The Challenge of Acute and Chronic Type B Aortic Dissections with Endovascular Aortic Repair

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Aortic Dissection in Japan

- Population: 57 / million cases/year in Japan
- M : F = 6 : 4
- 4319 surgical cases/year in Japan (2009)
- over three times the incidence rate

Treatment Strategy for Acute Aortic Dissection

Type A Dissection: Emergency Operation
Type B Dissection: Medical Hypotensive Therapy, Emergency Operation

Stanford type A  Stanford type B
Surgical Mortality Rate for Acute type B Aortic Dissection

Complicated cases: 28 — 92%
Uncomplicated cases: 13%

Treatment Strategy for Acute type B Aortic Dissection before TEVAR

Complication specific treatment

Uncomplicated → Medical Management

complicated → Surgical Management

Rupture → Graft replacement
Ischemia → Fenestration
Expansion → Graft replacement (rarely, Thromboexclusion)

Management of descending aortic dissection.

Morphological change in chronic type B Dissection

Acute → Chronic
Narrowing of true lumen
Involved visceral arteries

The Long-term Results of Uncomplicated Acute Type B Aortic Dissection with Best Medical Treatment

Freedom from aortic enlargement (Rupture, >10mm/year, >60mm)

<table>
<thead>
<tr>
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<th>1 year</th>
<th>3 years</th>
<th>5 years</th>
<th>10 years</th>
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<tr>
<td>Marui</td>
<td>75%</td>
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<td>60%</td>
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<td>Kato M,</td>
<td>88%</td>
<td>68%</td>
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<td>Kuratani T</td>
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<td>Circulation</td>
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<td>EJVES 2006</td>
<td>75%</td>
<td>67%</td>
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To prevent enlargement for uncomplicated type B dissection in chronic phase

1. Prediction of Aortic Enlargement

2. Entry Closure with minimal risk

Prediction of Aortic Enlargement at the onset

Study Design

- Retrospective study with 41 uncomplicated type B pts
- Multivariate analysis

Freedom from Aortic Enlargement

Comparison between <40mm and ≥40mm of aortic diameter at onset

Entry Closure with Minimal Risk

Study Design

- Animal study with experimental aortic dissection
- Clinical trial for patients with type B aortic dissection

CONCLUSIONS: These data suggest that patients with acute type B dissection who have a large aortic diameter (≥ 40 mm) and a patent primary entry site in the thorax should be treated surgically during the acute phase on the condition that the surgical risk in this phase is limited.

Stent-Graft Implantation for Experimental Animal Model of Aortic Dissection

IA graft (intra aortic graft) II Stent Graft

Entry close

Thrombosed false lumen

Experimental assessment of newly devised transcatheter stent-graft for aortic dissection.

TEVAR for Acute type B aortic dissection

Tapered graft: 28-25:GZV(30) 25-50

TEVAR for type B dissection

Device: Giantuco Z-stent

Open area to fit the curve for aortic arch


Aortic Aneurysm (Included Aortic Dissection): 2517 cases

Treatment with Stent-graft: 1883 (74.8%)

Aortic Dissection:
- Acute: 726
- Chronic: 672

Aortic Arch Aneurysm: 531
- Open Stent Grafting: 126
- Branched Open Stent Grafting: 213
- Debranched TEVAR: 192

Descending Aortic Aneurysm: 729
Thoraco-Abdominal Aortic Aneurysm: 108
Abdominal Aortic Aneurysm: 515
Patients

1999-2010 TEVAR for acute type B aortic dissection
34 cases

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<tr>
<th>Age</th>
<th>62.4(40-82)</th>
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<tbody>
<tr>
<td>Gender</td>
<td>M/F=23/11</td>
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</table>

**Early results**

- Primary success: 37/39 (94.8%) (minor type I endoleak: 2)
- Hospital mortality: 2/39 (5.2%) (complicated type B: 2)
- Complications:
  - Stroke: 1/39
  - Spinal cord ischemia: 0/39
  - Renal failure: 1/39
  - Retrograde type A: 0/39
  - Re-dissection: 0/39
  - New intimal injury: 1/39
  - Iliac injury: 0/39

**Long-term results**

Follow up: 32.3 month (0-129), 95.3% completion

- **ALL CAUSE SURVIVAL:**
  - 90.9%/1YEAR
  - 72.7%/3YEAR
  - 72.7%/5YEAR

- **Freedom from dissection related death:**
  - 94.8%/5year
Status of Thoracic false lumen (FL) with CT image

At discharge:
- Clotted (size no change) - patent

1 year later:
- Disappear
- Shrinkage
- Middle descending aorta (LA level)
- Clotted (size no change)
- Enlarge

Aortic event

- Proximal event: 3
- Distal event: 4

FREEDOM FROM AORTIC EVENT:
- 90.2%/1YEAR
- 79.2%/3YEAR
- 73.1%/5YEAR

Approval of the next generation device is absolutely essential

Chronic Type B Aortic Dissection
Impact of treatment timing on aortic event-free survival in patients with aortic dissection

Demographics 2005-2010
Chronic B Dissections with follow-up by MDCT 62 cases

Periods from onset to TEVAR: 9.7 months (1 - 49)

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<tr>
<th></th>
<th>M/F</th>
<th>Age</th>
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<td></td>
<td>50 / 12</td>
<td>66.0</td>
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Preoperative complications
- CVD: 9 (14.5%)
- CAD: 10 (16.1%)
- COPD: 5 (8.1%)
- CRF(Cr>1.5mg/dl): 6 (9.7%)
- Cancer: 5 (8.1%)
- Marfan: 1 (1.6%)
- Past AAA: 6 (9.7%)

Early Results

<table>
<thead>
<tr>
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<th>58 / 62 (93.5%)</th>
<th>0 / 62</th>
<th>3 / 62 (4.8%)</th>
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<tbody>
<tr>
<td>Primary success</td>
<td>(Endoleak I, 4)</td>
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<td>30 days mortality</td>
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<td>In hospital mortality</td>
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Postoperative complications
- Stroke: 1 (1.6%)
- Spinal cord ischemia: 0
- Prolonged intubation: 0
- Acute renal failure: 0
- Retrograde Type A dissection: 0
- Iliac injury: 1 (1.6%)
- Emboli: 1 (1.6%)
- Thrombosis of False lumen at discharge (Distal side of devices): 54 / 62 (87.1%)

Freedom from aortic event

Follow-up: 32.0±17.6 months

89.1%/1y
77.1%/3y

Patients at risk
- 62
- 38
- 28
- 8
- (months) 48
**Freedom from Aortic event**
(excluded hospital death and Type I endoleak)

- *<9months*
  - 100% / 1y
  - 92.3% / 2y
  - 92.3% / 3y
- *≥9months*
  - 95.8% / 1y
  - 85.2% / 2y
  - 75.7% / 3y
- Patients at risk: 24 16 11 2
- P=0.01143

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<th>*: Period from on-set to TEVAR</th>
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<td>24 16 11 2</td>
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</tr>
<tr>
<td>32 21 12 4</td>
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**CONCLUSIONS**

- TEVAR for acute type B aortic dissection had provided satisfactory early and mid-term results, even if TEVAR for uncomplicated cases.
- By using TEVAR, we have also achieved outstanding early and long-term results for chronic dissection. The period between TEVAR and onset may be critical and should be considered in order to avoid postoperative aortic events.
- TEVAR for type B aortic dissection may serve as an alternative to conventional open surgery, but this requires devices from the next generation.