2017: What Is New in PAD?

Larry J. Diaz-Sandoval, MD. FACC, FSCAI, FAHA
Director, Vascular & Endovascular Fellowship
Metro Health – U of M Health Hospital
Associate Professor of Medicine
Michigan State University

18th Annual Conference
May 31 - June 02
THE PERIPHERAL EVENT OF THE YEAR
Disclosures

Consultant to:

• Abbott Vascular
• Bard Peripheral Vascular
• Cardiovascular Systems, Inc.
• Terumo Medical
• Spectranetics
• Phillips Volcano
• Endocore
• Angiodroid
• Medtronic
THANKS TO ALL THE STUDENTS, MEN, WOMEN, KIDS & SENIORS WHO FIGHT DAILY TO RESTORE FREEDOM IN VENEZUELA.
THANKS TO ALL THE DOCTORS, NURSES, AND HEALTHCARE PERSONNEL, WHO WITHOUT RESOURCES DO THEIR BEST TO HEAL WOUNDS & RESTORE HEALTH IN VENEZUELA.
Leg SYMPTOMS are NOT adequate to identify individuals with PAD who are at high risk for cardiovascular events...
PVD: AN UNDERDIAGNOSED AND UNDERTREATED CHALLENGE

10,000,000 PVD Patients in US

2,500,000 Diagnosed

400,000 Treated With PVI
WHY SHALL WE BE IMPROVE OUR DIAGNOSTIC SKILLS WHEN IT COMES TO PATIENTS WITH PAD?

◆ 185,000 PAD-related amputations still performed every year.
◆ Patients with IC have a 3-fold increase in cardiovascular mortality.
◆ Patients with PAD face a 10-year drop in life expectancy.

Individuals “At Risk” for PAD

- Age < 50 years with diabetes +:
  - Smoking
  - Dyslipidemia
  - Hypertension
- 50 to 69 y/o + smoking or diabetes
- > 70 years old
- Leg symptoms with exertion (IC) or ischemic rest pain
- Abnormal leg pulse on examination
- Known CAD, carotid, RAS, AAA
Diabetes Increases the Risk of PAD

IGT: Oral GT test value $\geq 140 < 200$ mg/dL. *$P \leq .05$ vs. normal GT

Mortality According to ABI & DM: Strong Heart Study


Gender Differences In Prevalence Of Pad

6880 Patients (61% Female) in 344 PCP Offices

Prevalence (%) by Age and Gender:
- <70: Women 4%, Men 2%
- 70–74: Women 6%, Men 4%
- 75–79: Women 8%, Men 10%
- 80–84: Women 10%, Men 10%
- >85: Women 16%, Men 14%

Diehm C. Atherosclerosis. 2004;172:95-105
Clinical Presentations of PAD

- 50% Asymptomatic
- 15% Classic (Typical) Claudication
- 33% Atypical Leg Pain (functionally limited)
- 1-2% CLI

NCVH 2017
Individuals with asymptomatic PAD should be identified in order to offer therapeutic interventions known to diminish their increased risk of MI, stroke, and death. Should have ABI / Exercise ABI
Patients with CLI should undergo **expedited evaluation and treatment** of factors that are known to increase the risk of amputation.

Patients with CLI in whom open surgical repair is anticipated should undergo **assessment of CV risk**.
Evaluation of the Patient With CLI

Patients at risk of CLI (ABI < 0.4 in Non-DM, or ANY DM with known PAD) should undergo regular inspection of the feet to detect objective signs of CLI.

The feet should be examined directly, without shoes and socks at regular intervals after successful treatment of CLI.
Evaluation of the Patient With CLI

**B**

Patients with **CLI and skin breakdown** should be referred to healthcare providers with specialized expertise in wound care.

**C**

Patients at risk for **CLI (DM, neuropathy, CRF, or infection)** who develop **acute limb symptoms** represent potential vascular emergencies and should be assessed immediately and treated by a competent vascular specialist.
Clinical evaluation of individuals with PAD should include:

◆ A vascular review of symptoms.
◆ A vascular-focused examination.
◆ Use of the ABI & TBI, exercise ABI, Duplex u/s, MRA, CTA, SPP, TcPO2, LUNA.
◆ If needed, SELECTIVE diagnostic catheter-based angiography.
Hemodynamic Noninvasive Tests

- Resting Ankle-Brachial Index (ABI), TBI
- Exercise ABI
- Segmental pressure examination
- Pulse volume recordings
- DUS, MRA, CTA
- SPP, TcPO2, Indocyanin Green Angio

Simple, risk-free, and cost-effective approach to diagnose and follow up PAD
\[ \text{ABI} = \frac{\text{Each Ankle higher SBP}}{\text{Higher brachial SBP}} \]
Right ABI
80/160=0.50

Brachial SBP
150 mm Hg

PT SBP 120 mm Hg
DP SBP 80 mm Hg

Left ABI
120/160=0.75

Brachial SBP
160 mm Hg

PT SBP 40 mm Hg
DP SBP 80 mm Hg

ABI (Normal > 1.0)

Highest brachial SBP

Highest of PT or DP SBP

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## ABI Interpretation

<table>
<thead>
<tr>
<th>Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00–1.40</td>
<td>Normal</td>
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<tr>
<td>0.91–0.99</td>
<td>Borderline</td>
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<tr>
<td>0.70–0.90</td>
<td>Mild disease</td>
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<tr>
<td>0.41–0.69</td>
<td>Moderate disease</td>
</tr>
<tr>
<td>≤0.40</td>
<td>Severe disease</td>
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<tr>
<td>≥1.40</td>
<td>Noncompressible</td>
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Exercise ABI Testing

- Confirms the PAD diagnosis
- Assesses the functional severity of claudication
- May “unmask” PAD when resting ABI is normal.
- An ABI fall post-exercise supports a PAD diagnosis.
Plantar Flexion Exercise ABI

**Benefits:**
- Reproduces treadmill-derived fall in ABI
- Can be performed anywhere
- Inexpensive

**Limitation:**
- Does not measure functional capacity

Segmental Pressures (mm Hg)

<table>
<thead>
<tr>
<th>Segment</th>
<th>Pressure (mm Hg)</th>
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<tbody>
<tr>
<td>Brachial</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>150</td>
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<td></td>
<td>150</td>
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<td>150</td>
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<tr>
<td>ABI</td>
<td>0.41</td>
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<td></td>
<td>0.56</td>
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<td></td>
<td>0.56</td>
</tr>
</tbody>
</table>
TBI

- TBI: toe pressure / higher brachial pressure.
- TBI remains accurate despite non-compressible pulses.
- TBI values $\leq 0.7 =$ lower extremity PAD.
Noninvasive Imaging Tests

Duplex Ultrasound
In 2005, MRA had virtually replaced contrast arteriography for PAD diagnosis

- Excellent arterial picture
- No ionizing radiation
- Non-iodine–based IV contrast: rarely AKI or allergic reaction
- 10% of patients can’t have MRA:
  - Claustrophobia
  - Pacemaker / ICD
  - Obesity

Gadolinium use in individuals with a GFR <60 mL/min has been associated with nephrogenic systemic fibrosis (NSF) / nephrogenic fibrosing dermopathy
Dx anatomic location and degree of stenosis of PAD.

CTA: may be considered as a substitute for MRA for patients with contraindications to MRA.
Assessment of microcirculation (capillary flow) with laser Doppler.

SPP < 20 mmHg indicates poor healing potential.

SPP > 30 mmHg predicts good chance of healing.

Skin Perfusion Pressure

◆ SPP > 50 mmHg: Normal.

◆ SPP 30-49 mmHg: Refer to vascular specialist.

◆ SPP < 30 mmHg: Emergent referral.
TcPO2

- Measures amount of Oxygen that diffuses from capillaries through the skin (nutritive flow).
- TcPO2 < 20 mmHg indicates very poor healing potential.
- TcPO2 > 40 mmHg predicts good chance of healing.

Medial calcinosis, scars, wounds, amputations, infection & edema limit evaluation of tissue perfusion by SPP, TcPO2

Indocyanin Green Angiography (LUNA system)

Indocyanin Green Angiography (LUNA)

“RISK FACTOR MODIFICATION”
Asymptomatic PAD

◆ Smoking Cessation.
◆ Treatment of hyperlipidemia.
◆ Treatment of Diabetes.
◆ Treatment of HTN.
◆ Antiplatelets.
Kidney Disease in PAD / CLI:

- CLI is a multilevel, multivessel disease.

- Patients typically require multiple procedures, with repetitive exposure to contrast material.

- Peripheral interventions are inherently long, require large amounts of contrast.

- Risk assessment tools, hydration and pharmacological strategies have been extensively studied, without a clear advantage.

47 y/o male with long hx of Type 1 DM.

NH Ulcer in left 2nd toe x 3 m (Rutherford V).

ESRD (Cr 5.0 mg/dL, GFR: 13.29 ml/min/1.73 m²).

Pt has canceled procedure several times due to fear of nephrotoxicity.

Finally accepted when told he would not go on transplant list until wounds healed.
THINKING OUTSIDE THE BOX:

- CO₂ angiography.
- Ultrasound guided access & intervention.
- Antegrade tibial access (Exotic)
- Message: THINK OUTSIDE THE BOX.
CO$_2$-ANGIOGRAPHY
Antegrade AT US / CO$_2$-GUIDED PVI
Antegrade Tibial Access
Antegrade Tibial Puncture, $\text{CO}_2$
US / CO$_2$-GUIDED PVI
Automated CO$_2$ Angiography (ACDA)

- Single center, Prospective.
- 36 patients with DM, CLI (Rutherford V, VI) & CKD $\geq$ 3.
- PVA & PVI guided by ACDA. No image degradation.
- TcPO2 improved from 11.8 to 58.4 mmHg ($P<0.0001$).
- Clinical improvement in 100% of patients.
- No changes were seen in CrCl & no CO$_2$ complications.
- ACDA is safe and efficient to guide PVI in pts with DM, CLI and CKD $\geq$ 3.

*Journal Endovascular Therapy 2015; 1-9 DOI: 10.1177/1526602815616924*
2017: STATE OF AFFAIRS IN CLI

BTK, BTA, PEDAL LOOP
“PEDAL OUTFLOW”
2015: STATE OF AFFAIRS IN CLI

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TAKE HOME

- Be PROACTIVE on the look out for pad.
- Be AWARE and create AWARENESS.
- Diagnose PAD and treat risk factors.
- RFx + clinical suspicion = REFERRAL REGARDLESS of “normal abi”.
- NO AMPUTATION WITHOUT SELECTIVE ANGIO & ATTEMPT REVASCULARIZATION
- CREATE A CLI TEAM & COE: PCP, PODIATRIST, ORTHO, ID, VASCULAR SPECIALISTS, WOUND CARE, ENDOCRINE, REHAB, PROSTHETICS (1).

CONCLUSIONS:

- Minimize contrast: exotic arterial access, EVUS & CO$_2$ allow to revascularize CLI / CKD patients.
- Selective angio, revascularization with minimization of contrast & CO$_2$ guidance should become new standard.
- Aggressive wound care, low threshold for repeat revascularization & CLI Team involvement are the keys to success.
- New modalities to assess perfusion are being evaluated.
NO MORE
DICTATORSHIP
“LET’S PUSH OUR GRAIN OF SAND TOWARDS OUR FREEDOM BEACH”.

NO MORE DICTATORSHIP
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