Exercise TcPO2 can Differentiate Buttock Intermittent Claudication from Symptoms of Spinal Stenosis: How should Buttock IC be Treated?

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Prevalence of Proximal / Buttock Vascular Claudication

- 5 to 14% of patients with mild to moderate PAD 1, 2
- 28% of patients post aortobifemoral bypass 3
- 35% of patients post EVAR with prior internal iliac artery embolization 4

Prevalence in the general population is unknown

1Picquet et al., Eur J Int Med, 2005
2Jaquinandi et al., Vasc Med, 2004
3Jaquinandi et al., Ann Surg, 2007
4Rayt et al., Cardiovasc Intervent Radiol, 2008

Evaluation of Proximal Claudication

Standard Non-Invasive Evaluation
- Ankle brachial index
- Segmental pressures
- Pulse volume recording
- Doppler signals
- Duplex ultrasound

Problematic
AXIAL not PARALLEL / Collateral

Exercise O2 Study Protocol

Disclosure

I have no relevant financial relationships to disclose.
Exercise O2 Study Protocol

- Stand 10 minutes for probe stabilization
- 2 minute base-line values standing
- Walk on treadmill (10% grade, 2 mph)
  - Time to 12 minutes or until pain forces a stop
  - 10 mins recovery standing

Delta from Resting Oxygen Pressure

- Raw data recorded directly into Perimed software
- DROP (site) = PO_2 (peripheral) time [T-0] - PO_2 (chest) time [T-0]
- DROP > -15mmHg cut off ischemia (Duodates et al. 2015, Circulation)

Methods

- Patients being referred to the lab
  - Need to differentiate vasculogenic from neurogenic claudication
  - Evaluate the relative severity of buttock vs calf claudication
- Retrospective review of consecutive patients between Jan 2013 to Jan 2016
- Patients with concomitant aortoiliac arterial imaging (CT/US) within 6 months included

Determination of IIA Inflow Reduction

- Moderate (>50%)
- Severe (>70%)
- Isolated lesions
- Multiple tandem lesions

Results

Jan 2013-Jan 2017

- 137 patients (144 studies)
- 26 patients with no imaging excluded
- Mean Age: 70 yrs
- Mean BMI: 30 ± 5

Location of symptoms

- 101
- 36

Results: ExTcPO2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLE Resting ABI</td>
<td>0.61 ± 0.33</td>
</tr>
<tr>
<td>LLE Resting ABI</td>
<td>0.67 ± 0.33</td>
</tr>
<tr>
<td>Maximal walking distance (m)</td>
<td>359 ± 209</td>
</tr>
</tbody>
</table>

Exercise O2 Study

- Positive 56 pts (85 limbs)
  - Suspected Vasculogenic 45/82 pts (55%)
  - Suspected Neurogenic 11/29 pts (38%)
- Unable to complete protocol 24 pts (21%)
ROC analysis
DROP ≥15 mmHg vs IIA inflow reduction
Moderate (>50%) 128 limbs (58%)
Severe (>70%) 105 limbs (47%)
C-Statistic 0.79
C-Statistic 0.73

Results
CTA Protocol completed*
(excluding US n=21) (excluding n=24)
>50% >70% >50% >70%
Sensitivity 80 69 64 78
Specificity 68 80 91 88
PPV % 73 80 75 87
NPV % 75 70 69 71
C-Statistic 0.75 0.78 0.81 0.82

*Excluding those unable to complete total walking distance due to limiting lower extremity claudication or dyspnea

Rx of Buttock Claudication- Open
Endarterectomy Bypass

Rx of Buttock Claudication- Endo

IIA revascularization 1994 - 2016
95 patients; 106 IIAs
Right 57, Left 47

Buttock Claudication 71 (67%)
Part of Lower limb Revasc 6

Mean age 64.6 years

Type of Revascularization
Bypass (34) Endarterectomy (36) Endovascular (36)
Stenting 19 Angioplasty 18
**IIA Revascularization**

**Clinical Follow up**
- Available for all limbs
  - Median Follow up: 7.1 yrs
  - Endo: 4.3 yrs
  - Open: 10.2 yrs

**Yes**

**No**

Symptomatic Relief

**Primary Patency**

<table>
<thead>
<tr>
<th></th>
<th>1 year (%)</th>
<th>5 year (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall (n=105)</td>
<td>84.5</td>
<td>71.5</td>
<td></td>
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<tr>
<td>Type of Revasc</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bypass</td>
<td>85.2</td>
<td>74.6%</td>
<td>0.94</td>
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<tr>
<td>Endarterectomy</td>
<td>78.8</td>
<td>73.8%</td>
<td></td>
</tr>
<tr>
<td>Endovascular</td>
<td>88.5</td>
<td>66.7%</td>
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</tr>
<tr>
<td>Extent of Revasc</td>
<td></td>
<td></td>
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<tr>
<td>Isolated IIA interven</td>
<td>100.0</td>
<td>90.9</td>
<td>0.10</td>
</tr>
<tr>
<td>AIOD interventions</td>
<td>80.7</td>
<td>66.4</td>
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<tr>
<td>IIA occl de severity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteal stenosis</td>
<td>94.4</td>
<td>70.9</td>
<td>0.25</td>
</tr>
<tr>
<td>Diffuse stenosis</td>
<td>85.7</td>
<td>85.7</td>
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<tr>
<td>Osteal occlusion</td>
<td>83.3</td>
<td>62.5</td>
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</table>

**77 yr M with B/L buttock + thigh claudication R>L**

**Conclusions**
- Non-invasive evaluation of suspected buttock claudication with exercise TcPO2 is reliable with ability to reserve imaging for patients with positive studies
- A high negative predictive value promises good ability to differentiate from other non-vascular causes of buttock / hip discomfort
- Open and endovascular IIA revascularization are effective with good mid-term patency