VASCULAR IMAGING

• PAST
• PRESENT
• FUTURE
PERIPHERAL VASCULAR DISEASE
PAD currently affects 8–12 million Americans.

By 2050, the prevalence is expected to reach 19 million.

CHD = coronary heart disease. PAD = peripheral arterial disease.

* Includes myocardial infarction and angina pectoris.

Prevalence of PAD Increases With Age

Rotterdam Study (ABI<0.9, N=7715)
San Diego Study (PAD established with noninvasive test, N=613)

Independent Risk Factors for PAD*

Relative Risk vs the General Population

- Reduced
- Increased

1. Diabetes
2. Smoking
3. Hypertension
4. Total cholesterol (10 mg/dL)

* PAD diagnosis based on ABI <0.90.


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Effect of Smoking Cessation on Survival in PAD

131 Patients Followed After Bypass Graft or Lumbar Sympathectomy Surgery

Cholesterol Reduction and the Development of Intermittent Claudication

Scandinavian Simvastatin Survival Study
Impact of PAD on Mortality

Kaplan-Meier survival curves based on mortality from all causes.
†Large-vessel PAD.

Cardiovascular Events with PAD

Increased Risk of CV Mortality

- Stroke: 2–3x
- Fatal MI or CHD Death: 4x
- Death from CVD: 6x

Patients with symptomatic PAD face up to 6x greater risk of death from CVD, including MI and stroke.

CASE HISTORY

• 65 y.o. BLACK MALE with CC: 2 MONTHS OF CALF PAIN WHEN WALKING THE DOG. BETTER WITH REST. NOW MORE FREQUENT, with LESS ACTIVITY.
PAST MEDICAL HISTORY

- CAD/CABG X 4 2010 EF-55%
- DIABETES - TYPE – 2
- HTN
- HYPERLIPIDEMIA
- COPD
PHYSICAL EXAM

• HEENT: + EAR CREASE.
• LUNGS: CLEAR, HEART: RRR 2/6 M
• ABDOMEN: WNL.
• EXTERMATIES: + LOSS OF HAIR ON BOTH LEGS BELOW KNEES, + DOPPLER ON DP & PT, PALPABLE POLITEALS, FULL ROM & SENSATION.
PVD WITH SKIN CHANGES
Common Sites of Claudication

Obstruction in:
- Aorta or iliac artery
- Femoral artery or branches
- Popliteal artery or distal

Ischemia in:
- Buttock, hip, thigh
- Thigh, calf
- Calf, ankle, foot
WHAT NEXT?

- SEND HOME WITH PLETAL?
- MRI? CTA? PET SCAN? ANGIOGRAM?
- PERIPHERAL VASCULAR LAB –ABI’S
Ankle Brachial Index (ABI)

- Record bilateral systolic brachial pressure & systolic Ankle pressure (dorsalis pedis & post.tib art)

- Interpretation-Ratio highest ankle to brachial pressure.
ABI & Relation to PAOD

- 0.97 - 1.25  Normal
- 0.75 – 0.96  Mild PAOD
- 0.50 – 0.74  Moderate
- <0.5          Severe
- <0.3          Critical
- >1.5          Vessels non compressible
Segmental Pressure

- Drop in ABI at rest or post exercise indicates hemodynamically significant disease proximal to cuff.

- Segmental pressure measurement – localizes the diseased arterial segment.
Segmental Pressure

- Pressure difference between two adjacent segments <20mm of Hg
Segmental Pressure

- Gradient >30mmHg
- Hemodynamically significant disease between adjacent levels.
X-RAY HISTORY

• 1895 – DISCOVERY OF X-RAYS
• W.K. ROENTGEN
• 1895 – FIRST TIME USED IN SURGERY
• 1924-IODINE FIRST CONTRAST
• 1953- SELDINGER TECH. FEMORAL
• 1975 – DIAGNOSTIC X-RAY
• 1997 – DIGITAL X-RAY
IT ALL STARTED:

- The first angiogram was performed only months after Roentgen's discovery.
- Two physicians injected chalk or mercury salts into an amputated hand.
- And created an image of the arteries.
Treatment of PAD
Effect of Exercise Training

Meta-analysis of 21 Studies

![Graph showing the effect of exercise training on the onset and maximal claudication pain.](image)

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CASE HISTORY

• 40 YEAR OLD WHITE FEMALE CC: FATIGUE & ARM PAIN.

• PI: + 6 WEEKS OF DRAGGING FATIGUE, + WEIGHT LOSS OF 60-LBS OVER 12 MONTHS, + BILATERAL TRICEPT ACHE WITH WALKING OR UNDER STRESS, ONE EPISODE OF NOCTURNAL SYMPTOMS!
PAST MEDICAL HISTORY

• HYPERLIPIDEMIA.
• OBESITY.
• CHOLECYSTECTOMY.
• + Hx SMOKING, STOPPED x1 YEAR.
PHYSICAL EXAM

- HEENT-WNL, +EAR CREASE & XANTHALASMA.
- LUNGS: CLEAR BUT DECREASED, HEART: RRR 3/6 M,
- ABDOMEN & EXTREMATIES : WNL.
Example of earlobe crease.
Reprinted from *Dermatology Nursing*, 2010, Volume 22, Number 3, by permission of the publisher, Janetti Publications, Inc.
IMAGING
Vascular Case Conference
Stress Testing: What Type?  
“**To nuke or not to nuke?**”

<table>
<thead>
<tr>
<th>Modality</th>
<th>Sensitivity</th>
<th>Specificity</th>
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<tbody>
<tr>
<td>Exercise test</td>
<td>68%</td>
<td>77%</td>
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<tr>
<td>Nuclear Imaging</td>
<td>87-92%</td>
<td>80-85%</td>
</tr>
<tr>
<td>Stress Echo</td>
<td>80-85%</td>
<td>88-95%</td>
</tr>
</tbody>
</table>
Normal Myocardial Perfusion
Myocardial Ischemia
Myocardial Infarction
Last but not least... cost

<table>
<thead>
<tr>
<th>TEST</th>
<th>COST</th>
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<tbody>
<tr>
<td>ETT</td>
<td>$140</td>
</tr>
<tr>
<td>ETT + IMAGING</td>
<td>$906 (Nuclear)</td>
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<tr>
<td>CORONARY ANGIOGRAPHY</td>
<td>$5200</td>
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</tbody>
</table>

Comprehensive and well-obtained History & Physical Exam: priceless

CASE HISTORY

- 70 Y.O. ACTIVE WHITE MALE with CC: FUZZY VISION X 4 DAYS & PAINFULL RASH ON HEAD FOR 4 WEEKS.
- PMH: CAD/CABG-2000, HYPERTENSION, HYPERLIPIDEMIA,
- SH: +SMOKING Hx, but STOPED 2000, RARE-ETOH, RETIRED ELECTRICIAN.
- FH: + CAD & CVA
PHISICAL EXAM

- + CRUSTED, PAINFULL, BLISTERING RASH OVER THE FOREHEAD WITH PROMINENT VASCULATURE.
- REMAINING EXAM- WNL EXCEPT FOR STERNAL SCAR FROM CABG.
LABS

• CBC: WNL, EXCEPT FOR SED RATE OF: 130
• BMP: WNL.
• C-REACTIVE PROTEIN 3X NORMAL.
IMAGING

- **CAROTID ULTRASOUND**: LESS THEN 50% STENOSIS BILATERALLY.
- **TEMPORAL ARTERY ULTRASOUND**: 
Figure 3 Ultrasonographical findings for GCA

Salvarani, C. et al. (2012) Clinical features of polymyalgia rheumatica and giant cell arteritis
Nat. Rev. Rheumatol. doi:10.1038/nrrheum.2012.97
a & b = normal artery

C & d = temporal arteritis
C+D= Biopsy proven Giant Cell arteritis

Bley et al AJNR October 2007 28: 1722-1727

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TEMPORAL ARTERITIS

• TREATMENT: SIX WEEKS STEROIDS
CASE PRESENTATION

• 57 Y.O. BLACK MALE CC: ACUTE RIGHT SIDED WEAKNESS & SLURRED SPEECH STARTING FOUR HOURS AGO.

• PI: + 2 DAYS OF NAUSEA & FATIGUE, PATIENT NORMALLY ACTIVE WORKING AS MACHINEST.
PAST MEDICAL HISTORY

- HTN, HYPERLIPIDEMIA, POOR COMPLIANCE.
- SH: + SMOKING 1 PPD, +Mild MODERATE ETOH-6 PACK / NIGHT.
- FH: + HTN, STROKE, CAD.
- NKDA
PHYSICAL EXAM

- HEENT: + RIGHT FACIAL DROOP, 1/3 LEFT CAROTID BRUIT.
- LUNGS: DECREASED BUT CLEAR.
- HEART: IRREG WITHOUT M.
- ABDOMEN: WNL.
- + RIGHT ARM & LEG WEAKNESS.
IMAGING?

- ECG
- ECHO
- HEAD & NECK CT
- MRI
- ANGIOGRAM
ECG
LA Thrombus
ECHO

Cardiac Myxoma - TEE
Cardiac Myxomas
Multiple Intracardiac Thrombi