DCB in my practice: How the evidence influences my strategy

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Disclosure

Speaker name: Yang-Jin Park

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
Drug Coated Balloons

• **Improved outcomes of DCB over PTA**
  – RCTs: IN.PACT Admiral, Lutonix, Stellarex
  – Published many DCB Trials or Registries
  – Single center experiences

• **Safety and efficacy:**
  – proved in many studies

• **Long-term data: limited**
  – 5YR results of IN.PACT admiral released recently (VIVA2018)
Drug-coated balloons (DCB)
FDA approved

<table>
<thead>
<tr>
<th>Device</th>
<th>Company</th>
<th>Coating</th>
<th>Drug dose (μg/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN.PACT™ Admiral</td>
<td>Medtronic Vascular, Santa Clara, CA, USA</td>
<td>Paclitaxel–urea</td>
<td>3.5</td>
</tr>
<tr>
<td>Lutonix® 035 DCB</td>
<td>BARD, Murray Hill, NJ, USA</td>
<td>Paclitaxel–polysorbate/sorbitol</td>
<td>2.0</td>
</tr>
<tr>
<td>Stellarex®</td>
<td>Spectranetics, Colorado Springs, CO USA</td>
<td>Paclitaxel-polyethylene glycol</td>
<td>2.0</td>
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</tbody>
</table>
## RCTs of DCB in FP lesions

<table>
<thead>
<tr>
<th></th>
<th>1-Year</th>
<th>2-Year</th>
<th>3-Year</th>
<th>4-Year</th>
<th>5-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Patency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN.PACT DCB</td>
<td>87.5%</td>
<td>79.0%</td>
<td>69.5%</td>
<td>Not assessed after 3 years</td>
<td></td>
</tr>
<tr>
<td>Lutonix DCB</td>
<td>73.5%</td>
<td>58.6%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Stellarex DCB</td>
<td>82.3%</td>
<td>72.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD-TLR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN.PACT DCB</td>
<td>2.4%</td>
<td>9.1%</td>
<td>15.2%</td>
<td>23.4%</td>
<td>25.5%</td>
</tr>
<tr>
<td>Lutonix DCB</td>
<td>12.3%</td>
<td>18.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stellarex DCB</td>
<td>7.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DCBs: Unmet needs in daily practice

- Complex FP lesions
  - Heavy calcifications
    - Drug delivery, needs for scaffolds d/t post-balloon dissections
  - Long CTO lesions >25cm
  - Elastic recoils
  - Flow limiting dissections
    - Needs for scaffolds

- Limited data of:
  - Long-term durability: Restenosis rates
  - Efficacy mainly in claudicants, not in CLI
  - ISR lesions
## DCBs in “Real-World” Registries

<table>
<thead>
<tr>
<th>Key Inclusion Criteria</th>
<th>Global¹</th>
<th>Long Lesion²</th>
<th>Long Lesion³</th>
<th>CTO⁴</th>
<th>ISR⁵</th>
<th>Clinical⁶</th>
<th>ILLUMENATE Global⁷</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Patient Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stellarex</td>
</tr>
<tr>
<td>Age (years)</td>
<td>68.3y</td>
<td>67.6y</td>
<td>69.5y</td>
<td>67.5y</td>
<td>67.8y</td>
<td>68.6y</td>
<td>68.2y</td>
</tr>
<tr>
<td>RCC ≥4 (%)</td>
<td>9.0%</td>
<td>6.1%</td>
<td>16.7%</td>
<td>11.1%</td>
<td>10.0%</td>
<td>11.0%</td>
<td>8.6%</td>
</tr>
<tr>
<td>Men (%)</td>
<td>67.6%</td>
<td>73.7%</td>
<td>66.2%</td>
<td>69.0%</td>
<td>69.5%</td>
<td>67.8%</td>
<td>73.0%</td>
</tr>
<tr>
<td>DM (%)</td>
<td>39.5%</td>
<td>36.4%</td>
<td>41.0%</td>
<td>29.6%</td>
<td>35.1%</td>
<td>39.9%</td>
<td>33.7%</td>
</tr>
<tr>
<td>Key Lesion Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (cm)</td>
<td>10.1cm</td>
<td>21.3cm</td>
<td>26.4cm</td>
<td>22.9cm</td>
<td>17.2cm</td>
<td>12.1cm</td>
<td>7.5cm</td>
</tr>
<tr>
<td>CTO (%)</td>
<td>31.2%</td>
<td>52.1%</td>
<td>60.4%</td>
<td>100.0%</td>
<td>34.0%</td>
<td>35.5%</td>
<td>31.3%</td>
</tr>
<tr>
<td>Ca²⁺ (%)</td>
<td>50.2%</td>
<td>78.9%²</td>
<td>71.8%</td>
<td>71.0%</td>
<td>59.1%</td>
<td>68.7%</td>
<td>56.2%²</td>
</tr>
</tbody>
</table>

### 12-mo Outcomes

<table>
<thead>
<tr>
<th>1st Patency (%)</th>
<th>FF TLR/CD-TLR(%)</th>
<th>Bail-out Stent (%)</th>
<th>Amputations (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR</td>
<td>94.3%</td>
<td>25.2%</td>
<td>0.5%(3/632)</td>
</tr>
<tr>
<td>NR</td>
<td>NR</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>68.9%</td>
<td>87.8%</td>
<td>39.8%</td>
<td>NR</td>
</tr>
<tr>
<td>91.1%</td>
<td>94.0%</td>
<td>40.4%</td>
<td>0.0%</td>
</tr>
<tr>
<td>85.3%</td>
<td>89.1%</td>
<td>46.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>88.7%</td>
<td>92.9%</td>
<td>14.5%</td>
<td>0.2%(3/1311)</td>
</tr>
<tr>
<td>NR</td>
<td>92.6%</td>
<td>25.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>NR</td>
<td>NR</td>
<td>17.3%</td>
<td>(1/371)</td>
</tr>
<tr>
<td>81.4%</td>
<td>94.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>94.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LINC 2018
Experiences in Samsung Medical Center
Seoul, Korea
Purpose

• To evaluate outcomes (safety and efficacy) of endovascular treatment using drug-coated balloon (DCB) for femoropopliteal artery lesions in a single-center
Methods I

• Single center retrospective cohort study
• Study period: 2013. 4. – 2018. 10.
• 226 patients (297 lesions, 253 limbs)
• Follow-up (mean ± SD, range): 13.6 ± 14.1 (1-65.8) months
• DCB in femoro-popliteal lesions
• Primary end-points
  – Primary patency: Binary restenosis >50% on DUS (PSVR>2.4) or TLR
  – Freedom-from TLR
• Secondary end-points
  – Freedom-from death
  – Freedom-from major amputation
Methods II

• Inclusion criteria
  – Atherosclerotic disease of the femoro-popliteal lesion
  – RC 3-6
  – PTA using drug-coated balloon (with or without stenting or atherectomy)
  – De-novo or restenosis (non-stented or in stent restenosis), stenosis of bypass graft

• Exclusion criteria
  – Non-atherosclerotic lesions
    ex> acute thrombotic occlusion, TAO
## Patient Demographics and Comorbidities

<table>
<thead>
<tr>
<th>Patients characteristics</th>
<th>N=226(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years, median, IQR)</td>
<td>$71.7 \pm 9.1$ (38-93)</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>183 (81)</td>
</tr>
<tr>
<td>HTN</td>
<td>187 (82.7)</td>
</tr>
<tr>
<td>Smoking (ex or current)</td>
<td>92 (40.7)</td>
</tr>
<tr>
<td>DM</td>
<td>161 (71.2)</td>
</tr>
<tr>
<td>CAD</td>
<td>96 (42.5)</td>
</tr>
<tr>
<td>CKD ($\geq$grade 3)</td>
<td>75 (33.2)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>104 (46)</td>
</tr>
</tbody>
</table>
## Treatment Indication

### Limbs

<table>
<thead>
<tr>
<th>Indication</th>
<th>N=253 limbs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claudication</td>
<td>167 (66)</td>
</tr>
<tr>
<td>Rest pain</td>
<td>18 (7.1)</td>
</tr>
<tr>
<td>Tissue loss</td>
<td>68 (26.9)</td>
</tr>
<tr>
<td>Minor tissue loss</td>
<td>65 (82.7)</td>
</tr>
<tr>
<td>Major tissue loss</td>
<td>13 (17.3)</td>
</tr>
</tbody>
</table>

### Lesions

<table>
<thead>
<tr>
<th>Location</th>
<th>N=297 lesions (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>De-novo</td>
<td>62 (82.7)</td>
</tr>
<tr>
<td>Restenosis</td>
<td>13 (17.3)</td>
</tr>
<tr>
<td>Balloon angioplasty</td>
<td>6</td>
</tr>
<tr>
<td>Stenting</td>
<td>3</td>
</tr>
<tr>
<td>Surgical bypass</td>
<td>4</td>
</tr>
</tbody>
</table>

### Location

<table>
<thead>
<tr>
<th>Artery</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common femoral artery</td>
<td>8 (2.7)</td>
</tr>
<tr>
<td>Superficial femoral artery</td>
<td>226 (76.1)</td>
</tr>
<tr>
<td>Popliteal artery</td>
<td>63 (21.2)</td>
</tr>
<tr>
<td>Lesion Characteristics</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Calcification ≥50% in target lesion</td>
<td>87 (29.3)</td>
</tr>
<tr>
<td>Chronic total occlusion (CTO)</td>
<td>71 (23.9)</td>
</tr>
<tr>
<td><strong>TASC classification</strong></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>75 (25.3)</td>
</tr>
<tr>
<td>B</td>
<td>169 (56.9)</td>
</tr>
<tr>
<td>C</td>
<td>40 (13.5)</td>
</tr>
<tr>
<td>D</td>
<td>13 (4.4)</td>
</tr>
<tr>
<td>No. of run off vessel</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>7 (2.4)</td>
</tr>
<tr>
<td>1</td>
<td>69 (23.3)</td>
</tr>
<tr>
<td>2</td>
<td>105 (35.5)</td>
</tr>
<tr>
<td>3</td>
<td>115 (38.9)</td>
</tr>
<tr>
<td>Length (cm, median, IQR)</td>
<td>7 (4,13)</td>
</tr>
<tr>
<td>Preoperative ABI (median, IQR)</td>
<td>0.66 (0.5,0.8)</td>
</tr>
</tbody>
</table>
## Treatment details

<table>
<thead>
<tr>
<th>Treatment details</th>
<th>N(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DCB types</strong></td>
<td></td>
</tr>
<tr>
<td>IN.PACT</td>
<td>244 (82.2)</td>
</tr>
<tr>
<td>Lutonix</td>
<td>53 (17.8)</td>
</tr>
<tr>
<td><strong>Concurrent use of Atherectomy</strong></td>
<td>58 (19.5)</td>
</tr>
<tr>
<td><strong>Stenting</strong></td>
<td>26 (8.8)</td>
</tr>
<tr>
<td>Adjuvant</td>
<td>8</td>
</tr>
<tr>
<td>Bail out</td>
<td>18</td>
</tr>
<tr>
<td><strong>Complication</strong></td>
<td></td>
</tr>
<tr>
<td>Dissection</td>
<td>46 (15.5)</td>
</tr>
<tr>
<td>Embolization</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Hematoma</td>
<td>7 (2.4)</td>
</tr>
<tr>
<td>Pseudoaneurysm</td>
<td>1 (0.3)</td>
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## Immediate outcomes

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>N(%)</th>
</tr>
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<tr>
<td>Procedural success</td>
<td>294 (99)</td>
</tr>
<tr>
<td>30day mortality</td>
<td>0</td>
</tr>
<tr>
<td>Target limb major amputation</td>
<td>4 (1.6)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Intentional</td>
<td>4 (1.6)</td>
</tr>
<tr>
<td>Unplanned</td>
<td>0</td>
</tr>
<tr>
<td>Amputation level</td>
<td></td>
</tr>
<tr>
<td>Toe</td>
<td>5 (35.7)</td>
</tr>
<tr>
<td>Foot</td>
<td>5 (35.7)</td>
</tr>
<tr>
<td>BK</td>
<td>4 (28.6)</td>
</tr>
<tr>
<td>AK</td>
<td>0</td>
</tr>
<tr>
<td>Post procedural ABI, median (IQR)</td>
<td>0.95 (0.8,1.02)</td>
</tr>
</tbody>
</table>
**Primary patency**

<table>
<thead>
<tr>
<th>Follow up duration (months)</th>
<th>Cum Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>0.93</td>
</tr>
<tr>
<td>20</td>
<td>0.70</td>
</tr>
<tr>
<td>30</td>
<td>0.55</td>
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<tr>
<td>40</td>
<td>0.40</td>
</tr>
<tr>
<td>50</td>
<td>0.26</td>
</tr>
<tr>
<td>60</td>
<td>0.09</td>
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</table>

<table>
<thead>
<tr>
<th>No.at risk</th>
<th>Patency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mo</td>
<td>182</td>
</tr>
<tr>
<td>6mo</td>
<td>114</td>
</tr>
<tr>
<td>12mo</td>
<td>81</td>
</tr>
<tr>
<td>24mo</td>
<td>26</td>
</tr>
<tr>
<td>36mo</td>
<td>12</td>
</tr>
<tr>
<td>48mo</td>
<td>5</td>
</tr>
<tr>
<td>Patency (%)</td>
<td>97.6</td>
</tr>
<tr>
<td></td>
<td>88.1</td>
</tr>
<tr>
<td></td>
<td>79.3</td>
</tr>
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<td></td>
<td>51.4</td>
</tr>
<tr>
<td></td>
<td>43.3</td>
</tr>
<tr>
<td></td>
<td>29.7</td>
</tr>
</tbody>
</table>

**Freedom from TLR**

<table>
<thead>
<tr>
<th>Follow up duration (months)</th>
<th>Cum Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>0.96</td>
</tr>
<tr>
<td>20</td>
<td>0.90</td>
</tr>
<tr>
<td>30</td>
<td>0.85</td>
</tr>
<tr>
<td>40</td>
<td>0.80</td>
</tr>
<tr>
<td>50</td>
<td>0.75</td>
</tr>
<tr>
<td>60</td>
<td>0.70</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>No.at risk</th>
<th>No. at risk</th>
<th>FF TLR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mo</td>
<td>182</td>
<td>98.6</td>
</tr>
<tr>
<td>6mo</td>
<td>117</td>
<td>92</td>
</tr>
<tr>
<td>12mo</td>
<td>86</td>
<td>85.6</td>
</tr>
<tr>
<td>24mo</td>
<td>32</td>
<td>71.3</td>
</tr>
<tr>
<td>36mo</td>
<td>13</td>
<td>57.9</td>
</tr>
<tr>
<td>48mo</td>
<td>7</td>
<td>57.9</td>
</tr>
</tbody>
</table>

**Freedom from major amputation**

<table>
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<tr>
<th>Follow up duration (months)</th>
<th>Cum Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>0.98</td>
</tr>
<tr>
<td>20</td>
<td>0.95</td>
</tr>
<tr>
<td>30</td>
<td>0.92</td>
</tr>
<tr>
<td>40</td>
<td>0.89</td>
</tr>
<tr>
<td>50</td>
<td>0.86</td>
</tr>
<tr>
<td>60</td>
<td>0.83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.at risk</th>
<th>No. at risk</th>
<th>FF-Amp (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mo</td>
<td>221</td>
<td>97.9</td>
</tr>
<tr>
<td>6mo</td>
<td>150</td>
<td>96.4</td>
</tr>
<tr>
<td>12mo</td>
<td>109</td>
<td>96.4</td>
</tr>
<tr>
<td>24mo</td>
<td>48</td>
<td>92.6</td>
</tr>
<tr>
<td>36mo</td>
<td>15</td>
<td>92.6</td>
</tr>
<tr>
<td>48mo</td>
<td>9</td>
<td>92.6</td>
</tr>
</tbody>
</table>

**Patients overall survival**

<table>
<thead>
<tr>
<th>Follow up duration (months)</th>
<th>Cum Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>0.98</td>
</tr>
<tr>
<td>20</td>
<td>0.95</td>
</tr>
<tr>
<td>30</td>
<td>0.92</td>
</tr>
<tr>
<td>40</td>
<td>0.89</td>
</tr>
<tr>
<td>50</td>
<td>0.86</td>
</tr>
<tr>
<td>60</td>
<td>0.83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.at risk</th>
<th>No. at risk</th>
<th>Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mo</td>
<td>206</td>
<td>100</td>
</tr>
<tr>
<td>6mo</td>
<td>140</td>
<td>95.8</td>
</tr>
<tr>
<td>12mo</td>
<td>102</td>
<td>94.9</td>
</tr>
<tr>
<td>24mo</td>
<td>44</td>
<td>91.8</td>
</tr>
<tr>
<td>36mo</td>
<td>14</td>
<td>87.2</td>
</tr>
<tr>
<td>48mo</td>
<td>9</td>
<td>87.2</td>
</tr>
</tbody>
</table>
## Risk factors of restenosis (multiple regression model)

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>P-value</th>
<th>RR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesion length (cm)</td>
<td>0.014</td>
<td>1.053</td>
<td>1.011, 1.097</td>
</tr>
<tr>
<td>Combined atherectomy use</td>
<td>0.004</td>
<td>2.806</td>
<td>1.384, 5.688</td>
</tr>
<tr>
<td>DCB type2</td>
<td>&lt;0.001</td>
<td>3.701</td>
<td>1.902, 7.200</td>
</tr>
</tbody>
</table>
Strength & Limitation

- Relatively large number of patients
- Guideline-based practice by vascular specialists in real clinical field
  - Balanced, multidisciplinary approach after conference
- Retrospective single center study
- Selection bias
  - Complex FP lesion were treated mainly by surgical bypass with autologous vein
  - TASC C/D, long CTO, severe calcification, ISR
Conclusions

• Drug coated balloons (DCBs) are a good option for the treatment for femoropopliteal occlusive disease.

• But, primary patency and target limb revascularization rate in real practice was not as good as that of RCT in this study.

• Evidence-based, lesion-specific, and individualized approach is essential part of treatment for the patients with FP lesions.
DCB in my practice: 
How the evidence influences my strategy

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