Diabetic patients in CLI

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Disclosure

Speaker name: Min Yang

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
Case 1 - Brief History

Female, 63 yo

Rest pain in the right foot for 3 months

Diabetes for 20 yrs; Hypertension for 10 yrs

PE:

Right femoral artery(+), Right DPA/PTA(-), Right foot poikilothermia

ABI: R0.45 L0.80
Angiography
Antegrade Access
Trying to recanalize PPL
GE MEDICAL SYSTEMS
Peking University First Hospital

FOV: 40x40 cm
LAO: 24.8 deg
CRA: 0.6 deg
L: 0.0 deg
Tilt: 0 deg
Mag = 1.00
PL: PRT
WW: 4096 WL: 2048
XA 1000x1000

Seq: 28
FRAME = 6 / 41
MASK = 1

(Fit: 5)
Trying to recanalize PTA
Crossing PPL with 0.014inch guidewire
Dilating PPL and PTA

Coyote 2 × 220mm
Dilating PTA

Coyote 2.5 × 150mm
Completion Angiography
Post procedural Condition

- Right DPA/PTA(+), poikilothermia relieved
- ABI: Pre 0.45 → Post 0.85
Case 2 - Brief History

Male, 83 yo
Gangrene in 2\textsuperscript{nd} and 3\textsuperscript{rd} digits of left foot for 3 months
Diabetes for 30 yrs, Hypertension for 20 yrs

PE:
- Tenderness and paleness
- Left femoral artery pulse (+)
- Left PTA and DPA pulse (-)

ABI: R 0.84 L 0.48

Doppler: Patent left femoral and popliteal artery and occluded BTK arteries
Angiography after antegrade access
Endovascular procedure

Cross the occluded segment of peroneal artery with Command guidewire accompanied by balloon catheter

Saber 2.5 × 150mm Balloon catheter
Crossing the occlude lesion of ATA V-18 guidewire with a loop at the tip and balloon catheter as support

Failure in crossing the heavily calcified occlusion at the DPA
Saber 2.5×150mm 4 French 70cm long sheath
0.014” Rubicon support catheter and M6 CTO guidewire
Coyote 2.5 × 150mm and 3 × 220mm

LitePAC 5 × 30mm
Completion angiography
Post-procedural condition

Symptom - Coldness and rest pain alleviated

ABI: R 0.70 L 0.78

Wound healed after 3m
Goal of EVT for CLI patients

- Pain relief
- Wound healing
- Amputation
- QOL improvement
- ADL improvement
- Reduce Mortality rate

Excessive pursuit for binary patency

QOL Quality of life
ADL Activities of daily living

Osamu Iida presentation @ LINC 2018
Procedural endpoint of BTK intervention
Necessary or sufficient?

• One straight line
• Number of runoff
• Below the ankle
• Pedal arch
• Direct Angiosome Revascularization
• Wound blush obtainment
Neville et al reported results of angiosome-targeted revascularization for BTK lesions for the first time in 2009.

Conclusions

- Revascularization plays a crucial role in the treatment of ischemic lower extremity wounds.
- DR leads to a higher rate of healing and limb salvage than IR.

Number of Infrapopliteal arteries
-the more, the better

Number of patent infrapopliteal arteries per limb at the end of primary PTA and corresponding primary limb salvage rate

1-year limb salvage rate (%)
Role of Intact PPL

Kaplan-Meier analysis of the healing rate and time to healing with standard error bars and number of subjects at risk (#SR) in complete pedal arch (CPA), incomplete pedal arch (IPA), and no pedal arch (NPA) groups.

Conclusions: The rates for healing and time to healing were directly influenced by the quality of the pedal arch rather than the angiosome revascularized.
Figure 5. The pedal artery angioplasty group [PAA(+)] showed a higher wound healing rate and shorter time to wound healing than limbs that did not have PAA [PAA(−)].

PAA: pedal artery angioplasty

Nakama et al. Journal of Endovascular Therapy, 2016, 23(1).
OBJECTIVES The aim of this study was to investigate the clinical outcomes of pedal artery angioplasty (PAA) for patients with critical limb ischemia.

(Figure 1) Representative Case of Successful Pedal Artery Angioplasty

(A) Digital subtraction angiography (DSA) before pedal artery angioplasty (PAA). (B) PAA with a 2.0-mm balloon. (C) DSA after PAA. Both the lateral plantar and dorsal arteries were recanalized.
### FIGURE 2  Overall Outcomes

- **Limbs salvage rate**: 88.5%
- **Amputation free survival rate**: 73.5%
- **Wound healing rate**: 49.5%

**Mean time to wound healing**: 319 days, IQR(86.5-365)

<table>
<thead>
<tr>
<th>Interval (months)</th>
<th>0</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Limbs salvage rate (n=257)</strong></td>
<td>at risk</td>
<td>257</td>
<td>229</td>
<td>213</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>100.0</td>
<td>93.6</td>
<td>90.3</td>
<td>89.1</td>
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<tr>
<td><strong>Amputation free survival rate (n=257)</strong></td>
<td>at risk</td>
<td>257</td>
<td>229</td>
<td>213</td>
<td>200</td>
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<tr>
<td></td>
<td>%</td>
<td>100.0</td>
<td>89.1</td>
<td>82.9</td>
<td>77.1</td>
</tr>
<tr>
<td><strong>Wound healing rate (n=257)</strong></td>
<td>at risk</td>
<td>257</td>
<td>190</td>
<td>155</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>100.0</td>
<td>24.8</td>
<td>37.5</td>
<td>43.2</td>
</tr>
</tbody>
</table>

### FIGURE 3  Rate of Wound Healing in Patients Undergoing and Those Not Undergoing Pedal Artery Angioplasty

- **Log-rank P=0.003**
- **211 days, IQR(69.25-365)**
- **365 days, IQR(86.5-365)**

<table>
<thead>
<tr>
<th>Interval (months)</th>
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<th>9</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PAA group (n=140)</strong></td>
<td>at risk</td>
<td>140</td>
<td>99</td>
<td>75</td>
<td>65</td>
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<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>28.3</td>
<td>43.8</td>
<td>49.9</td>
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<tr>
<td><strong>Non-PAA group (n=117)</strong></td>
<td>at risk</td>
<td>117</td>
<td>88</td>
<td>79</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>24.1</td>
<td>31.0</td>
<td>36.3</td>
</tr>
</tbody>
</table>

Role of wound blush obtainment

**TABLE 4** Multivariate Analysis for Predictor of Wound Healing (Angiographic Variables)

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted HR (95% CI)</th>
<th>Adjusted HR (95% CI)</th>
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</thead>
<tbody>
<tr>
<td>Number of patent BK vessels</td>
<td>0.96 (0.77-1.78) (p = 0.667)</td>
<td>0.85 (0.66-1.10) (p = 0.226)</td>
</tr>
<tr>
<td>Number of patent BA vessels</td>
<td>1.23 (0.93-1.63) (p = 0.141)</td>
<td>1.24 (0.88-1.75) (p = 0.225)</td>
</tr>
<tr>
<td>Pedal arch</td>
<td>1.12 (0.79-1.59) (p = 0.524)</td>
<td>0.90 (0.61-1.33) (p = 0.597)</td>
</tr>
<tr>
<td>Direct flow</td>
<td>1.06 (0.75-1.50) (p = 0.736)</td>
<td>1.10 (0.743-1.63) (p = 0.629)</td>
</tr>
<tr>
<td>Wound blush</td>
<td>1.85 (1.15-2.98) (p = 0.012)</td>
<td>1.84 (1.11-3.05) (p = 0.019)</td>
</tr>
</tbody>
</table>

In the multivariate Cox model, all the variables listed in the table were entered to obtain adjusted hazard ratios. CI = confidence interval; HR = hazard ratio; other abbreviations as in Table 3.
Role of wound blush obtainment

**FIGURE 2** Representative Cases of Positive and Negative WB

(A) Stain of contrast agent around wound was confirmed in completion digital subtraction angiography. After skin graft, the wound healed.
(B) Contrast agent could not reach the wound, and the wound did not heal. WB = wound blush.
Summary

Goal of treatment in diabetic CLI patients

• Symptom improvement
• Reducing mortality rate

Optimal endpoint of endovascular procedures

• DR according to Angiosome
• Number of runoffs
• Intact PPL
• Wound blush obtainment
• Personalized treatment option
Thanks!