td>Zone 2</td>
<td>16 (41)</td>
<td>15 (60)</td>
<td>31 (48.4)</td>
<td></td>
</tr>
<tr>
<td>Zone 3</td>
<td>22 (56)</td>
<td>8 (32)</td>
<td>30 (46.9)</td>
<td></td>
</tr>
<tr>
<td>Zone 4</td>
<td>0 (0)</td>
<td>2 (8)</td>
<td>2 (3)</td>
<td></td>
</tr>
</tbody>
</table>

### Branch vessel stenting
- 14 patients
- 20 stents

- 11 Bare metal stent
- 9 covered stent

- LNA 8
- RNA 5
- SMA1
- Iliac 4

Laparotomy in 2 patients with intestinal resection in one

Percutaneous fenestration in 5 patients (25%)

Transfemoral thrombectomy in 2 patients

No Amputation or extremity bypass

Cervical debranching in 41% for non ischemic group and 16% in ischemic group
Early and late outcome

### Early outcome

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group I (N=39)</th>
<th>Group II (N=25)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 day Death</td>
<td>2 (5)</td>
<td>4 (16)</td>
<td>0.273</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>1 (2)</td>
<td>0 (0)</td>
<td>0.530</td>
</tr>
<tr>
<td>Paraplegia</td>
<td>2 (5)</td>
<td>0 (0)</td>
<td>0.377</td>
</tr>
<tr>
<td>Respiratory</td>
<td>1 (2)</td>
<td>2 (8)</td>
<td>0.264</td>
</tr>
<tr>
<td>Renal insufficiency</td>
<td>1 (2)</td>
<td>2 (8)</td>
<td>0.198</td>
</tr>
<tr>
<td>Wound infection</td>
<td>3 (8)</td>
<td>1 (4)</td>
<td>0.535</td>
</tr>
<tr>
<td>Early endoleak</td>
<td>2 (5)</td>
<td>1 (4)</td>
<td>0.791</td>
</tr>
<tr>
<td>Early retrograde flow</td>
<td>2 (5)</td>
<td>0 (0)</td>
<td>0.377</td>
</tr>
<tr>
<td>ICU stay in days (SD)</td>
<td>4.8±9.4</td>
<td>2±2</td>
<td>0.630</td>
</tr>
<tr>
<td>Post-operative hospital stay in days (SD)</td>
<td>7.4±10.3</td>
<td>10.3±10.5</td>
<td>0.646</td>
</tr>
</tbody>
</table>

### Late outcome

- **Death**
  - Pulmonary complication
  - Visceral ischemia

- **Late endoleak**
  - Persistent retrograde flow in 2 patients
  - Type II endoleak in 3 patients with sac enlargement in one

- **Re-intervention**
  - Candy plug for retrograde flow in 2 patients
  - Embolization of sac in for type II endoleak in one case
  - LCCA-LSA bypass for arm claudication
  - Ascending aorta and partial arch replacement for RTAAD

- **Non Ischemic group**

- **Ischemic group**
  - 2 cardiac arrest (renal, mesenteric)
  - 2 SIRS (mesenteric)

- **Late endoleak**
  - Type I a endoleak

- **Re-intervention**
  - LCCA-LSA and zone 2 TEVAR for type I a endoleak
  - Distal TEVAR in order to expand the true lumen at the level of right renal artery for kidney malperfusion
  - LCCA-LSA for arm claudication in 2 patients
Final results

Ruptured FL after TEVAR

Correction of malperfusion
Branch vessel stenting in malperfusion

Ruptured Acute Type B AD
Branch vessel stenting in malperfusion
Ruptured Acute Type B AD

**Objective:** Reports of thoracic endovascular aortic repair (TEVAR) for complicated acute type B aortic dissection (ABAD) bring together a large range of clinical presentations. With a 30 day mortality of 50% when managed by open surgery, rupture is the most devastating complication of ABAD. This study investigated the outcome of TEVAR for ABAD complicated by rupture (r-ABAD) to assess the results of this particularly critical subgroup.

**Methods:** A review of consecutive TEVAR for r-ABAD in two tertiary referral centers was performed using a prospectively maintained database.

**Results:** Between 2000 and 2013, 24 patients (mean age 71 years; 14 males) underwent TEVAR for r-ABAD. Sixteen (67%) were in shock (Systolic blood pressure <80 mmHg) before surgery. Seven patients had coverage of the left subclavian artery, of whom four had partial arch debranching procedures via cervical access concomitant with TEVAR. Median length of aortic coverage was 150 mm, median proximal oversizing was 13.3% (range 6.2–33.3%). Technical success was achieved in 100%. There were four in hospital deaths (16%). Two patients (8%) had paraplegia, but neither stroke nor renal insufficiency requiring dialysis occurred. During a mean follow up of 28 months, there was one aortic dissection related death and eight patients (40% of the surviving patients) required re-intervention. All re-interventions were managed endovascularly. At last follow up CT scan, eight patients (40%) had complete remodeling of the aortic wall.

**Conclusion:** With 16% in hospital mortality and 8% early major complications, this study confirms the feasibility of TEVAR for r-ABAD with a lower peri-operative morbidity and mortality rate compared with open surgery. Given the high rate of re-intervention, close follow up is required in surviving patients.

**Our Data**
- 16% mortality
- 8% major complication
- 40% reintervention

- 1/8 (12%) mortality
- 1/8 (12%) major complication
- No reintervention
Home message

TEVAR is an effective and safe method for treating cATBAD.

Visceral direct reperfusion after TEVAR through branch vessel stenting is crucial in achieving good outcome.

Results suggested no statistically significant difference at the outcome of Ischemic versus Non-ischemic cATBAD.
THANK YOU FOR YOUR ATTENTION!
ANY QUESTIONS?
NO? GREAT!
BYE.