Approach To the Patient with Claudication: Evaluation and Revascularization

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DISCLOSURE

Columbia University Medical Center
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Atherosclerotic Disease in the US

<table>
<thead>
<tr>
<th>Disease</th>
<th>Prevalence (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary artery disease</td>
<td>13.2</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>4.8</td>
</tr>
<tr>
<td>Peripheral arterial disease</td>
<td>8.0-12.0</td>
</tr>
</tbody>
</table>

Overlap of Atherosclerotic Disease

38% overlap ≥2 vascular beds

Scope of PAD in the US

- Symptomatic-untreated: 3.75 million
- Symptomatic-treated: 1.25 million
- Asymptomatic: 5 million

Patients with one manifestation often have coexistent disease in other vascular beds.

WE ARE NOT DOING A GOOD JOB IDENTIFYING PVD PATIENTS.
Intermittent claudication

- Aching, pain, tiredness, tightness, cramping in the buttocks, thigh, calf or foot brought on by exercise and relieved by rest
  - reproducible with a consistent level of exercise from day to day
  - completely resolves within 2-5 minutes after the exercise has stopped
  - occurs again at the same distance once walking has resumed

Natural History of Intermittent Claudication

- Population > 55 years of age
- Intermittent Claudication 5%
- Peripheral Vascular Outcomes
  - Other Cardiovascular Morbidity/Total Mortality
  - Other Cardiovascular Event 70%
  - Cardiovascular Death 5%
  - Nonfatal Cardiovascular Event 30%
  - Stroke mortality 30%
  - Major amputation 4%
  - Lower Extremity Bypass surgery 7%
  - Stable Claudication 73%
  - Worsening Claudication 16%
  - 5-year mortality 30%

Some Not So Well Known Facts

- Only 8-10% of patients with PAD have “classic” claudication
- ~40% of Patients with PAD have “atypical” leg symptoms
- ~50% of patients with PAD are asymptomatic from the leg standpoint

GLOBAL VASCULAR CARE

- RECOGNITION OF THE POPULATION AT RISK.
- RECOGNITION OF THE VASCULOPATH PATIENTS.
- RECOGNITION OF THE THERAPEUTIC OPTIONS AVAILABLE.
Risk Factors for PAD

- Smoking: Increased
- Diabetes: Increased
- Hypertension: Increased
- Hypercholesterolemia: Increased
- Hyperhomocysteinemia: Increased
- Fibrinogen: Increased
- C-Reactive Protein: Increased
- Alcohol: Increased

Relative Risk

<table>
<thead>
<tr>
<th>Factor</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
</tr>
<tr>
<td>Hypercholesterolemia</td>
<td></td>
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<tr>
<td>Hyperhomocysteinemia</td>
<td></td>
</tr>
<tr>
<td>Fibrinogen</td>
<td></td>
</tr>
<tr>
<td>C-Reactive Protein</td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
</tr>
</tbody>
</table>

NOT ENOUGH TO SCARE PATIENTS

Natural History of Atherosclerotic Lower Extremity PAD

- PAD Population (50 years and older)
  - Amputation 20-35%
  - Critical Ischemia 5-10%
  - Ascending aortic aneurysm 5%
  - Critical Limb Ischemia 3%
  - Critical Limb Ischemia 1%

Initial clinical presentation

- Progressive functional impairment

1-year outcomes

- Alive with 2 limbs 50%
- Amputation 25%
- CV mortality 25%

5-year outcomes

- Alive with 2 limbs 40%
- Amputation 35%
- CV mortality 35%

(to next slide)

Natural History of Atherosclerotic Lower Extremity PAD

For each of these PAD clinical syndromes:

- Asymptomatic PAD: 20%-30%
- Claudication: 10%-20%
- Critical limb ischemia: 1%-2%
- Amputation: (see CLI data)

5-year outcomes:

- Limb morbidity:
  - Stable claudication: 70%-80%
  - Worsening claudication: 10%-20%
- Critical limb ischemia: 1%-2%
- Amputation: (see CLI data)

CV morbidity & mortality:

- Nonfatal CV event (MI or stroke): 20%
- Mortality: 15%-30%

CV causes: 75%
Non-CV causes: 25%


3.1
5.9
6.6

Relative Risk (95% CI)

PAD and Relative Risk of Death

- All Causes: 3.1 (1.9-4.9)
- Cardiovascular Disease: 5.9 (3.0-11.4)
- Coronary Artery Disease: 6.6 (2.9-14.9)


PAD Survival Curve


Natural history of PAD
America is “growing”

PAD, DM, and Cardiac Mortality

474 Men Age 68 Followed Prospectively for 14 Years

No DM, PAD +DM, -PAD +PAD, +DM (p<0.001)

Goals of Therapy for PAD

- Identify CAD/CVD
- Prevent Progression of Disease/Amputation
- Modify Atherosclerotic Risk Factors To Reduce Risk of Mortality
- Improve Functional Capacity/QOL

Pharmacotherapy: smoking cessation

- Sustained-release buprion
- Nicotine supplements
  - Combination more effective
  - Chantix (varenicline) improved outcomes vs. Buprion
- However long-term outcomes for cessation remains poor 16%-22% at 1 year
**Effects of tobacco cessation**

- Reduces progression of PAD
- CLI and amputation
- Reduces IC symptoms
- Reduces CV morbidity and mortality
- Improves graft patency

**Pharmacotherapy: antiplatelet**

- Antiplatelet Trialist Collaboration
  - >100,000 CAD/PAD patients Rx’ed with ASA reduced CV events
  - Other studies confirm a 20%-25% reduction in events with ASA
  - Dipyridamole without data for + effect
  - Thienopyridine administration with positive effects

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**CAPRIE Study**

**Efficacy of Clopidogrel in Primary Analysis of MI, Ischemic Stroke, or Vascular Death**

- Aspirin better vs Clopidogrel better

**CAPRIE Study**

**Outcome by Subgroup**

- Stroke
- MI
- PAD
- All patients
Pharmacotherapy: hypertension

- Beta-adrenergic blockade OK
  - No increase in claudication
- ACE inhibitors appear to reduce CV events (HOPE/ramipril)
  - ? pleotropic effect

The HOPE Study: PAD Subgroup Analysis

<table>
<thead>
<tr>
<th>No. of Patients</th>
<th>Incidence (%) of Composite Outcome in Placebo Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAD 4051</td>
<td>22.0</td>
</tr>
<tr>
<td>No PAD 5246</td>
<td>14.3</td>
</tr>
</tbody>
</table>

Relative Risk in Ramipril Group

Pharmacotherapy: dyslipidemia

- Both with and without statin use, the lowering of lipid levels benefit PAD patients
  - Improved IC
  - Improved all cause CV mortality
- Targets for patients with LDL<70, TG<150 (NCEP guidelines)

The Effect of Atorvastatin on Pain-Free Walking Time

- Intent-to-treat population

Mohler, E. Presented at AHA 2002.
Pharmacologic Effects of Cilostazol

- **Cilostazol**
  - Antiplatelet activity
  - Anti-thrombotic activity
  - In vitro inhibition of vascular smooth muscle cells
  - Produces vasodilation
  - Increases HDL-C
  - Mildly increases heart rate
  - Increases blood flow
  - Decreases triglycerides

Effect of Cilostazol on Walking Distance in Patients With Claudication

- Maximal Walking Distance
  - Cilostazol 100 mg bid
  - Cilostazol 50 mg bid
  - Placebo (n=140)

- Pain-Free Walking Distance
  - *P<.05 vs placebo

Dawson Drug Withdrawal Study

- Cilostazol 100 mg bid (n=16)
- Pentoxifylline 400 mg tid (n=13)
- Placebo (n=16)

Therapy for Intermittent Claudication

- Symptom/Limb
  - Tobacco Cessation
  - Foot Care
  - Control of DM
  - Reduction in Cholesterol
  - Antiplatelet Agents
  - Exercise

- Life
  - Tobacco Cessation
  - Control of DM
  - Reduction in Cholesterol
  - Reduction in BP
  - Antiplatelet Agents
  - Exercise

Lower-extremity ischemia: therapeutics

Surgical
- Aorto-bifemoral, femoral-popliteal, etc, bypass
- Generally good symptom relief and durability, but is dependent on inflow, conduit used, outflow disease, etc.,
- Risks increase with abdominal operation, medical comorbidities
- Recovery period is significant

WHAT ABOUT THE PERCUTANEOUS OPTION.

DOES PLUMBING WORK

YES IT DOES

Lower-extremity ischemia: percutaneous
The Superficial Femoral Artery (SFA) is the most common site of peripheral arterial involvement and the leading cause of claudication.

- Greater than 50% of peripheral lesions are located in the femoropopliteal segment.
- Most common location of disease is in adductor canal.
- The plaque can involve the entire 30cm artery.
- Occlusions are 3 times more common than stenoses in the SFA.
- Tends toward significant calcification.
- Disease tends to be “mirrored” in the contralateral limb.
- Profunda femoral artery collaterals usually sustain limb and progression to limb threat is unusual: 2%-3%/year.
Lower-extremity ischemia: percutaneous therapeutics

Restenosis rates for percutaneous intervention

- Iliac (in-flow) 10%-20%
- Superficial femoral/popliteal artery 20%-50%
- Tibioperoneal 50%-75%

Lesion Length and Location

- Focal lesion
- Diffuse Disease
- Long occlusion

Occlusive Disease

Gangrene = Arterial Insufficiency
TASC classifications of SFA lesions

Type A lesions
- Single lesion: 20 cm or less length
- Multiple lesions: 5 cm or less length

Type B lesions
- Multiple lesions: >20 cm length

Type C lesions
- Single lesion: >20 cm length

Type D lesions
- Multiple lesions: >20 cm length

Arterial Tortuosity: Knee Flexion

SFA disease past: endovascular options

- PTA
- Stenting
  - Bare metal
  - Covered stents
- Brachytherapy

Vessels lose elasticity and flexibility over time – leads to increased compression and kinking
PTA patency in SFA by lesion length

**TABLE III. Patency by Tertiles of Lesion Length**

<table>
<thead>
<tr>
<th>Ranges of lesion length</th>
<th>12 month patency</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0–6.5 cm</td>
<td>28% (8/29)</td>
</tr>
<tr>
<td>6.6–11.0 cm</td>
<td>38% (12/32)</td>
</tr>
<tr>
<td>11.1–15 cm</td>
<td>16% (4/25)</td>
</tr>
</tbody>
</table>

Legacy stent results in SFA lesions

<table>
<thead>
<tr>
<th></th>
<th>Mean lesion length</th>
<th>Stent</th>
<th>1st patency (1 year)</th>
<th>2nd patency (1 year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White et al 1995</td>
<td>3.7 cm</td>
<td>Wallstent and Streaker</td>
<td>75%</td>
<td>89%</td>
</tr>
<tr>
<td>Marin et al 1995</td>
<td>?</td>
<td>Wallstent</td>
<td>61%</td>
<td>84%</td>
</tr>
<tr>
<td>Gray et al 1997</td>
<td>16.5 cm</td>
<td>Wallstent and Palmaz</td>
<td>22%</td>
<td>46%</td>
</tr>
<tr>
<td>Conroy et al 2000</td>
<td>13.5 cm</td>
<td>Wallstent</td>
<td>47%</td>
<td>79%</td>
</tr>
<tr>
<td>Gordon et al 2001</td>
<td>14.4 cm</td>
<td>Wallstent</td>
<td>55%</td>
<td>82%</td>
</tr>
</tbody>
</table>

Biamino retrospective

![Biamino retrospective graph]
FESTO: Differential stent patency

Sirolimus-eluting stents for the treatment of obstructive SFA disease

- Two phases I and II
  - Primary endpoint % DS (I) and mean in-stent lumen diameter (II)
  - De novo or restenotic, lesion length 4-20 cm (I) and 4-14.5 cm (II)
- Total of 46 BMS and 47 DES implants
  - 90 µg/cm² drug/vessel area (coronary equivalent)
- Baseline patient and lesion characteristics were not different, except for more calcification in the DES group (I)

DES in SFA intervention: SIROCCO

DES in SFA intervention: SIROCCO I

6 month mean lumen diameter

- p=0.047
**SIROCCO II**

18-Month Duplex Ultrasound

<table>
<thead>
<tr>
<th></th>
<th>Sirolimus (n=24)</th>
<th>Control (n=23)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In-Stent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binary Restenosis</td>
<td>4 (16.7)</td>
<td>3 (13.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Occlusion</td>
<td>0</td>
<td>1 (14.3)</td>
<td>0.49</td>
</tr>
<tr>
<td>Total</td>
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<td>1.00</td>
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<td><strong>In-Lesion</strong></td>
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<td>1.00</td>
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**Cook Zilver® PTX™ Coating**

- Paclitaxel only
- No polymer or binder
- Thin coating (less than 5 μm)
- 3 μg/mm² dose density
  - maximum 880 μg total dose on largest stent
**Cook Zilver PTX: clinical trial status**

- **Randomized Study (480 pts)**
  - Phase 1: 60 patients
    - lesions ≤ 7 cm, up to 1 stent per limb
    - Enrollment complete
  - Phase 2: 420 patients
    - Lesions < 14 cm, up to 2 stents per limb
    - Enrollment complete
- **Registry Study (760 pts)**
  - Up to 4 Zilver® PTX™ stents per patient
  - Currently enrolling:
    - more than 700 patients enrolled/approximately 2500 stents implanted

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**Zilver PTX Registry Effectiveness: Freedom from TLR**

- Target Lesion Revascularization (TLR) defined as:
  - Clinically driven re-intervention for ≥ 50% DS within treated segment (including +/- 5 mm)
  - Surgical bypass of target vessel

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**DES in SFA intervention: summary**

- DES appears to be safe
- SIROCCO and STRIDES without apparent effect (sirolimus and everolimus)
- ZILVER PTX registry results encouraging, randomized data pending

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**SFA disease: Brachytherapy**

- Brachytherapy for restenotic lesions in the lower extremities
  - A proven therapy in the coronaries with 1/3 the expected recurrent restenosis expected compared with placebo
  - Prior small studies in PAD suggest similar effect
- Issues with beta radiation in the SFA are:
  - Centering
    - Delivery of adequate dosing (~18cGy) 0.5 mm deep into a 6-7 mm vessel
- A 20 center study (Novoste MOBILE trial) began summer 2002 but after 125 patients was halted and results not disclosed
Debulking devices: Overview

Current devices

- FDA Approved
  - Spectranetics laser
  - FoxHollow/eV3 Silverhawk
  - CSI Orbital Atherectomy Diamondback System (Q3 2007)
  - Pathway Medical

Angioplasty transiently displaces plaque... but vessel recoils & remodels over time... dissections shown to cause PTA failure in SFA... but triggers stretch injury

Stenting permanently displaces plaque... intimal hyperplasia common in SFA 6-9 months post-treatment... risk of strut fracture and subsequent occlusion... No dilatation used - avoids barotrauma and vessel recoil... smooths the lumen... reduces need for stent placement

Plaque excision permanently removes the plaque...
Atherectomy

Crown
- Diamond grit coated
- Creates lumen 1.75x greater than crossing profile

Orbital Atherectomy System (OAS)
Mechanism of Action: Differential Sanding

**Speed ~ lumen size**
- Off-set burr spins eccentrically
- Increased speed increases the centrifugal force
- Greater centrifugal force enlarges burr sweep increases lumen size

\[ CF = \text{Mass} \times \text{Rotational speed}^2 \]

1.9mm crown at 80k RPMs
1.9mm crown at 200k RPMs

OAS: Particulate Size Distribution

- 5 studies, 37 experiments
- (Carbon blocks; Thermal injury porcine coronary artery; Diseased cadaver peripheral arteries)
- Mean particle size: 2.3 μm (± .1 μm)
  - (99.95% CI)
- 99.14% < Red Blood Cell Diameter (99% CI)
- 99.3% < Capillary Diameter (99% CI)
- Rotablator Average Particle Distribution

CSI: Below the knee

CSI: Below the knee

More debulking Rx: Excimer laser
CryoPlasty: What is it?

- Cryoplasty is a new form of angioplasty that simultaneously dilates and cools the plaque and vessel wall at treatment site
- Cooling achieved by inflating the balloon with nitrous oxide instead of saline

Why CryoPlasty?

- Cryosurgical in vivo studies performed decades ago suggest freezing arterial tissues associated with a benign healing devoid of neointimal proliferation

SFA disease: Cryotherapy

- Cryotherapy
  - Induction of apoptosis via a controlled balloon cooling of the vessel to -10°C
  - Results in significantly reduced rates of dissection and stent usage
  - Restenosis rate at 9 months ~20% in short lesions
- Most recent data (JVS) does not demonstrate differential outcomes with cryoplasty for restenosis
Pathway PV Atherectomy System

**Distal Tip**
- 2.1 mm

**Control Pod**
- Differential cutting tip removes a variety of plaque types, including calcium
- Aspiration ports collect plaque and thrombus
- One step size expansion

Angiographic studies

Baseline

Debulking

Pathway, Case # 02, Germany

Trial updates

- RESILIENT
- ZILVER PTX

RESILIENT: Study Device

- Edwards LifeStent
- Self-expanding Nitinol stent
- Helically-designed
RESILIENT Trial Structure

- n=20
  - PTA + LifeStent
- Phase I: Feasibility @ 6 sites

- n=20 roll-in
  - PTA + LifeStent
- Phase II: Pivotal @ 24 sites

- n=206 randomly allocated
  - 1:2
- PTA Only Control Arm n=69
- PTA + LifeStent Test Arm n=137

Bail-Out Stenting Protocol

- Bailout stenting is considered a target lesion revascularization (TLR): primary endpoint & patency failure
- All bailouts were confirmed to be acceptable per protocol by the independent angiographic core lab data and CEC (93%) or via site-source documentation in two patients (7%)

Bailout Stenting % (n)
- 40.2% (29)

Reason for Bailout Stenting % (n)
- Major Flow-Limiting Dissection 38% (11)
- Residual Stenosis > 30% 62% (18)

Bail-out lesion characteristics

Lesion Length/patient (mm)

- 52.0 ± 38.2
- 70.5 ± 44.3
- 82.8 ± 37.8

RESILIENT: 12-Month Results

- Freedom from MACE* 86% 86%
- Prim. Patency (duplex)* 80% 80%
- Freedom from TLR* 87% 87%
- Clinical success 72%

*Data from Kaplan-Meier Survival Analysis

p ≤ .0001
Stent Fracture Grading

Type-I | Type-II | Type-III | Type-IV | Type-V

Jaff. et al. 2007

Strut fracture determination: challenging

Photograph | Low-resolution X-ray | High-resolution X-ray

Strut fracture? | No fracture | No fracture

RESILIENT: Stent Fracture Observations

<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Total Stents</th>
<th>Lesion Location Stents</th>
<th>Lesion Location at Deployment</th>
<th>Lesions Extended Beyond Calcium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>4</td>
<td>1 of 4</td>
<td>1 of 4</td>
<td>MMMD</td>
</tr>
<tr>
<td>Type II</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Type III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Type IV</td>
<td>5</td>
<td>4 of 5</td>
<td>5 of 5</td>
<td>MMMMP</td>
</tr>
</tbody>
</table>

Total Number of Fractured Stents: 9
Fracture rate/stents evaluated: 2.9%

RESILIENT 2: Type IV Stent Fracture

Baseline | Follow-up

None of the stent fractures were associated with restenosis at 12 months

* Per Core Lab Analysis: M=Mid SFA; D=Distal SFA; P=Popliteal
RESILIENT: Conclusions

RESILIENT’s Level 1 evidence illustrates:

- In claudicants with lesions shorter than 150 mm, a primary stenting strategy with the LifeStent is superior to a PTA alone strategy
  - Peri-procedurally, as evidenced by a larger luminal diameter, lesion success and procedure success
  - One year as evidenced by primary patency and freedom from TLR
  - 40% cross-over=PTA TLR
- PTA + LifeStent did not lead to a higher rate of “Major Clinical Adverse Events” than PTA alone

Observations in RESILIENT

- “Longer” and/or “more calcified” lesions did not respond sufficiently to a PTA alone strategy as evidenced by the significant cross-over rate (~40%)
  - Confounds analysis
  - A low fracture rate in the LifeStent
    - Fractures seen may be explained by poor deployment technique
    - A “One Stent” strategy is recommended when viable

SFA disease: covered stents

- Hemobahn (WL Gore) randomized data
  - 28 patients randomized to PTA or ePTFE covered stent
  - Results:
    - Post-procedure ABI’s better in the stent group
    - 6 month patency 93% in ePTFE vs. 42% in PTA
    - 2 year patency 87% vs. 25%
    - *Transient thigh pain requiring meds in 20% of ePTFE group, with one thrombotic complication
- VIBRANT trial recently completed
  - Randomized BMS vs. Viabahn, long lesions
  - No difference in binary restenosis
  - Improvement in ABI and functional measures with Viabahn
  - Pattern of restenosis different between stents/grafts

PAD Tools

Total occlusion devices

- Attempts to improve success in long occlusions in iliac and SFA given the promise of brachytherapy and coated stents to significantly reduce restenosis rates
  - Optical coherence reflectometry with radiofrequency ablation
  - Mechanical
Total occlusion devices
True Lumen Return: Trapped Wire

Total occlusion devices
True Lumen Return: Ultrasound Guidance

Crosspoint IVUS image from within a dissection of the SFA

Total occlusion devices
True Lumen Return
Future SFA: Design challenges

- This arterial territory response to intervention is poorly understood
  - There are no large-scale data sets from which to establish design goals
  - Such data was critical to the understanding of coronary stent behavior and the opportunity to improve the technology in a focused direction

Late Loss in Bare Metal Stents

Factors with unclear influence on interventional outcomes

- Length of disease
- Occlusion vs. stenosis
- Inflow/Run-off status
- Diabetic status
- Tobacco status
- Vessel diameter
- Atheroma volume
- Calcification
- Gender
Result of lack of outcome data

• Current efforts at designing successful devices which will have improved outcomes are at best estimates of the causal relationships

• In the typically small clinical trials testing in SFA therapies, these devices are subject to variation in subject/vessel characteristics

Disclaimer on SFA devices

• All approaches are reasonable until proven less effective to another approaches

• Even if less effective in head-to-head comparisons, the adjunctive value of the “loser” is unknown

Future SFA therapies: Overview

• Adventitial therapy
• Bioabsorbable stent
• Drug-eluting balloon

Adventitial Therapy
Adventitia as a restenosis enabler: Balloon injury draws cells to intima

Photodynamic therapy

- **Photodynamic therapy: InLumena**

  - Molecular Program
  - Photoreactive Agent
  - Activating Light

  - Biological effects of photodynamic action are mediated by photosensitizer

  - Photodynamic therapy: InLumena

  - Photodynamic therapy:

Bioabsorbables

- **Bioabsorbable stents**
  - Attractive as a non-permanent implant with drug delivery possibilities
  - Challenges include degree and duration of scaffolding, drug duration, etc
  - Abbott Vascular, RevaMedical, others
Local Delivery of Paclitaxel to Inhibit Restenosis during Angioplasty of the Leg: Porcine restenosis studies.

Columbia University Medical Center
The Cardiovascular Research Foundation

Circulation 2004; 110: 810 - 814

THUNDER trial

Drug eluting balloons: MedRad/Bayer

Porcine restenosis studies

Comparative study with the Cypher stent porcine restenosis trial

28 days follow-up

Columbia University Medical Center
The Cardiovascular Research Foundation

Am J Cardiol 2004; 94: 133E

vessel area [mm²] luminal area [mm²] neointimal area [mm²]

control, n=12
EEER, n=9
AcL, n=10
AcR, n=9

p=0.001
p=0.001

28 days follow-up, n=40

p=0.001*
p=0.002*

p-values
* vs control
** DEB vs Cypher

p=0.001*
p=0.030*
p=0.001**
p=0.176**
p=0.641*
p=0.228*
p=0.099**
Drug-eluting balloon: custom-made for the SFA?

- Coronary application limited by the need to “secure” the vessel after interventional procedure
- Occurrence/consequences of acute closure in SFA less frequent/critical
- Options for non-stent options in SFA to secure the vessel are greater
  - Laser
  - Atherectomy

Conclusions

- The current drawbacks with permanent prosthetic implants leaves room for one or more niche/novel approaches
- The ultimate future treatment may well involve a combination of these or other therapies

SURGERY IS AN ESTABLISHED STANDARD BUT NOT THE GOLD STANDARD

Bypass versus angioplasty in severe ischaemia of the leg (BASIL): multicentre, randomised controlled trial
The PAD Rx

- ASA or Clopidogrel 75 mg or both (?)
- Smoking cessation
- Statin to lower LDL-C < 70 mg/dl
- ACE - I or ARB to lower BP < 130 / 85 mmHg
- Hypoglycemic therapy if A1C > 6.0%
- Foot care instructions (Podiatry)
- Cilostazol 100 mg po BID on empty stomach?

General Considerations: Options for CLI Treatment

- Data – Societal and consensus recommendations
- Comorbidities
- Prior revascularization history
- Patient preference
- Local operator expertise
- Hybrid procedures
- **Preserve surgical options!!!**

Orders to Dr Charles Dotter!!!

**Visualize but do not try to fix.**

TASC Recommendations

Lesion Stratification

- Percutaneous
- Surgery

Endovascular Best: Recommendations

- TASC A and D lesions: Endovascular therapy is the treatment of choice for Type A lesions and surgery is the treatment of choice for Type D lesions.
- TASC B and C Lesions: Endovascular treatment is the preferred treatment for Type B lesions and surgery is the preferred treatment for good-risk patients with Type C lesions. (co-morbidities, informed patient preference and operator’s long-term success rates must be considered in decision making)


Rate of Deaths Due to Atherosclerosis is Increasing in U.S.


Why??
The Health of America

Persons Diagnosed with DM in US

But Here is the Reality!

Is There Differential Specialty Procedural Growth?
The Specialties Involved...

Vascular Surgery
- Knowledge
- Surgical Skills
- Endo Skills
- No surgical skills
- Low interest in med Rx

Interventional Radiology
- Knowledge
- Endo Skills
- No surgical skills
- High interest in med Rx

Cardiology/Vascular Medicine
- Knowledge
- Endo Skills
- No surgical skills
- High interest in med Rx

WE ARE SUBSPECIALIZED INTERNISTS.
The Public Perception of Physicians

A Trial of Disclosing Physicians’ Financial Incentives to Patients

Arch Intern Med 2006;166:623-628

Maybe We Should Have a Randomized Trial of Skills/Management by Each Specialty?

Do You Need a Randomized Trial to Determine What This Person Should do RIGHT NOW???

So, What Should Be Done About All of These Turf Battles?

We KNOW That a Parachute is the Only Reasonable Option...

Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials

Graedon JS, Smith JJ, PADD

Conclusions As with many interventions intended to prevent ill health, the effectiveness of parachutes has not been subjected to rigorous evaluation by using randomised controlled trials. Advocates of evidence-based medicine have criticised the adoption of interventions evaluated by using only observational data. We think that everyone might benefit if the most radical proponents of evidence-based medicine organised and participated in a double-blind, randomised, placebo-controlled, crossover trial of the parachute.
In the United States, 30,000-40,000 amputations are performed annually.

There were an estimated 1.6 million individuals living with the loss of a limb in 2005;

These estimates are expected to more than double to 3.6 million such individuals by the year 2050.8
Major lower limb amputations

85% are performed for peripheral vascular disease. 
10% for trauma. 
3% for malignant disease 
2% for chronic pain, congenital deformity and other causes

Approximately:

80% below knee amputees (BKA) will walk again with disability. 
40% above knee amputees (AKA) will walk again with major disability.

CASES DONE AT JCMC

Atherectomy of Right SFA. Tariq Haddadin, MD JCMC

Pre-Procedure Angiogram reveals multiple plaque blockages in patient’s Superficial Femoral Artery (SFA) causing pain and dependency on collateral flow.

Plaque excised from patient’s artery.

Post-Procedure Angiogram reveals complete opening of SFA Artery allowing for swift blood flow and relief of pain.
Patient: Severe Claudicant as a result of total blockage in distal Superficial Femoral Artery.

Stand Alone plaque excision performed by Tariq Haddadin, MD, ETSU Heart, JCMC.

Actual plaque excised from patient’s artery. Three insertions and cleaning of LS device.

Entire SFA occluded with plaque & thrombus.

Patient: Limited lifestyle w/minimal ambulation due to Bilateral SFA Chronic Total Occlusions.

Plaque excision performed by Tariq Haddadin, MD of ETSU Heart. Patient now active without assistance.

Pre-Procedure Angiogram reveals complete occlusion of Superficial Femoral Artery (SFA).

Plaque excised from patient’s artery.

Post-Procedure Angiogram shows complete opening of Native SFA Artery from atherectomy & low inflation balloon.

THANK YOU FOR YOUR ATTENTION