Perfusion as the Ultimate Goal to Determine Success of Therapy

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Talk outline

• Current state of revascularization evaluation
• What are the available perfusion strategies
• Clinical and practical relevance
Definition of CLI:

- Hemodynamic values thresholds for the diagnosis of CLI:
  - ABI < 0.5
  - TBI < 0.5
  - TP < 50 mmHg

- Presence of rest pain requiring analgesia and/or ischemic tissue loss for at least 2 to 4 weeks with an ankle pressure <50 mmHg
Noninvasive limb hemodynamic measurements

- Almost 30% of patients with CLI and abnormal infrapopliteal runoff had normal or mildly abnormal ABIs.
- Low TBI was not associated with abnormal infrapopliteal runoff.
Noninvasive limb hemodynamic measurements

• Another study examined ABI’s in CLI patients (50 patients).
• The mean ABI in the cohort of 0.89.
• The mean TBI in this study cohort was 0.42.
• This renders those patients as non CLI patients based on strict definition.

29% of patients did not fit the definition
What Perfusion Imaging?

- Simple
- Reliable
  - Actual end points?
  - Values?
- Reproducible
Evaluation modalities

• Laser Doppler
• MRI
• PET
• Indocyanine Green Fluorescence Angiography
• Perfusion Software
- Noninvasive
- No ionizing radiation
- Performed at the bedside

- Low-depth penetration of laser light (marker of skin perfusion), measures small area of skin
- Readings affected by temperature, weather and consumption of vasoactive substances
- Noninvasive
- No ionizing radiation
- Easy access to imaging facilities
- Quantifies perfusion in different muscle groups

- Low signal: noise ratio
- Longer scan time with inherent problems of motion artifact (ASL)
- Variation in transit time in patients with PAD may make it difficult to assess perfusion accurately
- No absolute quantification
- Visual improvement?
- No actual values
-T1/2 is the bet predictor of correlation with non invasive tests
Case Presentation

- This is a 74 year old female with an ulcer involving the L great toe. Rutherford class V
- PMH: HTN, CKD and diet controlled DM
- ABI of 0.93 on the left
Tibial CTO’s

Type I CTO In PT

Type II CTO In AT
- Initial assessment
- 12 cc of contrast with a rise time of 0.5 sec
- 0.035” catheter placed in the popliteal artery
Variables in perfusion

- Time to peak
- Wash out time
- Area under curve
- Peak density post/Peak density after
The AMP Group
Retrograde Pedal Access
Reverse access and deliver therapy in AT from CFA
Final Result
- No vasodilators
- Same position of imaging catheter
- Balloon angioplasty in the PT
- Atherectomy in the AT
Makes Sense!
Case example

- Demographics: 52 y.o. male, HTN, CAD, hyperlipidemia, DM Type II, acute renal failure, RC 3, 100% occluded prox SFA to popliteal

<table>
<thead>
<tr>
<th></th>
<th>Pre procedure</th>
<th>Post Procedure</th>
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</thead>
<tbody>
<tr>
<td>ABI</td>
<td>1.27</td>
<td>0.53</td>
</tr>
<tr>
<td>TBI</td>
<td>0.21</td>
<td></td>
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<tr>
<td>Toe pressure</td>
<td>absent</td>
<td>28</td>
</tr>
</tbody>
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Courtesy of Dr Mustapha
Pre and Post Angio
Case example
Case Example

Density (volume) / Time: = D/T

Pre perfusion density

Peak Density

Revasc modality? Time to perfusion? Vasodilators?

Pre ABI = 1.27, TP = absent, TBI = absent

Post ABI = 0.53, TP = 28, TBI = 0.21

ABI decreased post revascularization
- Location: SFA
- Pedal Access
- Lesion: CTO
- Protection: EPD
- Revas: Atherectomy
- Balloon: DCB

Does not make sense?

Palpable pulse
In 2 hours
Perfusion Images

• There appears to be limitations in applying the technology

• Immediate vs delayed assessment might have different implications

• Anatomical treatment zone: Supra vs infra popliteal

• Revascularization modality: Balloon angioplasty, Stenting, Atherectomy
Therapy End Points

- Revascularization
- Wound Care
- Surveillance

• Angiography?
• Hemodynamic?
• Perfusion?
• Duplex?
• The need for identifying an evaluation tool beyond angiography is necessary

• Current perfusion technology need to define better targets for revascularization

• Clinicians must not ignore other clinical factors contributing to wound healing
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