

# PERIPHERAL ARTERY DISEASE: A VASCULAR SURGEONS PERSPECTIVE

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# DISCLOSURES

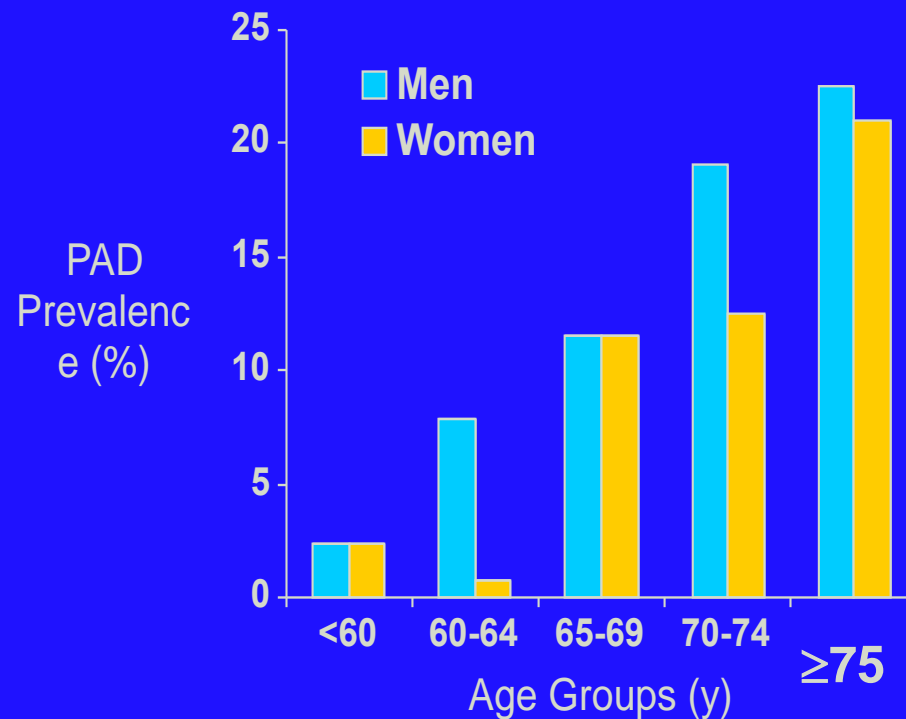
- I have no financial disclosures.

# WHAT IS ATHEROSCLEROSIS?

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

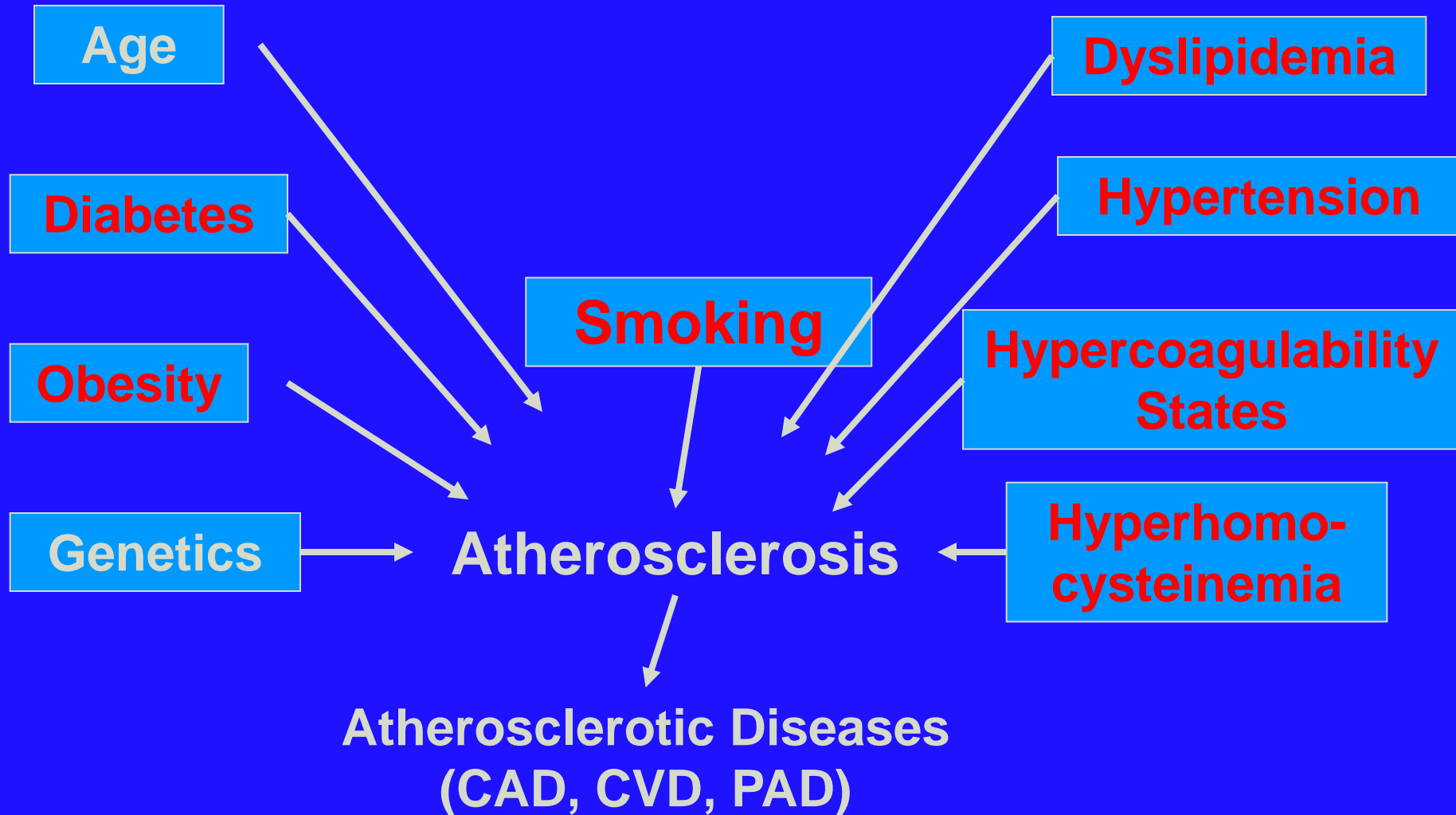


# Prevalence of PAD

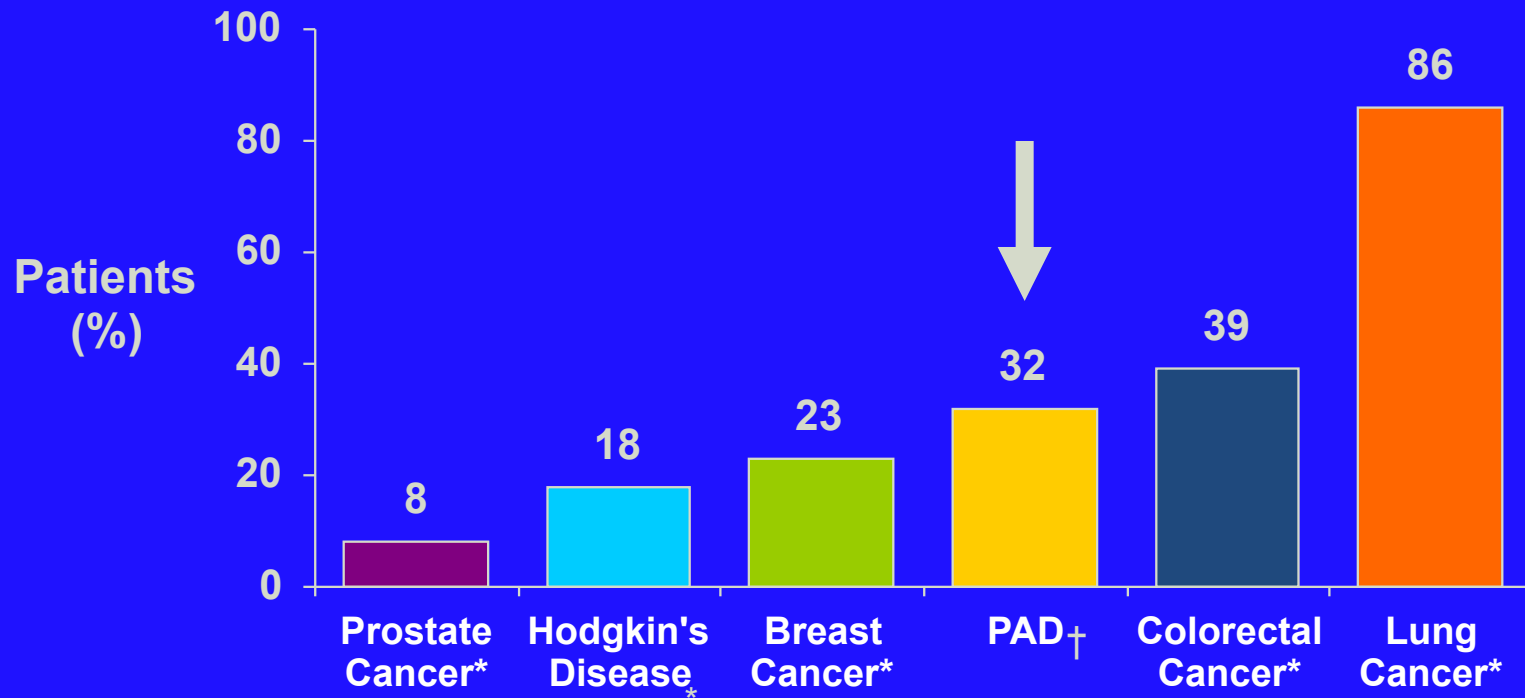


Adapted from Criqui MH et al. *Circulation*.1985;71:510-5.

# Multiple Risk Factors Responsible for Atherosclerosis



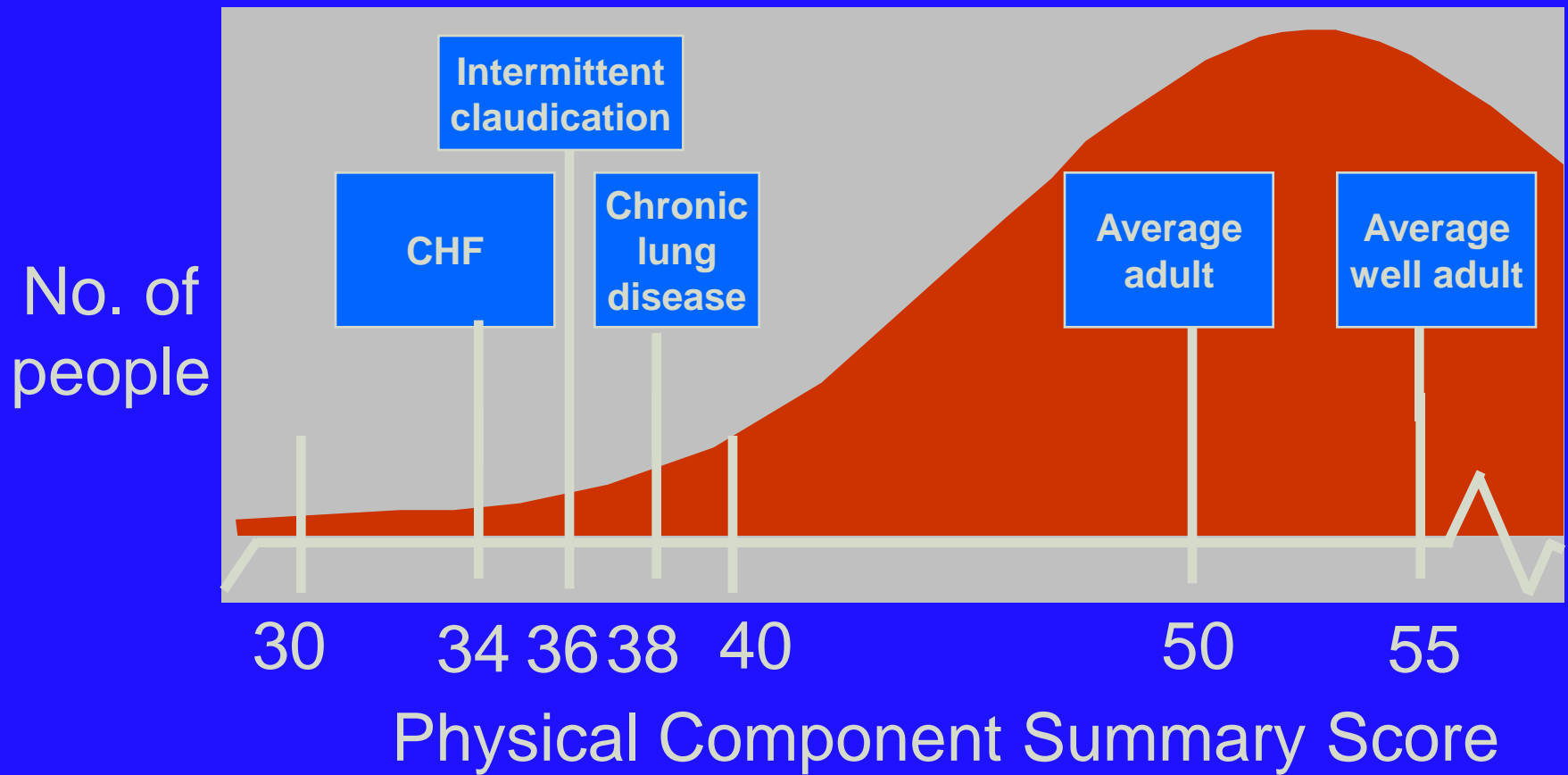
# Relative 5-Year Mortality Rates



\*American Cancer Society. *Cancer Facts and Figures*, 2000.

†Criqui MH et al. *N Engl J Med*. 1992;326:381-6.

# SF-36 Scores in Health and Disease



Adapted from Ware JE. *Ann Rev Pub Health*. 1995;16:327-54.

# WIDE RANGE OF PRESENTATION

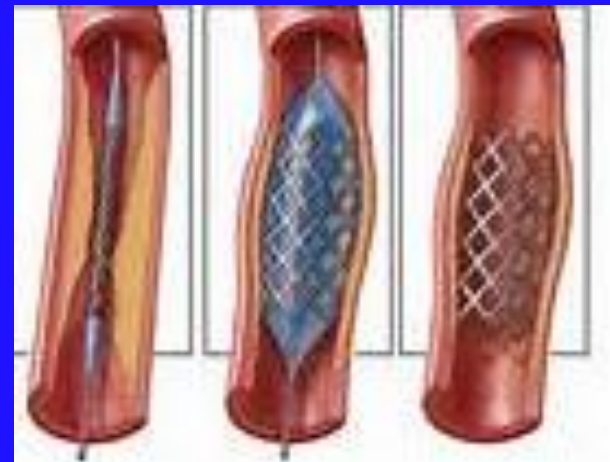
- Claudication: Exercise, ASA, Risk factor modification +/- Cilostazol
- Non-healing Skin Sores (ulceration)
- Continuous pain in the toes (severe ischemia)
- Gangrene





# 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



# HISTORICAL PERSPECTIVE

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

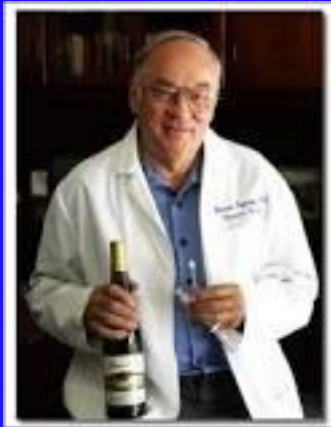
- 1949 Kunlin resected occluded femoral arteries and replaced them with reversed saphenous vein
- 1960 Karl Victor Hall, Professor of Surgery at Norway's National Hospital described saphenous valvulotomy to create an arterial bypass conduit.



# 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

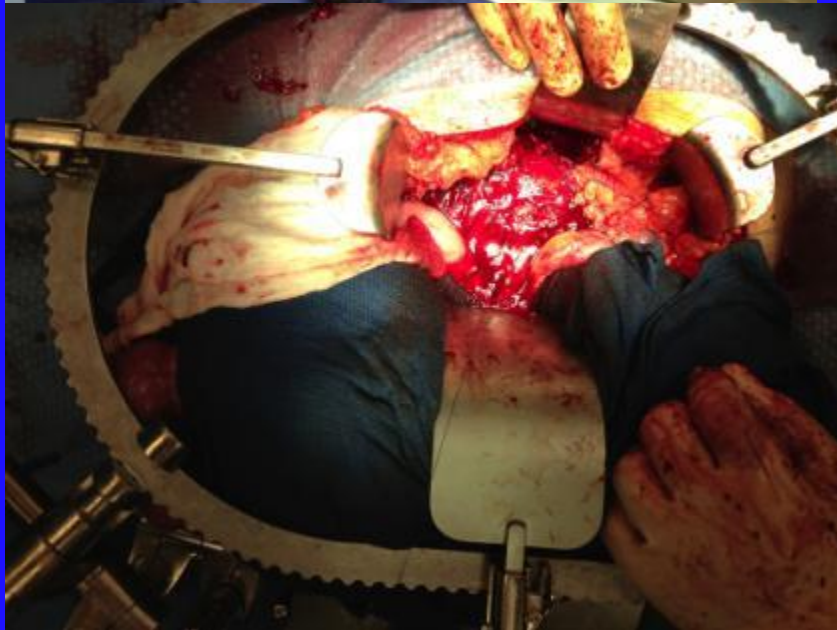


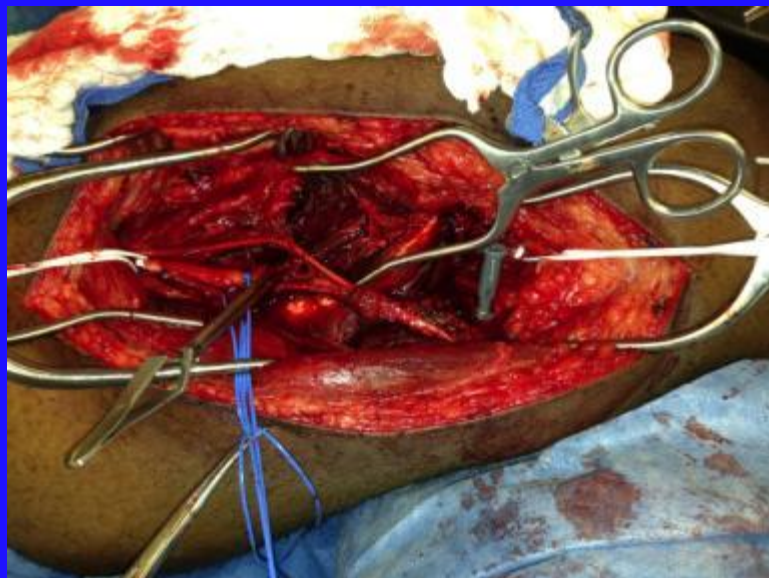
# INDICATIONS FOR OPEN VASCULAR BYPASS SURGERY

- TRAUMA
- EARLY AND RECURRENT FAILURE OF ENDOVASCULAR THERAPY
- EXTENSIVE MULTISEGMENT ARTERIAL OCCLUSIONS
- ACUTE ARTERIAL OCCLUSION WITH RAPID ISCHEMIC CHANGES TO THE FOOT



# TRAUMA







# 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 sidebranches
- 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)

## Loupes and Lead

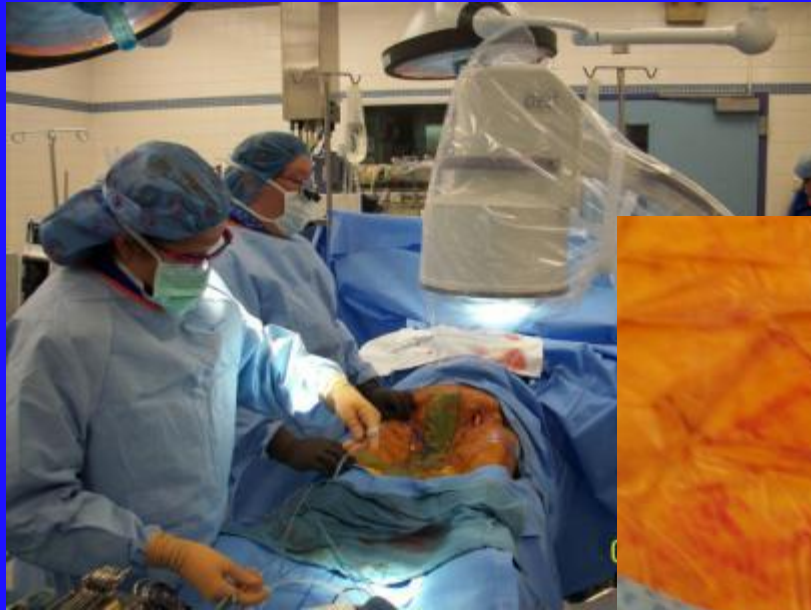


# HYBRID OPERATION: ILIAC STENT, FEMORAL TO FEMORAL BYPASS AND LEFT SFA ATHERECTOMY

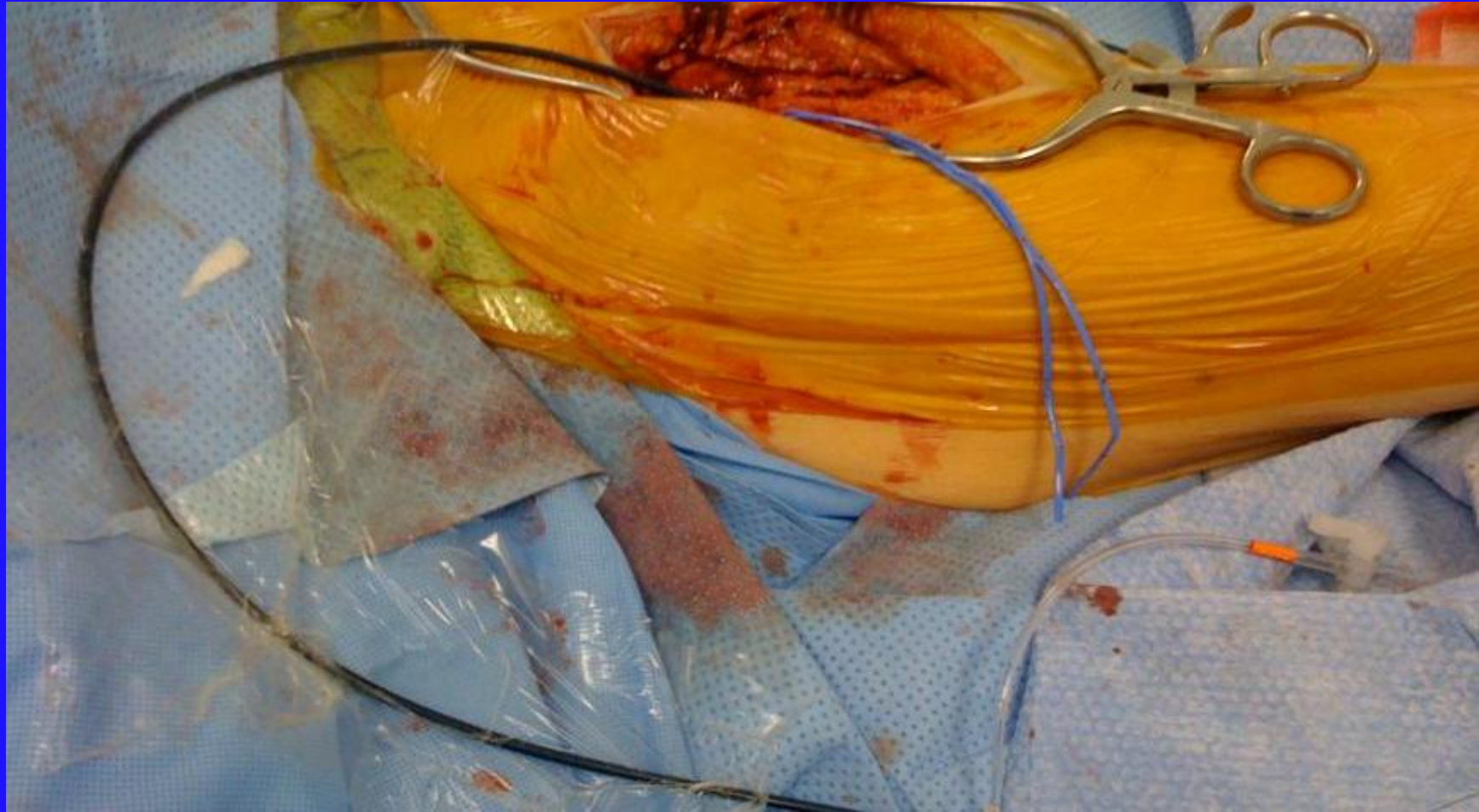




# HYBRID OPERATION





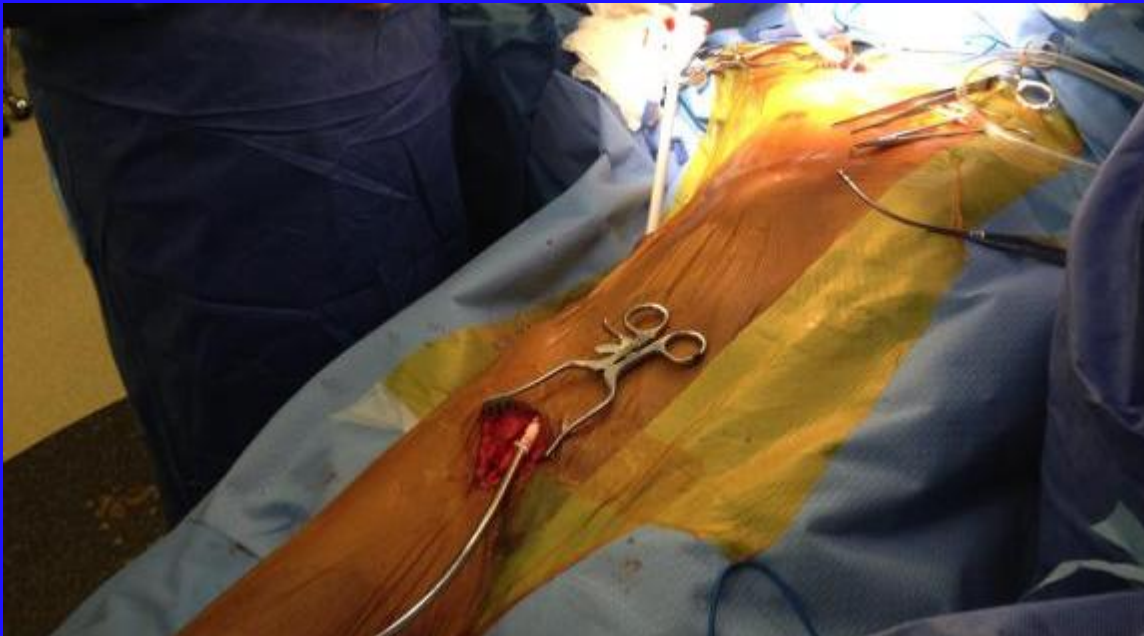


Hybrid operations  
can be done  
successfully with C-  
arm Fluoroscopy in a  
standard operation  
room setting

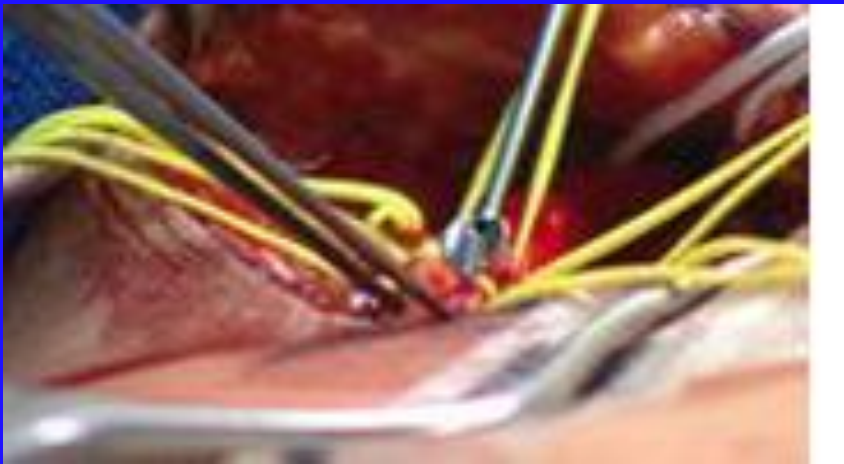




# HYBRID AXILLOFEMORAL BYPASS WITH POPLITEAL ANGIOPLASTY



# REMOTE FEMORAL ENDARTERECTOMY



- Open femoral exposure

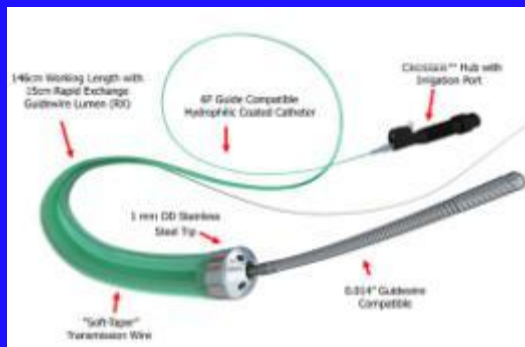
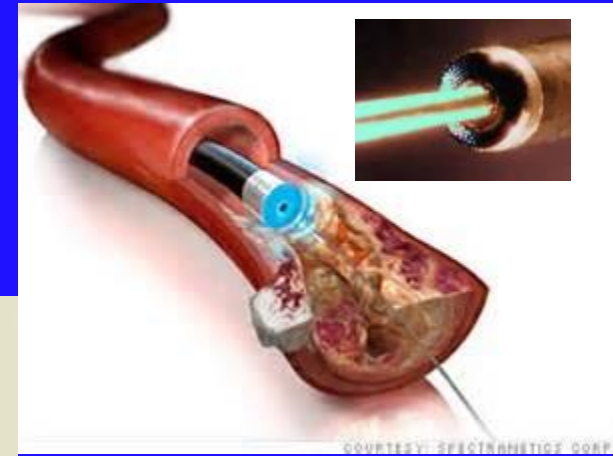
- Use of ring dissectors to transect and remove long segments of occluded plaque



# 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 (Rosenthal J Vasc Surg 2004;67-72)

# CTO TECHNOLOGY



# REENTRY CATHETERS



**1.** Insert the Pioneer Plus catheter over the 0.034-in. subintimal guidewire.



**4.** Advance the new 0.014-in. guidewire through the needle into the true lumen.



**2.** Use IVUS to precisely target reentry.



**5.** Retract the needle and remove the catheter.



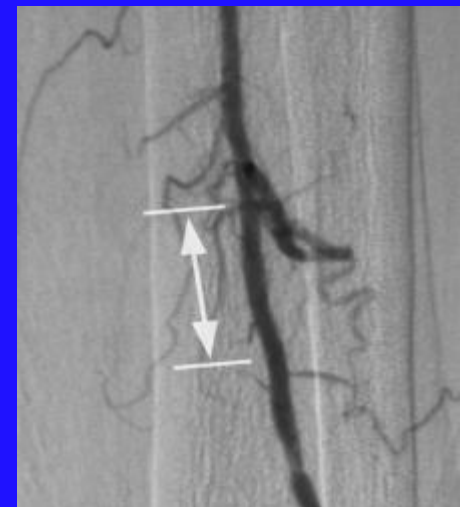
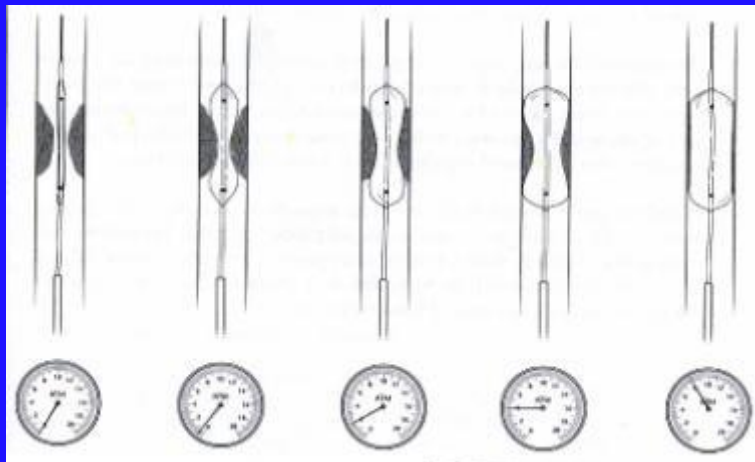
**3.** Deploy the nitinol needle to create a pathway to the true lumen.



**6.** Complete the procedure.

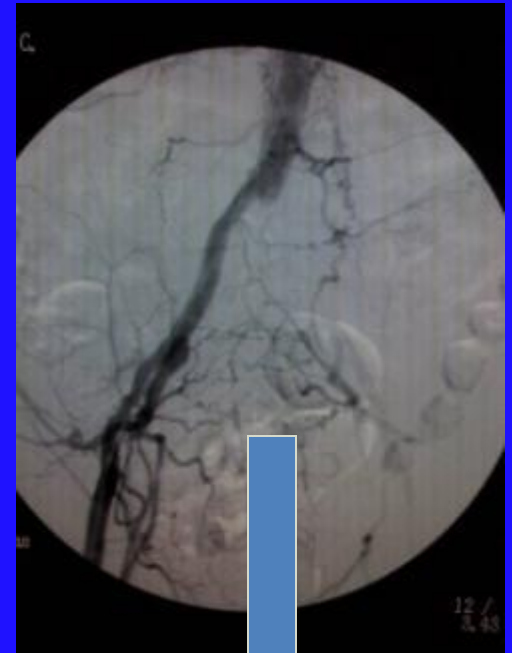
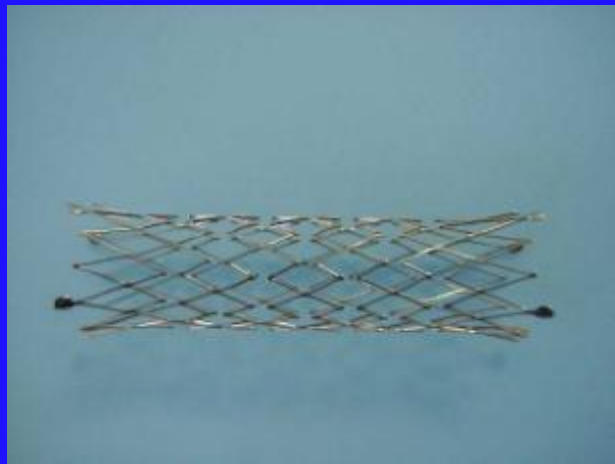
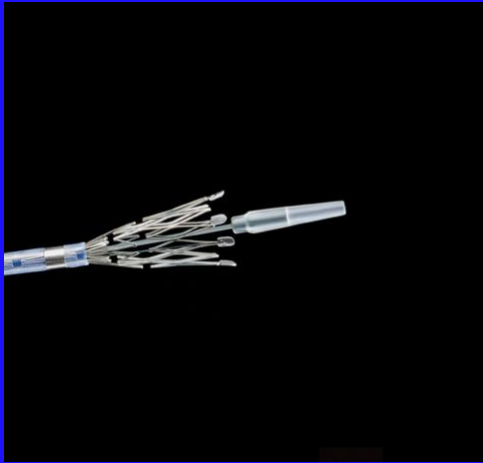


# ENDOVASCULAR THERAPY

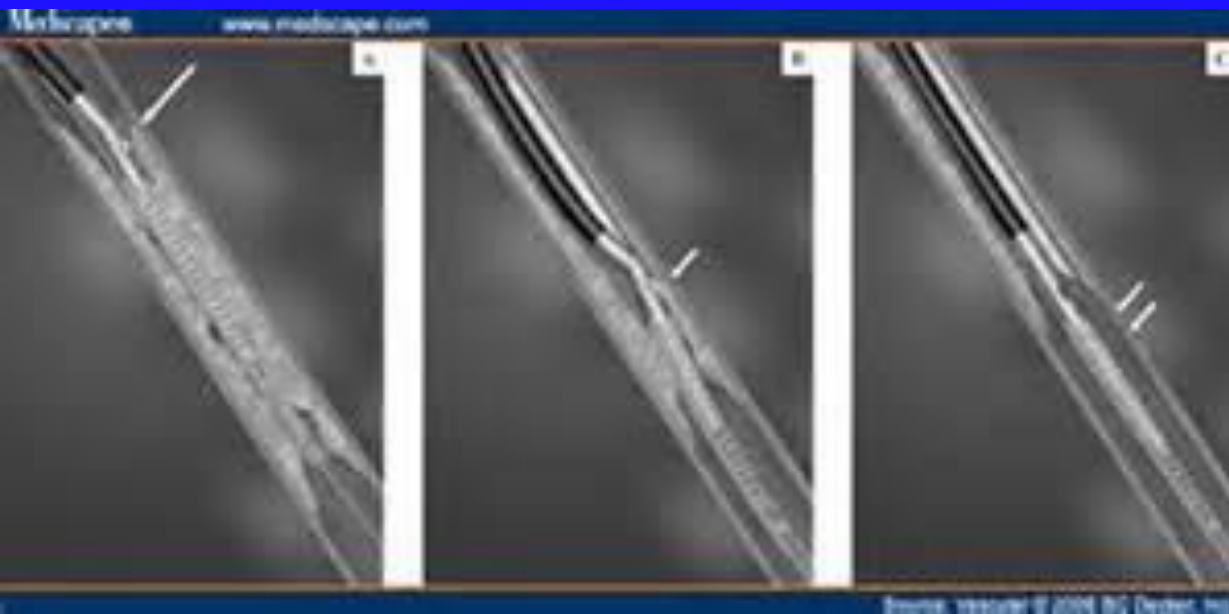




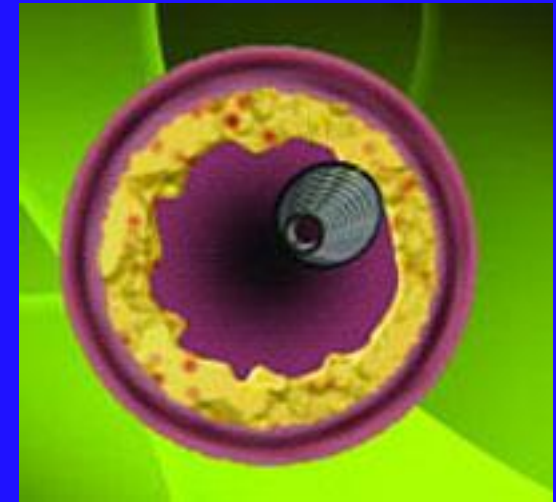
# STENTING



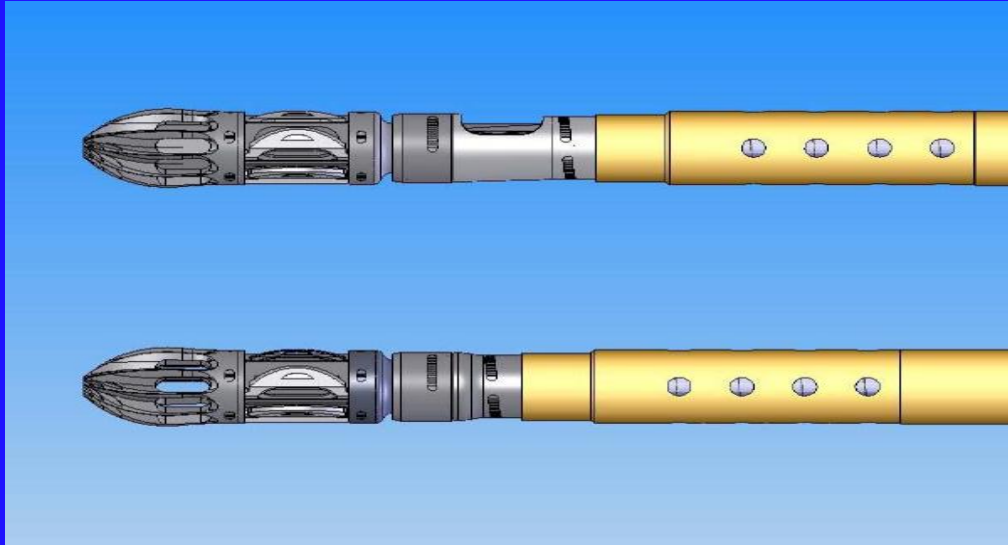
# DIRECTIONAL ATHERECTOMY



# ORBITAL ATHERECTOMY



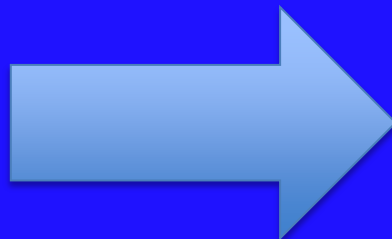
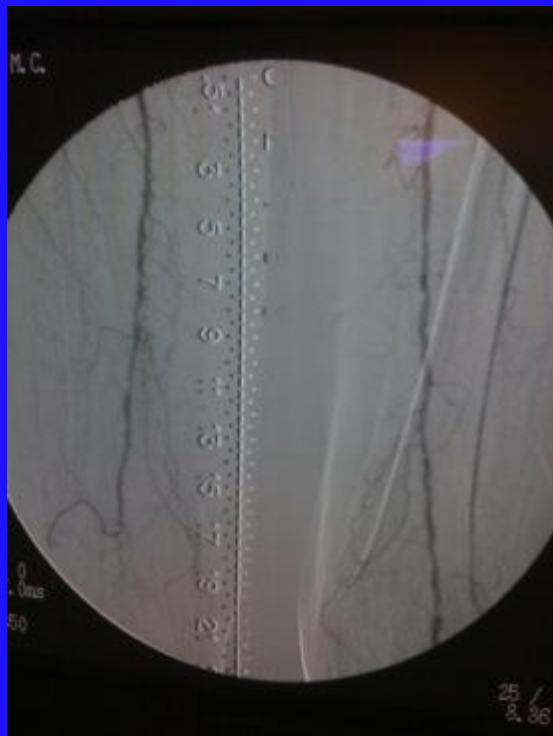
# ROTATIONAL ATHERECTOMY



# ORBITAL ATHERECTOMY









# DIRECTIONAL ATHERECTOMY





# DIRECTIONAL ATHERECTOMY



# ROTATIONAL ATHERECTOMY

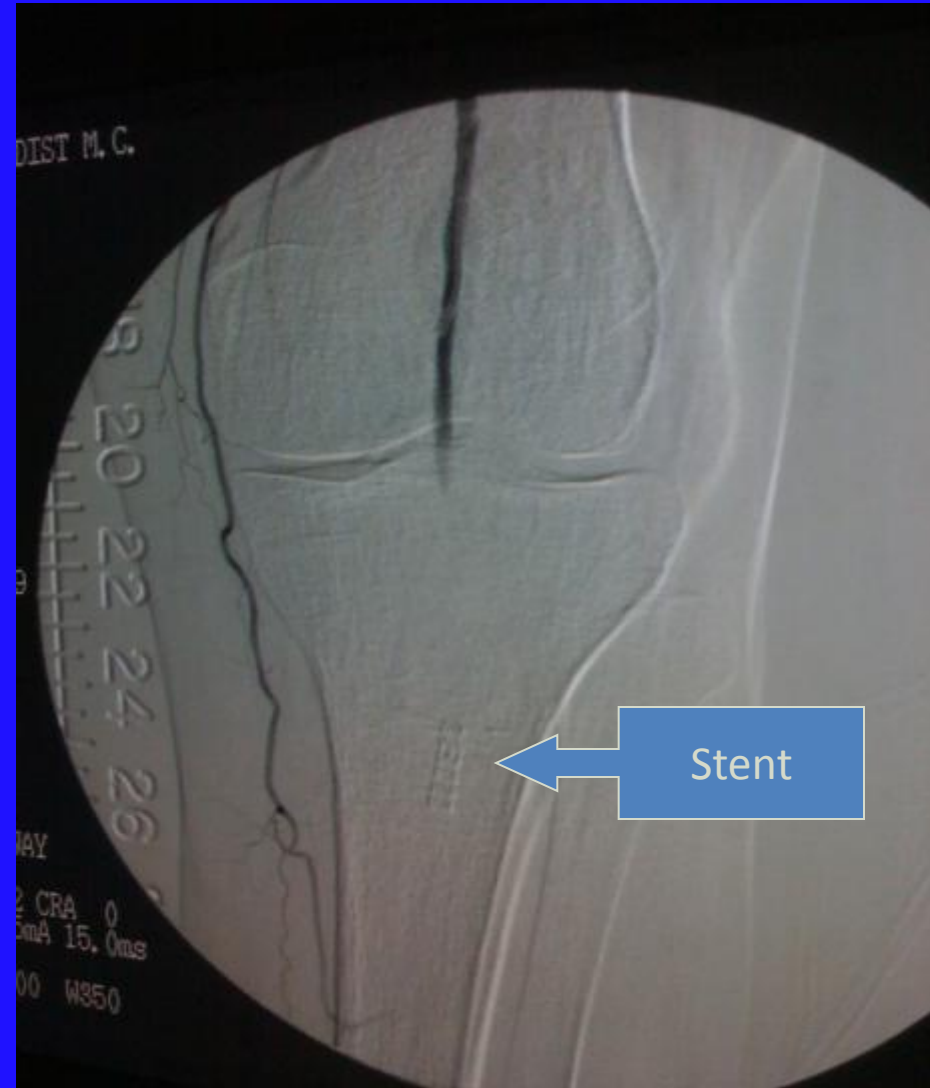


# ROTATIONAL ATHERECTOMY

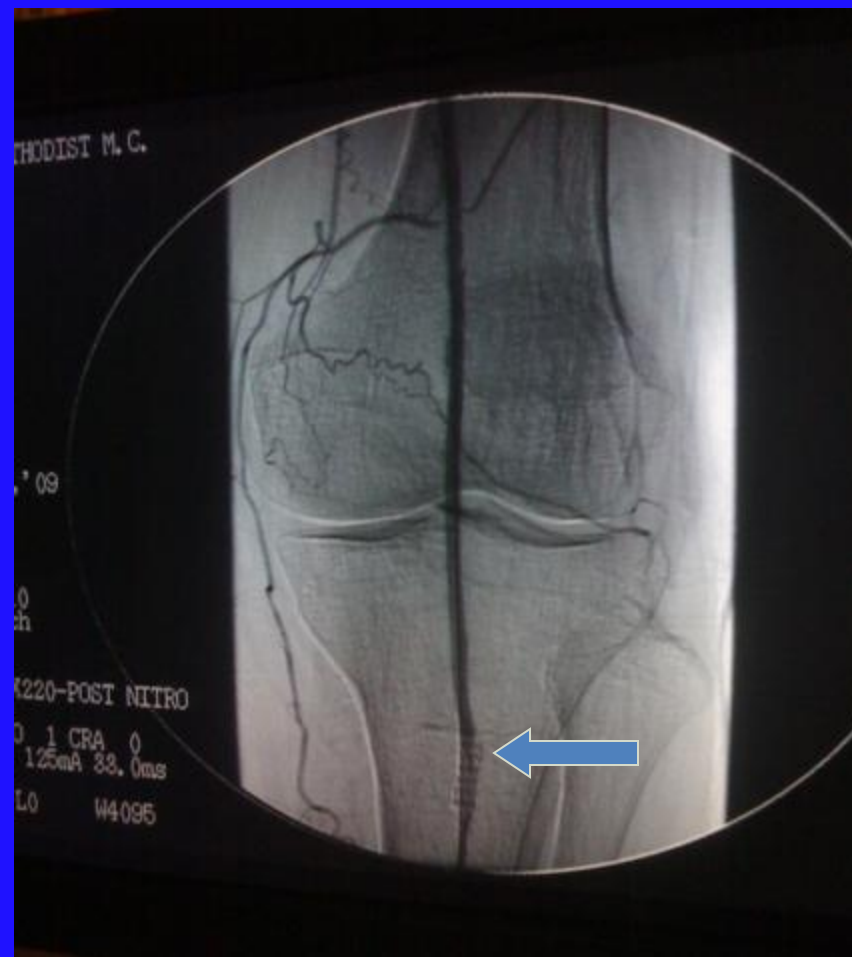


# ROTATIONAL ATHERECTOMY









# 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

