What Preop CTA Features Can Predict Outcome Of TEVAR For TBAD In Terms Of Remodeling And Distal Endograft Induced Re-Entry Tears: Insights from ROBUST study in China

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Disclosure
None

Clinical Questions

- Aortic expansion is the most significant post-TEVAR complication.
  - Post-TEVAR aortic aneurysmal degeneration
    - Thoracic aortic expansion (TAE)
    - Abdominal aortic expansion (AAE)
    - Further aortic rupture/impending rupture
  - Distal stent-graft induced new entry
  - Endoleaks
    - Type I & Type II & Type III...
  - Retrograde type A aortic dissection
  - Aortic-related death

Incidence

- 12 mo: 19.7%-41.7%
- 24 mo: 20.9%-54.2%
- 5 yr: TAE&AAE: 62.7%
- 2 yr: 3.3%-27.3%
- 23.1% by meta-analyis
- 3%-10%
- 4.2%

Incidence

“Steal Phenomenon” in TBAD

Thoracic false lumen branches (TFLBs)
Ruptured after TEVAR

Previous evidence existences, but limited:
- Single center with limited sample size (n=67);
- TAE: > 5mm increase in max diameter vs. the preop CTA, rather than aortic volume.

Multicenter TBAD Database: ROBUST Study

Registry Of type B aortic dissection with the Utility of Stent graft: ROBUST study (registration number: ChiCTR-POC-17011726)

- Ambispective, multicenter, open cohort study.
- Patients after TEVAR for TBAD from January 1, 2008 to July 1, 2012;
- Focusing on preop CTA features related to outcomes after TEVAR;
- Until now, 201 patients available for analysis.
New Evidence: Predictive Role of Preop TFLBs in TAE

- 201 patients with a mean age of 52.7 years, male predominance (88.6%);
- Median follow-up period: 26.4 months (range, 1.4-109.1);
- TAE: >20% increase in TA volume of most recent CTA relative to the preop CTA.

<table>
<thead>
<tr>
<th>TFLBs</th>
<th>Crude HR (95% CI)</th>
<th>adjusted HR a (95% CI)</th>
<th>adjusted HR b (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preop</td>
<td>1.11 (1.04-1.18)</td>
<td>1.11 (1.04-1.19)</td>
<td>1.11 (1.03-1.19)</td>
</tr>
</tbody>
</table>

Hazard ratio (HR) and 95% confidence interval (CI) for the association of preop TFLBs with the risk of TAE

a Adjusted for gender, acute dissection, abdominal entries related to visceral arteries, and FL-perfused celiac trunk;
b Adjusted for gender, acute dissection, abdominal entries related to visceral arteries, FL-perfused celiac trunk, preop TA volume, the number of preop FL perfused visceral arteries, and LLR (the ratio of the dissection length and aortic length between LSA and aortic bifurcation).

QUESTION: Which patient is at a higher/lower risk of TAE after TEVAR?
Response: We still don’t know!

Rapid Interpretation on Axial Images

Aortic segment of interest: lower margins of Th4 to Th11

Type I
Type II
Type III


Predictive Role of 301 Classification in TAE

- 201 patients with a mean age of 52.7 years, male predominance (88.6%);
- Median follow-up period: 26.4 months (range, 1.4-109.1);
- TAE: >20% increase in TA volume of most recent CTA, as compared with preop CTA.

<table>
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<tr>
<th>Type</th>
<th>Crude HR (95% CI)</th>
<th>adjusted HR a (95% CI)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.0 (Reference)</td>
<td>1.0 (Reference)</td>
<td>1.0 (Reference)</td>
</tr>
<tr>
<td>II</td>
<td>4.25 (0.98-18.38)</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>III</td>
<td>10.22 (2.12-49.29)</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
</tbody>
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Hazard ratio (HR) and 95% confidence interval (CI) for the association of the novel features with the risk of TAE

a Adjusted for gender, acute dissection, abdominal entries related to visceral arteries;
b Adjusted for gender, acute dissection, abdominal entries related to visceral arteries, preop TA volume, number of preop FL-perfused visceral arteries, presence of entry tear at the end of dissection, and type I endoleak and SINE.

QUESTION: Which patient is at a higher/lower risk of TAE after TEVAR?
Response: Yes, we know!
Predictive Role of Preop AFLSB in AAE

AFLSB: abdominal false lumen SMALL branches (e.g. lumbar arteries, adrenal arteries)
- 184 patients with TBAO extending through the visceral segment;
- Mean age of 52.6 years with a male predominance (88.6%);
- Median follow-up period: 26.4 months (range, 1.4-109.1);
- AAE: >20% increase in AA volume of most recent CTA compared with preop CTA.

Unadjusted Model I Model II Model III
<table>
<thead>
<tr>
<th>Hazard ratio (HR) and 95% confidence interval (CI) for the association of preoperative AFLSB with risk of abdominal aortic expansion (AAE) after TEVAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model I: covariates included age, sex, SVS score, chronicity of dissection, preoperative maximum descending aorta, preoperative false lumen status of AA.</td>
</tr>
<tr>
<td>Model II: covariates in model I plus the number of preoperative abdominal false lumen-perfused reno-visceral arteries, and number of preoperative abdominal intimal large tears.</td>
</tr>
<tr>
<td>Model III: covariates in model II plus the number of preoperative abdominal intimal small tears and LLR.</td>
</tr>
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Concept of LLR

LLR: dissection length and descending aortic length ratio

- 184 patients with TBAO extending through the visceral segment;
- Mean age of 52.6 years with a male predominance (88.6%);
- Median follow-up period: 26.4 months (range, 1.4-109.1);
- AAE: >20% increase in AA volume of most recent CTA compared with preop CTA.

Non-adjusted Model I Model II Model III
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<tr>
<td>Model I: chronicity of dissection, gender, age, max aortic diameter, stent graft length, presence of intimal tears, no. of abdominal false lumen-perfused reno-visceral arteries, no. of abdominal true lumen, pre-TEVAR rate of FL, FL type and preoperative intimal large tears.</td>
</tr>
<tr>
<td>Model II: variables in model I plus presence of preoperative abdominal small false lumen branches.</td>
</tr>
</tbody>
</table>

Potential Mechanism of LLR Related to AAE

Preop AFLSB ↑
- More outflow tracts of abdominal FL
- Persistent FL flow
- Possible higher FL pressure
- Higher FL flow capacity
- Abdominal aortic enlargement

Preop abdominal intimal small tears ↑
- More inflow tracts of abdominal FL
- Incomplete thrombosis
- Unfavorable remodeling

Conclusion
- Preoperative TFLL is independent risk factor TAE after TEVAR.
- 301 classification scheme can help predict TAE after TEVAR.
- Preoperative AFLSB is independent risk factor for post-TEVAR AAE.
- LLR is associated with the risk of AAE after TEVAR.
- Further studies focusing on the risk factor identification for unfavorable remodeling after TEVAR are warranted.

Thanks for your attention

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