PERIPHERAL ARTERY DISEASE: A VASCULAR SURGEONS PERSPECTIVE

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DISCLOSURES

• I have no financial disclosures.
WHAT IS ATHEROSCLEROSIS?

- Atherosclerosis = Athere (gruel) + Skleros (hard).
  First coined by Marchand in 1904. Symptoms occur by occlusion, embolism, or stenosis.
Prevalence of PAD

Multiple Risk Factors Responsible for Atherosclerosis

- Age
- Diabetes
- Obesity
- Genetics
- Smoking
- Dyslipidemia
- Hypertension
- Hypercoagulability States
- Hyperhomocysteinemia

Atherosclerosis

Atherosclerotic Diseases (CAD, CVD, PAD)
Relative 5-Year Mortality Rates

Patients (%)

- Prostate Cancer*
- Hodgkin's Disease*
- Breast Cancer*
- PAD†
- Colorectal Cancer*
- Lung Cancer*

SF-36 Scores in Health and Disease

Adapted from Ware JE. Ann Rev Pub Health. 1995;16:327-54.
WIDE RANGE OF PRESENTATION

• Claudication: Exercise, ASA, Risk factor modification +/- Cilostazol
• Non-healing Skin Sores (ulceration)
• Continuous pain in the toes (severe ischemia)
• Gangrene
CLEVER STUDY

- 22 sites enrolled 111 patients with aortoiliac disease (38% had aortoiliac occlusion)
- Stented patients reported a better QOL than exercise but exercise patients had better walking distance

Murphy et al. Circulation 2012;125:130-9
1889 Jassinowski reported 22 successful anastomoses on sheep carotid arteries that remained open for over 3 months.

1891 Alexis Carrel described the triangulation technique of vascular anastomosis. He received the Nobel Prize in Medicine in 1912.
ERA OF SAPHENOUS VEIN BYPASS

- 1949 Kunlin resected occluded femoral arteries and replaced them with reversed saphenous vein
- 1960 Karl Victor Hall, Professor of Surgery at Norway’s National Hospital described saphenous valvulotomy to create an arterial bypass conduit.
ERA OF ENDOVASCULAR THERAPY

• 1964 Charles Dotter percutaneously dilated the femoral artery of an 82 year old woman who refused amputation using a guidewire and coaxial catheters resulting in the first report of percutaneous limb salvage
INDICATIONS FOR OPEN VASCULAR BYPASS SURGERY

• TRAUMA
• EARLY AND RECURRENT FAILURE OF ENDOVASCULAR THERAPY
• EXTENSIVE MULTISEGMENT ARTERIAL OCCLUSIONS
• ACUTE ARTERIAL OCCLUSION WITH RAPID ISCHEMIC CHANGES TO THE FOOT
FAILURE OF ENDOVASCULAR THERAPY
LONG SEGMENT ARTERIAL OCCLUSIONS
ACUTE ARTERIAL OCCLUSION WITH PROFOUND ISCHEMIA

• Pain, Pallor, Pulselessness, Paresthesia, Paralysis

• No window to perform thrombolysis
WOUND COMPLICATIONS

- Occur in 17-33% leg bypass operations.
- Serious wound complications lead to prolonged hospitalizations (mean 27 days) and often involve plastic reconstructive procedures to cover exposed vein bypass grafts.

MINIMALLY INVASIVE LEG BYPASS
TECHNIQUES OF SAPHENOUS VEIN PREPARATION

- Lighted sterile laryngoscope or lighted retractor with fewer incisions
- Venography or doppler/ultrasound to identify side branches
- Endoscopic vein harvest or preparation
- Angioscopic valvulotomy and coil occlusion of side branches
HYBRID OPERATIONS

- Combined open bypass and endovascular treatment either at the inflow (iliac stent) or outflow (popliteal or tibial vessel angioplasty or atherectomy)
HYBRID OPERATION: ILIAC STENT, FEMORAL TO FEMORAL BYPASS AND LEFT SFA AHERECTOMY
Hybrid operations can be done successfully with C-arm Fluoscopy in a standard operation room setting.
HYBRID AXILLOFEMORAL BYPASS WITH POPLITEAL ANGIOPLASTY
REMOTE FEMORAL ENDARterectomy

- Open femoral exposure

- Use of ring dissectors to transect and remove long segments of occluded plaque
REMOTE ENDARTERECTOMY

• 70% patency at 30 months and 94% limb salvage (Martin J Vasc Surg 2006;43:320-6)
• Treated lesions up to 41 cm long with 88% 18 month patency (Rosenthalal J Vasc Surg 2004;67-72)
CTO TECHNOLOGY
REENTRY CATHETERS

1. Insert the Pioneer Plus catheter over the 0.014-in. subintimal guidewire.
2. Use IVUS to precisely target reentry.
3. Deploy the nitinol needle to create a pathway to the true lumen.
4. Advance the new 0.014-in. guidewire through the needle into the true lumen.
5. Reinsert the needle and remove the catheter.
6. Complete the procedure.
ENDOVASCULAR THERAPY
STENTING
DIRECTIONAL ATHERECTOMY
ORBITAL ATERECTOMY
ROTATIONAL ATERECTOMY
ORBITAL AHERECTOMY
DIRECTIONAL ATHEREECTOMY
DIRECTIONAL ATHERECTOMY
ROTATIONAL AHERECTOMY
ROTATIONAL ATERECTOMY
ROTATIONAL AHERECTOMY
**STENT VS BYPASS**

- BASIL Trial compared PTA vs bypass for Rutherford class 4-6 patients (rest pain, ulceration, gangrene). 45% died within 5 years. No difference in amputation rates, overall mortality or QOL between groups. However, long term bypasses with vein stayed open longer but cost more initially.

Lancet 2005;366:1925-34 and JVS 2010;51:69s-75s
AMPUTATION IS SOMETIMES NECESSARY
INNOVATIONS IN AMPUTATION SURGERY

VASCULAR STAPLERS TO REDUCE BLEEDING AND PAIN

BETTER PAIN CONTROL WITH NERVE BLOCK CATHETERS AND IMPROVED HEALING WITH VAC DRESSINGS

TENDON REIMPLANTATION TO IMPROVE MOBILITY
PERSONAL THOUGHTS

• If you have a sink with an occluded drain, pick a plumber with chemicals and wire devices to unclog the drain. However, if multiple water pipes are damaged, it is best to choose a plumber who can actually replace the rotting pipes and not just reinforce them.

• I would of coarse recommend a plumber who is equally as good with a wrench and chemical agents and wires.
FUTURE TECHNOLOGY