Reconstruction of the aortic bifurcation with balloon expandable covered stents

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Speaker’s name: Peter Goverde

- I have the following potential conflicts of interest to report:
  - Consulting:
    - Abbott Vascular; Angioslide; Atrium Maquet Getinge group; Bard Peripheral Vascular; Cardionovum; Cordis Cardinal Health; IMDS; Ivascular; Stille; Veyran; Ziehm Imaging
How to treat?

How to prevent?
Aortoiliac Occlusive Lesions
Aortoiliac Occlusive Lesions
Aortoiliac Occlusive Lesions

- Current standard for complex occlusive aorto-iliac lesions is open surgical repair
- 5-year patency rate: 87 - 91%
- Complication rate: 8 - 12%
- Mortality rate: 3 - 4%

Type D lesions:
- Infra-renal aortoiliac occlusion
- Diffuse disease involving the aorta and both iliac arteries requiring treatment
- Diffuse multiple stenoses involving the unilateral CIA, EIA, and CFA
- Unilateral occlusions of both CIA and EIA
- Bilateral occlusions of EIA
- Iliac stenoses in patients with AAA requiring treatment and not amenable to endograft placement or other lesions requiring open aortic or iliac surgery
Open versus endovascular approach

Ask your patient: what would you choose?
Extensive aortoiliac disease: endovascular treatment options

- Double barrel bare metal stents ± stents in the renal /visceral arteries

- Chimney stents + stenting of juxtarenal aortic occlusion

- Covered endovascular reconstruction: CERAB (+/- chimney or branch)
Lesions of the aortic bifurcation & kissing (covered) stents: death space issue
An alternative technique to reconstruct the aortic bifurcation with 3 Atrium – Maquet V12 covered stents for extensive occlusive disease

Advantages of covered stents

- May reduce the impact of radial mismatch
- May reduce the risk on embolization
- Prevention of in-stent re-stenosis
- May reduce the risk on rupture
Why using balloon expandable covered stents?

due to its specific characteristics:

• low profile
• double ePTFE layer
• easy and accurate deployment
• radial force
• Dog-bone type inflation of balloon
• **diameter adaptiveness**
  (postdilation to a larger diameter is possible without damaging the stent structure and ePTFE)
Covered stent
Adaptiveness

1 stent V12 LD (12x 61 mm) = 4 different shapes

12mm

16mm

18mm

20mm
RESULTS

– **In vitro testing**: in collaboration with
  - University of Twente, Enschede, The Netherlands; E. Groot Jebbink (J Vasc Surg, 2014)

– **In vivo**
  - Vascular Clinic ZNA, Antwerp, Belgium
  - Rijnstate Hospital, Arnhem, The Netherlands

“The Science behind the Technology”
Results: in vitro

- **CERAB configuration:**
  - Related to the best geometrical conditions
  - Low radial mismatch
  - High stent conformation
  - Lower mismatch area
  - Lowest total mismatch volume or dead space
Results: in vitro, flow visualization

Dye injection
Particle Image Velocimetry measurements:
Mostly laminar flow throughout the cardiac cycle
Technical considerations
Different possible CERAB configurations with BX stents

In the FUTURE

Courtesy of Peter Goverde MD
Different possible CERAB configurations

- CERAB made of:
  - Main body:
    - V12 Maquet Getinge Bx
    - Diameters 10-12-14-16 mm
    - Length:
      - 10: 38 & 59 mm
      - 12-14-16: 41 & 61 mm
  - Legs:
    - V12 Maquet Getinge Bx
    - Diameters 6 to 9 mm
    - Length: 38 & 59 mm
- Can be postdilated
- Cave shortening

Courtesy of Peter Goverde MD
Different possible CERAB configurations

- **CERAB made of:**
  - **Main body:**
    - LifeStream Bard PV Bx
    - **Diameters** 10-12 mm
    - Can been postdilated to 16 mm
    - **Length:**
      - 38 & 58 mm
  - **Legs:**
    - LifeStream Bard PV Bx
    - **Diameters** 6 to 9 mm
    - **Length:** 37 (38 for 9mm) & 58 mm
  - Can be postdilated
  - Less shortening

Courtesy of Peter Goverde MD
Different possible CERAB configurations

• Future CERAB made of:
  • Main body:
    – **BeGraft Aortic Bentley Bx**
    – **Diameters 12-14-16-18-20-22-24mm**
    – Largest Can been postdilated up to max 28 mm
    – **Length**: 19-28-mm
  • Legs:
    – **BeGraft Bentley Bx Bx**
    – **Diameters 6 to 10mm**
    – **Length**: 28 (27)-38(37)-58(57)
• Can be postdilated
• Less shortening

Courtesy of Peter Goverde MD & Bentley InnoMed (booth 13)
Results CERAB: Antwerp and Arnhem

- February 2009 – March 2014
- 103 elective patients
- Acute cases (n=5) and chimney’s (n=5) excluded
- 61 (36-85) years
- Rutherford classification:
  - 1 (n=1) 1%
  - 2 (n=0) 0%
  - 3 (n=64) 62%
  - 4 (n=20) 19%
  - 5 (n=17) 17%
  - 6 (n=1) 1%
- Technical success 95%

Technical Results CERAB: Antwerp and Arnhem

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<tr>
<th>Aortic stent length (mm)</th>
<th>Count (Percentage)</th>
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<tr>
<td>29</td>
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<tr>
<td>38</td>
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<tr>
<td>41</td>
<td>64 (64.6%)</td>
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<tr>
<td>61</td>
<td>28 (28.2%)</td>
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<td>1 (1.0%)</td>
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<tr>
<td>12</td>
<td>95 (96.0%)</td>
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<tr>
<td>14</td>
<td>2 (2.0%)</td>
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<tr>
<td>16</td>
<td>1 (1.0%)</td>
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Technical Results CERAB: Antwerp and Arnhem

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<th>Iliac artery stent length (mm)</th>
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<td>38</td>
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<tr>
<td>41</td>
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<td>2</td>
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<td>59</td>
<td>80</td>
<td>83</td>
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<td>61</td>
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<th>Iliac artery stent diameter (mm)</th>
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<td>6</td>
<td>4</td>
<td>5</td>
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<tr>
<td>7</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>88</td>
<td>85</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
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<tr>
<td>12</td>
<td>1</td>
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<table>
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<th>Number of stents used</th>
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<tr>
<td>3</td>
<td>65</td>
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<tr>
<td>4</td>
<td>19</td>
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<tr>
<td>5</td>
<td>15</td>
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## Results CERAB:
### Antwerp and Arnhem

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<tr>
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<th>6 m</th>
<th>12 m</th>
<th>18 m</th>
<th>24 m</th>
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<tr>
<td>Primary patency</td>
<td>91.5</td>
<td>87.3</td>
<td>87.3</td>
<td>82.3</td>
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<tr>
<td>Secondary patency</td>
<td>97.8</td>
<td>95.0</td>
<td>95.0</td>
<td>85.0</td>
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<tr>
<td>Freedom from TLR</td>
<td>93.7</td>
<td>88.2</td>
<td>88.2</td>
<td>85.6</td>
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- **Median follow-up**: 19 months
- **Limb salvage**: 100%
CERAB & Complex Aortic Occlusive Disease

2 chimney, V12 Atrium Maquet

P. Goverde MD, Antwerp Belgium/ A. Schmidt MD, Leipzig Germany
CERAB & Complex Aortic Occlusive Disease

Andrew Holden, MD: Auckland City Hospital, Auckland NZ
CERAB & Complex Aortic Occlusive Disease

Used stents:
- 1 x V12 LD 12 x 41 mm
- 3 x V12 6 x 59 mm
- 2 x V12 7 x 59 mm
- 2 x Gore Viabahn 6 x 150 mm

P. Goverde MD, Antwerp Belgium
CERAB & Complex Aortic Occlusive Disease: iliac Re- Re- stent occlusion
Conclusions

- Covered endovascular reconstruction of the aortic bifurcation (CERAB) is safe and feasible and seems to be a valid alternative for surgery and/or kissing stents

- Exploration of the chimney-CERAB, patient selection and the economic benefit may further expand the indications of this technique
Thank you for your attention
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