Essentials of LE-PAD: natural Hx, risk profile, and non-invasive diagnosis (ABI, TBI, duplex US)

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Estimates of prevalence of peripheral artery disease in men/women by age and ethnicity


Age-specific prevalence estimates for peripheral artery disease by sex and country income level


Peripheral Vascular Disease variation in phenotype (location and severity of vascular disease) according to sex

A population database of over 3.6 million people in the US

<table>
<thead>
<tr>
<th>Location of Vascular Disease</th>
<th>Adjusted Odds Ratio aOR (Women versus Men)</th>
<th>95% Confidence Interval</th>
<th>p-value for interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAD</td>
<td>1.62</td>
<td>1.60 - 1.64</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CAS</td>
<td>0.90</td>
<td>0.89 - 0.91</td>
<td>-</td>
</tr>
<tr>
<td>AAA</td>
<td>0.17</td>
<td>0.17 - 0.18</td>
<td>-</td>
</tr>
</tbody>
</table>
Peripheral Vascular Disease variation in phenotype (*location and severity of vascular disease*) according to sex

A population database of over 3.6 million people in the US

<table>
<thead>
<tr>
<th>PAD Odds in Women Across Different Severities</th>
<th>Adjusted Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>p-value for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>2.12</td>
<td>2.08 - 2.16</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Moderate</td>
<td>1.24</td>
<td>1.21 - 1.27</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>1.08</td>
<td>1.04 - 1.11</td>
<td></td>
</tr>
</tbody>
</table>
Estimated likelihood of LEPAD according to comorbidities after multivariate logistic regression

CAD/IHD \( \Rightarrow OR = 4.92 \) (95% CI; 2.52-9.59)

Diabetic \( \Rightarrow OR = 6.65 \) (95% CI; 2.60-17.01)

PAD was associated with diabetes, total and abdominal obesity, stroke, and MI

NS trend of greater PAD prevalence with hypertension, CHF, RF/dialysis, and smoking

Chart 1 - Comparison of the probability means of having Peripheral Arterial Disease (PAD) estimated by the multivariable logistic regression model for Ischemic Heart Disease (IHD) (A) and for Diabetes (B) per Sex; The analyses show that the effect of the presence of IHD for the female sex was highly significant for the presence of PAD (OR=4.92, 95%CI=2.52-9.59); in the male sex, the presence of Diabetes is significantly associated to PAD (OR=6.65, 95%CI=2.6-17.01).

1 in 5 individuals over age of 65 has PAD †

† ABI < 0.9

Only 1 in 10 of these patients had classical symptoms of intermittent claudication (IC)


**Original Article**

Arq Bras Cardiol 2008;91(6):370-382

**Prevalence and Risk Factors Associated with Peripheral Arterial Disease in the Hearts of Brazil Project**

Marcia Makdisse¹,², Alexandre da Costa Pereira³, David de Pádua Brasil⁴, Jairo Lins Borges⁵, George Luiz Lins Machado-Coelho⁶, José Eduardo Krieger⁷, Raimundo Marques Nascimento Neto⁸, Antonio Carlos Palandri Chagas⁹ and on behalf of the investigators of the Hearts of Brazil Study and Peripheral Arterial Disease Committee of the Brazilian Society of Cardiology/Funcor

Hospital Israelita Albert Einstein, São Paulo, SP, Universidade Federal de São Paulo (Uniesp), São Paulo, SP, Instituto do Coração da Faculdade de Medicina da Universidade de São Paulo (Incor USP), São Paulo, SP, Faculdade de Ciências Médicas de Minas Gerais, Belo Horizonte, MG, Instituto Dante Fazzanese de Cardiologia, São Paulo, SP, Departamento de Ciências Médicas da Universidade Federal de Ouro Preto, Ouro Preto, MG – Brazil
LEPAD and Incident Total Mortality

<table>
<thead>
<tr>
<th>Study</th>
<th>PAD Definition</th>
<th>Hazard Ratio</th>
<th>95% CI Low</th>
<th>95% CI High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total mortality</td>
<td>Large-vessel PAD</td>
<td>3.1</td>
<td>1.8</td>
<td>5.3</td>
</tr>
<tr>
<td>Criqui, 1992(^{130})</td>
<td>ABI&lt;0.9</td>
<td>3.4</td>
<td>1.6</td>
<td>7.1</td>
</tr>
<tr>
<td>Vogt, 1993(^{131})</td>
<td>ABI&lt;0.9</td>
<td>3.1</td>
<td>1.5</td>
<td>6.7</td>
</tr>
<tr>
<td>Ogren, 1993(^{132})</td>
<td>ABI&lt;0.90</td>
<td>2.3</td>
<td>1.4</td>
<td>3.8</td>
</tr>
<tr>
<td>Kornitzer, 1995(^{133})</td>
<td>ABI&lt;0.9</td>
<td>2.1</td>
<td>0.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Jager, 1999(^{134})</td>
<td>ABI&lt;0.9</td>
<td>1.5</td>
<td>0.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Newman, 1999(^{135})</td>
<td>ABI&lt;0.9</td>
<td>1.6</td>
<td>1.2</td>
<td>2.1</td>
</tr>
<tr>
<td>Hooi, 2002(^{136})</td>
<td>ABI&lt;0.7 (vs. &gt;0.95)</td>
<td>2.1</td>
<td>1.6</td>
<td>2.8</td>
</tr>
<tr>
<td>Murabito, 2003(^{137})</td>
<td>ABI&lt;0.9</td>
<td>1.4</td>
<td>0.9</td>
<td>2.1</td>
</tr>
<tr>
<td>Lee, 2004(^{138})</td>
<td>ABI&lt;0.9</td>
<td>1.1</td>
<td>0.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Resnick, 2004(^{139})</td>
<td>ABI&lt;0.9</td>
<td>1.7</td>
<td>1.3</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Hazard ratios for total mortality in men and women by ABI at baseline for all studies in the ABI collaboration

Criqui MH et Aboyans V. Circ Res. 2015;116(9):1509-16
PAD: Quantitative Correlation with CV Outcomes in Different Arterial Beds

Prevalence of Severe CAD Among Patients With and Without PAD

**ABI<0.90**

- PAD: 279 patients
  - 107 (38%) CLI & surgery
  - 138 (50%) Symptomatic PAD
  - 038 (12%) Asymptomatic PAD

- Non PAD Group: 218 patients

- Normal ABI

For **Left main CAD %**:
- PAD: 19% (p<0.001)
- Non PAD: <1%

For **Three- or four-vessel CAD %**:
- PAD: 63% (p<0.001)
- Non PAD: 11%

Angiographic data from patients with CAD suspicion

**Sukhija R, Yalamanchili K, Aronow WS. Am J Cardiol 2003;92:304-305**
# PAD: Natural Hx and Clinical Symptom Classification

**PARC (Peripheral Academic Research Consortium)**

<table>
<thead>
<tr>
<th>Fontaine Classification</th>
<th>Proposed PARC Universal Data Elements</th>
<th>Rutherford Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td>Symptoms</td>
<td>Grade</td>
</tr>
<tr>
<td>I</td>
<td>Asymptomatic</td>
<td>0</td>
</tr>
<tr>
<td>II</td>
<td>Intermittent claudication/other exertional limb symptoms</td>
<td>0</td>
</tr>
<tr>
<td>IIa</td>
<td>Moderate claudication/limb symptoms (able to walk without stopping &gt;2 blocks or 200 m or 4 min)</td>
<td>1</td>
</tr>
<tr>
<td>IIb</td>
<td>Severe claudication/limb symptoms (only able to walk without stopping &lt;2 blocks or 200 m or 4 min)</td>
<td>1</td>
</tr>
<tr>
<td>III</td>
<td>Ischemic rest pain</td>
<td>2</td>
</tr>
<tr>
<td>IV</td>
<td>Ulceration or gangrene</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

$↔$ = comparable terms.

**Patel MR, et al. J Am Coll Cardiol 2015; 65(9): 931-41.**
Major Manifestations of PAD According to Different Risk Factors

Peripheral Arterial Disease
- Intermittent Claudication
- Critical Limb Ischemia

Smoking and Hypertension
commonly associated with more proximal PAD (aortoiliac-femoral arteries)

Diabetes
most strongly associated with infrapopliteal (distal) PAD

Fate of patients with CLI after initial treatment
Summary of 6-month outcomes from 19 studies

Causes of death in patients with intermittent claudication

Cardiovascular Disease 55%
Non-vascular 25%
Cerebrovascular 11%
Other vascular causes 9%

Alive with amputation 35%
Alive without amputation 45%
Dead 20%

Measurement of the Ankle-Brachial Index (ABI)

Right ABI

Higher of the Right Ankle Systolic BPs

Higher Arm Systolic BP (R or L)

Left ABI:

Higher of the Left Ankle Systolic BPs

Higher Arm Systolic BP (R or L)

TASC II
Eur J Vasc Endovasc Surg Vol 33, Suppl 1, 2007
Measurement and Interpretation of the Ankle-Brachial Index: A Scientific Statement
From the American Heart Association

In the case of clinical suspicion based on symptoms and clinical findings, the ABI should be used as the first-line noninvasive test for the diagnosis of PAD (Class I; Level of Evidence A).\(^{11,38,41,50,56}\)

An ABI \(\leq 0.90\) should be considered the threshold for confirming the diagnosis of lower-extremity PAD (Class I; Level of Evidence A).\(^{11,37-39,42-44,46,50,51}\)

When the ABI is >1.40 but there is clinical suspicion of PAD, a toe-brachial index or other noninvasive tests, which may include imaging, should be used (Class I; Level of Evidence A).\(^{65,66}\)

\[\text{ABI as a Predictor of CV Risk}
\]

\[\text{The Cardiovascular Health Study}
\]

\[n = 4268\]

\[n = 1446\]

Observational Study \(\geq 65\) years

\[\text{CVD -}
\]

\[\text{CVD +}
\]

\[\text{ABI 0.9 - <1}
\]

\[\text{ABI 1 - <1.5}
\]

\[\text{ABI < 0.8}
\]

\[\text{ABI 0.8 - <0.9}
\]

\[\text{Toe-Braquial Index}
\]

\[\text{Duplex US}
\]

\[\text{Arterioscler Thromb Vasc Biol 1999;19:538-45}
\]

\[\text{Circulation. 2012;126(24):2890-909.}
\]
Conclusions

The risk of death is increased whether or not PAD is symptomatic, and patients with CLI face a high mortality, overwhelmingly due to MI and ischemic stroke.

“PAD prevalence is sharply age-related, rising >10% among patients in their 60s and 70s.”

Smoking, diabetes, and hypertension are particularly strong risk factors for PAD.

“Awareness of PAD is most likely to gain a foothold in the mind of the public if the symptoms and outcomes of the disease are taught more widely in health education programs.”

Halperin JL et Fuster V. Arch Intern Med 2003;163(8):877-8

Criqui MH et Aboyans V. Circ Res 2015;116(9):1509-16