Characterization Of Tibial Velocities By Doppler Ultrasonography And Validity of the Ankle-profunda Index In Peripheral Arterial Disease

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Fundación Jiménez Díaz
Disclosure

Speaker name: .............................................Gergana T. Taneva.............................................

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
Duplex ultrasound (DUS): not invasive, widespread, cost-effective and precise.

—The relation between arterial velocities and PAD are not well defined.
Validate and establish reference criteria as a guide in the interpretation of duplex ultrasound (DUS) in PAD patients.
Methods

• Inclusion: patients with PAD and DUS examination.
  – ABI and Rutherford classification.

Exclusión:
- Previous revascularization
- Non-compressible ABI
- Lesions which inhibit the DUS
Methods

• Control cases:
  – No claudication
  – No previous PAD
  – ABI 0.9-1.2

Indication for DUS: flebostatic symptoms (80%), swollen legs (12%) or unspecific 8%).
Methods

- Two explorers (Transductor 3 – 10 MHz).
- PSV at the origin of the profunda and at the distal end of the three tibial vessels.

\[
\text{Ankle-profunda index (API) = } \frac{\text{Mean Tibial Velocity (MTV)}}{\text{PSV profunda}}
\]

Results

- 35 PAD
- 25 controls
## PAD vs. Control

<table>
<thead>
<tr>
<th></th>
<th>PAD</th>
<th>Control</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABI</td>
<td>0.586 ± 0.192</td>
<td>1.008 ± 0.053</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PSV femoral profunda</td>
<td>124.2 ± 59.24</td>
<td>79.68 ± 15.26</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PSV PT</td>
<td>34.88 ± 23.14</td>
<td>68.92 ± 16.00</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PSV AT</td>
<td>27.94 ± 23.68</td>
<td>66.60 ± 27.26</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PSV per</td>
<td>5.169 ± 13.65</td>
<td>39.44 ± 26.53</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Mean Tibial Velocities</td>
<td>38.05 ± 18.06</td>
<td>63.21 ± 15.05</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
## Rutherford 1 y 2 vs. Rutherford 3,4,5 y 6

<table>
<thead>
<tr>
<th></th>
<th>Rutherford 3 - 6</th>
<th>Ruth 1 - 2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABI</td>
<td>0.494 ± 0.195</td>
<td>0.673 ± 0.148</td>
<td>.007</td>
</tr>
<tr>
<td>PSV femoral profunda</td>
<td>141.3 ± 68.40</td>
<td>107.2 ± 44.22</td>
<td>.105</td>
</tr>
<tr>
<td>PSV PT</td>
<td>21.73 ± 16.31</td>
<td>48.02 ± 21.74</td>
<td>.001</td>
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<tr>
<td>PSV AT</td>
<td>13.79 ± 15.96</td>
<td>42.09 ± 21.84</td>
<td>.000</td>
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<tr>
<td>PSV per</td>
<td>9.344 ± 18.23</td>
<td>0.994 ± 3.975</td>
<td>.092</td>
</tr>
<tr>
<td>Mean Tibial Velocities</td>
<td>26.71 ± 12.35</td>
<td>49.40 ± 15.73</td>
<td>.000</td>
</tr>
<tr>
<td>Age</td>
<td>68.06 ± 12.93</td>
<td>66.38 ± 11.78</td>
<td>.702</td>
</tr>
</tbody>
</table>
ABI tertile agrupation of PAD patients

Mean Tibial PSV (cm/s)

- PSV PT
- PSV AT
- PSV per
- MTV

ABI > 0.6
ABI 0.4-0.6

p<.001
When ABIs Drop, Profunda PSVs Rise

- **ABI > 0.6**: Profunda PSV = 89 Cm/s
- **ABI 0.4 - 0.6**: Profunda PSV = 128 Cm/s
Correlation between ABI and API

Ankle- Profunda INDEX

| ABI > 0.6  | 0.72 |
| ABI 0.4 - 0.6 | 0.28 |
Ankle- Profunda Index

- Establish reference ranges.
- More specific in PAD patients.
- Special importance in non-collapsible ABI (Diabetic patients).
Calculation of API is easy and practical.

Ankle-profund index (API) = \[ \frac{\text{MTV}}{\text{VPS profunda}} \]
Simplified API

- The measurement of peroneal PSV is challenging (we measured 72% of peroneal VPS in healthy and 17% in PAD patients) and may be waived out.
- Its null value has not altered the results.

Simplificated API = PSV AT and PT 

Profunda PSV
Limitations and considerations

- Design
- Selection bias
- Small number of patients
In future

Prospective validation in multiple laboratories

Adoption of API in the interpretation of the DUS
Conclusions

1. The decrease in the ABI correlates with tibial PSV decrease, while the profunda PSV increases.

2. API correlates with ABI drop. That can be useful to establish reference ranges for more precise diagnosis and evaluation in PAD patients.

3. API: a new diagnostic tool with special importance in non-collapsible ABI.
Thank you
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