Is a Paradigm Shift towards Early Endovascular Treatment of Type B Dissection justified?

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Disclosure

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I have the following potential conflicts of interest to report:

☐ Consulting
☐ Employment in industry
☐ Stockholder of a healthcare company
☐ Owner of a healthcare company
☐ Other(s)

☒ I do not have any potential conflict of interest
Adressing An “Old” Debate....

To stent or not to stent aortic dissection: good news for a chosen few, but who?

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Purpose: It is now more than a decade since aortic stent-grafts were introduced clinically to provide a less invasive and potentially less harmful therapeutic option to treat type B aortic dissections. However, recent publications on best medical treatment and quality of life in patients with chronic type B dissection support conservative treatment due to the low incidence of aneurysm formation, rupture, and disease-related complications. Against this backdrop, we analyzed our experiences and now discuss whether the availability of endografts allowed us to change indications toward a more aggressive endovascular approach to acute and non-complex type B dissections, seeking to determine which patients we should treat and which ones we should observe.

Methods: Between 1997 and 2008 in our institution in Heidelberg, we treated 172 patients with acute and chronic type B dissections, most (n = 118, 69%) conservatively. However, 54 patients (60 mm; mean age 57 years, range 30–82) underwent endovascular repair; 43% (n = 23) were emergency cases. Patients were followed periodically with computed tomographic angiography.

Results: Correct stent-graft deployment was achieved in 50 (93%) patients; the left subclavian artery was intentionally covered in 30 (65%) cases. Two carotid-subclavian bypass grafts were performed at the time of the endovascular repair due to partial coverage of the left common carotid artery. The periprocedural complication rate was 19% (n = 10), but there were no neurological sequelae. The 30-day mortality rate was 11% (n = 5). Over a mean 32.1 ± 26 months, 6 other patients died (18.5% overall mortality rate); survival estimates by Kaplan-Meier analysis were 80.4% and 66.1% after 1 and 5 years, respectively. Complete false lumen thrombosis was observed in 32 (60%) and a persisting completely patent false lumen in 3. The aortic expansion rate was 31% (±7%) overall. No difference was found between acute and chronic dissections in terms of survival (p = 0.247).

Conclusion: Despite a minimally invasive approach, complication and mortality rates for endovascular therapy of type B aortic dissections are considerable. Endografting is limited to symptomatic patients and those with chronic large aneurysmal expansion. At this stage in stent-graft development, asymptomatic patients benefit more from conservative treatment.

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Key words: thoracic aorta, dissection, thoracic endovascular aortic repair, stent-graft, outcome analysis, mortality

Is Early Treatment in Type B dissections justifiable?

YES - but under certain conditions:

By

- identifying high risk patients
- performing TEVAR with low complication rate
- identifying the right time of intervention
- optimal device selection (sizing, conformability)
Type B Dissection Sub-Categories

• Acute Complicated
  • Rupture
  • Malperfusion

• Chronic
  • Potential reasons for intervention
    • Aneurysm degeneration
      • Up to 30% become aneurysmal
    • Rupture
    • Dissection extension
    • Malperfusion or ischemic events

• Acute Uncomplicated

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Complications after endovascular repair of acute symptomatic and chronic expanding Stanford type B aortic dissections

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Objective: To outline the complications after endovascular repair in patients with acute symptomatic and chronic expanding Stanford type B aortic dissections.

Methods: Between 1997 and 2004, of 125 patients with acute and chronic aortic type B dissections, 88 were treated conservatively. Thirty-seven patients (29 male, mean age 58 years, range 30-82 years) underwent endovascular repair (30%) using 44 stent grafts of 3 different designs: Excluder (W. L. Gore & Associates, Inc, Flagstaff, Ariz), Talent (Medtronic Vascular, Santa Rosa, Calif), and Endofit (Endomed, Inc, Phoenix, Ariz). Indications for treatment were acute symptomatic type B dissection in 15 patients, chronic expanding aortic dissection greater than 55 mm in 14, rupture in 3, and simultaneous type A repair in 5 patients. Twenty-two operations were performed on an emergency basis. Patient characteristics, procedural variables, outcome, and complications were prospectively recorded. All patients underwent follow-up by computed tomography before discharge, at 6 and 12 months, and annually thereafter (mean follow-up: 24 months).

Results: Correct deployment was achieved in 97% of cases. There were no instances of primary conversion, paraplegia, or stroke. Complete false lumen thrombosis was observed in 11 patients (44%). Perioperative complication rate was 22%. Thirty-day mortality rate in acute and chronic dissections was 19% and 0%, respectively. Freedom from aortic reintervention was 81%, 73%, and 68%, freedom from late rupture was 97%, 90%, and 80%, and overall survival rate was 76%, 65%, and 57% at 1, 2, and 5 years, respectively. Results for patients with chronic dissections are significantly (P = .038) better than results in those with acute dissections.

Conclusions: Despite the minimally invasive approach, the complication and mortality rates for endovascular therapy of aortic dissections are still high. Frank reporting of these sequelae is of great importance to clarify the recent limitations of the method.

- 30 day mortality
  19% acute/ 0% in chronic
- 22% complication rate
Chronic Risks of TEVAR in Acute Dissections

abdominal aneurysmal progression

Frequency of abdominal aortic expansion after thoracic endovascular repair of type B aortic dissection

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Abstract

Purpose: To determine abdominal aortic expansion after thoracic endovascular aortic repair (TEVAR) in patients with aortic dissection type B and 36 months minimum follow-up.

Methods: Retrospective study of 18 TEVAR patients with follow-up >36 months. Abdominal aortic diameters at celiac trunk (location B) and infrarenal aorta (location C) were recorded on the first and last imaging after TEVAR. False lumen thrombosis was determined at level of endograft (A) and at B and C. Aortic expansion was defined as diameter increase of 5 mm or 15%. Correlation analyses were performed to investigate potential determinants of expansion.

Results: Median follow-up was 75.2 months. Sixteen of 18 patients (88.9%) demonstrated abdominal expansion. Mean expansion was 9.9 ± 6.1 mm at B and 11.7 ± 6.5 mm at C, without a difference between acute and chronic dissections. Critical diameters of 55 mm were reached in two patients treated for chronic dissection (11.1%). Annual diameter increase was significantly greater at locations with baseline diameters >30 mm (2.1 ± 1.1 mm vs. 1.0 ± 0.6 mm, p = 0.009). Baseline diameters were greater in patients with chronic dissections.

Conclusion: Abdominal aortic expansion can be frequently recognized after TEVAR for aortic dissection type B and occurs independently from thoracic false lumen thrombosis. Clinical significant abdominal aortic expansion may occur more frequently in patients treated with TEVAR for chronic dissection.

Abdominal expansion rate 88.9% after 36 mths.
Growth rate 3mm /yr.
Benefits and Risks of Endovascular vs BMT

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic Remodeling</td>
<td>Procedural Complications</td>
</tr>
<tr>
<td>Patient management</td>
<td>Paraplegia</td>
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<td>Long-term outcomes</td>
<td>Stroke</td>
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</table>
Acute/subacute Uncomplicated Type B-Dissection

Can we Identify high risk patients that could benefit from early TEVAR than BMT alone?
Can MRCT answer this?

Uncomplicated but chronic Type B dissections

Acute uncomplicated Type B dissections but...
Criticism & Downsides of RMCT

**ADSORB**
- primary endpoints definition
- different definitin of FL thrombosis in both arms
- underpowered, change in sample size

**Instead & Instead XL**
- early chronic phase (2 -52 weeks after onset)
- underpowered
- 21 % crossover rate
- 4 received TEVAR rather than being excluded
Endpoints of TEVAR Treatment

• Primary clinical endpoint
  • All cause mortality

• Secondary end points
  • Aorta-specific mortality
  • Progression of disease
Endpoint: All cause - Mortality

INSTEAD XL at 5 yrs

ADSORB at 1 yr.

Not an endpoint
Endpoint: Aorta –specific Mortality

INSTEAD XL at 5 yrs  ADSORB at 1 yr.

Not an endpoint
Endpoint: Progression & Adverse Event

INSTEAD XL at 5 yrs

ADSORB at 1 yr.

Figure 4. Aortic diameter was similar at baseline and the difference at 1 year did not reach statistical significance ($p < .052$).
How to define the high risk patient?

56 year, male from Heidleberg
Acute Type B-Dissection
RR controlled under medication
„asymptomatic“ or „uncomplicated“
- randomized in BMT arm in ADSORB
„High riks predictors“ in Retrospective Imaging Evaluation

At initial presentation:

1) Primary entry tear diameter ≥ 10 mm
2) Primary entry tear location
3) Total aortic diameter ≥ 4 cm
4) False lumen diameter ≥ 22 mm
5) Partial false lumen thrombosis
6) Fusiform index ≥ .64

Primary Tear Location

Can be difficult to determine outer or inner curve on Axial slices

False Lumen Measurement

Initial Presentation

Measurement at Upper Thoracic (UT) or Distal to Arch

Partial False Lumen Thrombosis
1 year follow-up

Expanded False Lumen Distal Aorta
1 year follow-up

Here is the patient who may benefit from early treatment!
Right Timing for TEVAR in B Dissections

Impact of timing on major complications after thoracic endovascular aortic repair for acute type B aortic dissection

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Objective: Thoracic endovascular aortic repair (TEVAR) has been shown to have survival benefit in patients with complicated type B dissection compared with open surgery or medical therapy. We analyze the impact of timing of intervention from the onset of symptoms to TEVAR, and its relation to complications.

Methods: Between 2005 and 2012, we performed 132 TEVARs for acute and subacute (<6 weeks) type B dissection; 186 other patients were managed with medical therapy only. Patients were followed in a clinical registry. Standard univariate and survival methods were used.

Results: Of the 132 TEVARs for type B dissection, 70 were performed within 48 hours of presentation (Acute-Early); 44 between 48 hours and 14 days from presentation (Acute-Delayed); and 18 between 14 days and 6 weeks of presentation (Subacute). Demographic characteristics were similar among groups. Severe complications were more common in the Early-Acute and Delayed-Acute patients than in the Subacute patients (P = .04) Retrograde type A dissection tended to be more common in the Acute-Early group. Overall survival was similar among groups.

Conclusions: Delayed intervention appears to lower the risk of complications of TEVAR for aortic dissection in patients who are stable enough to wait. Among patients initially managed medically, new TEVAR indications were not uncommon, and such patients must be followed closely. (J Thorac Cardiovasc Surg 2015;149:S151-6)
Right Timing for TEVAR in B Dissections

Impact of timing on major complications after thoracic endovascular aortic repair for acute type B aortic dissection

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Objectives: To assess the impact of timing of aortic repair using TEVAR in patients with acute type B aortic dissections (TBDs) and to compare the impact with clinical and radiological findings.

Methods: This is a retrospective study of 132 patients with acute type B TBDs, of which 70 were treated in the acute–early phase (within 7 days of symptom onset) and 44 in the acute–delayed phase (7–14 days).

Results: Overall survival at 1 and 5 years was similar between the two groups (P = 0.5255).

Conclusions: Acute–early management of acute type B TBDs is feasible and associated with low complication rates and high survival. This may help in patient selection and in the development of new TEVAR indications.

FIGURE 2. Long-term survival stratified by timing of intervention.
Device Conformability and Morphological Assessment After TEVAR for Aortic Type B Dissection: A Single-Centre Experience with a Conformable Thoracic Stent-Graft Design

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Andreas S. Peters
Dittmar Böckler

Departmental sources:

The aim of this study was to analyze device conformability in TEVAR of acute and chronic (a/c) type B aortic dissections (TBAD) using the Core Conformable Thoracic Aortic Stent-graft (CIG). From January 1997 to February 2014, a total of 90 out of 405 patients in our center received TEVAR for TBAD. Since November 2009, 23 patients (16 men; median age: 62 years) were treated with the CIG. Indications were complicated aTBAD in 15 (65%) and expanding cTBAD in 8 (35%) patients. Primary endpoints were the assessment of device conformability by measuring the distance (D) from the radiopaque gold band marker (GM) at the proximal CIG end to the inner curvature (IC) of the arch on parasagittal planar reformations of CT angiography, as well as the evaluation of aortic diameter changes following TEVAR. Median follow-up was 13.3 months (range: 2 days to 35 months).

Primary and secondary success rates were 91.3% (21/23) and 95.6% (22/23), respectively. There was 1 type la endoleak, retrograde dissection or primary conversion was not observed. Median GM-ICG was 0 mm (range: 0 mm to 10 mm). GM-ICG was associated with zone 2 placement compared to zone 3 (P=0.036). There was no association between GM-ICG formation and arch type. In aTBAD cases the true lumen significantly increased after TEVAR (P=0.017) and the false lumen underwent shrinkage (P=0.025). In cTBAD patients the false lumen decreased after TEVAR (P=0.036).

The CIG shows favorable conformability and wall apposition in challenging arch pathologies such as TBAD.
Summary

Is Early Treatment in Type B Dissections justifiable?

YES - under these conditions:

- Identification of high risk patients (CT based)
- High TEVAR performance (low complication rate)
- Delayed timing
- Optimal device selection
Conclusions

• There is a trend towards early treatment in selected patients at higher risk that could benefit from early TEVAR intervention

• Image-based “high risk” predictors may help identify uncomplicated Type B dissection patients
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