

# Critical Limb Ischemia

*Claudication = blood flow is inadequate for exercising muscle*

Blood flow is inadequate for  
TISSUE @ REST  
So survival is @ risk

# Disease State

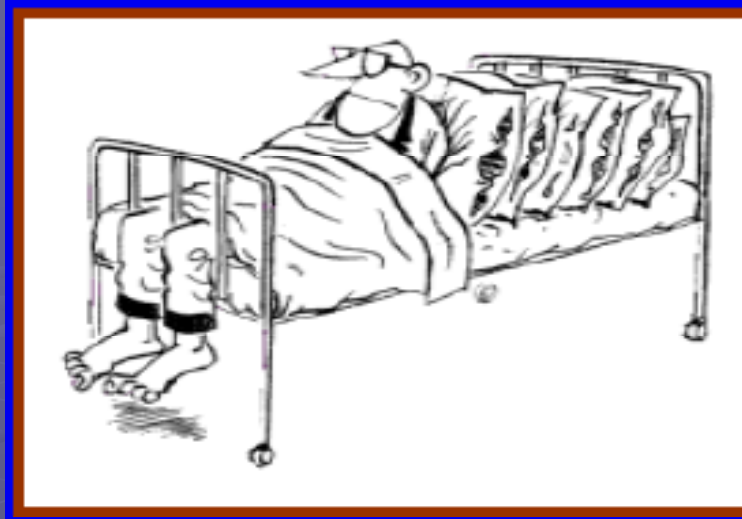
## ● Primary Cause

- Severe multivessel PAD

15% – 30% of patients with intermittent claudication progress to CLI over the course of their disease.<sup>1,2</sup>



# Rest Pain



- Dangle their foot over the edge of the bed
- Sleep in recliner
- Get up and walk for relief – all of these promote edema & rubor in foot.

• Often the patient won't recognize the relationship between dependency & pain relief. Confuses the swelling as the cause of pain, and not consequence of pain relieved by dependence

# Signs of CLI

## *Elevation/dependency test*

*(particularly helpful if dark skinned)*

- Elevate limbs to 45°- 60° for 60 sec.  
**pallor +/- more wound pain**
- Dependent → rubor (reddish/purple):  
red 2° to vasodilatation + blue 2° stasis  
(unable to pump against gravity).
- Foot will be cooler than other.





# *Signs of CLI*

## 2. Ulcerations

- Non-healing @ 1 mo.
- @ pressure points (neuropathy, abn. wgt. bearing 2° to shortened Achilles, Charcot joints)
- Constant pain (tired, depressed; as is family)



# CLI - Signs

## 3. Gangrene

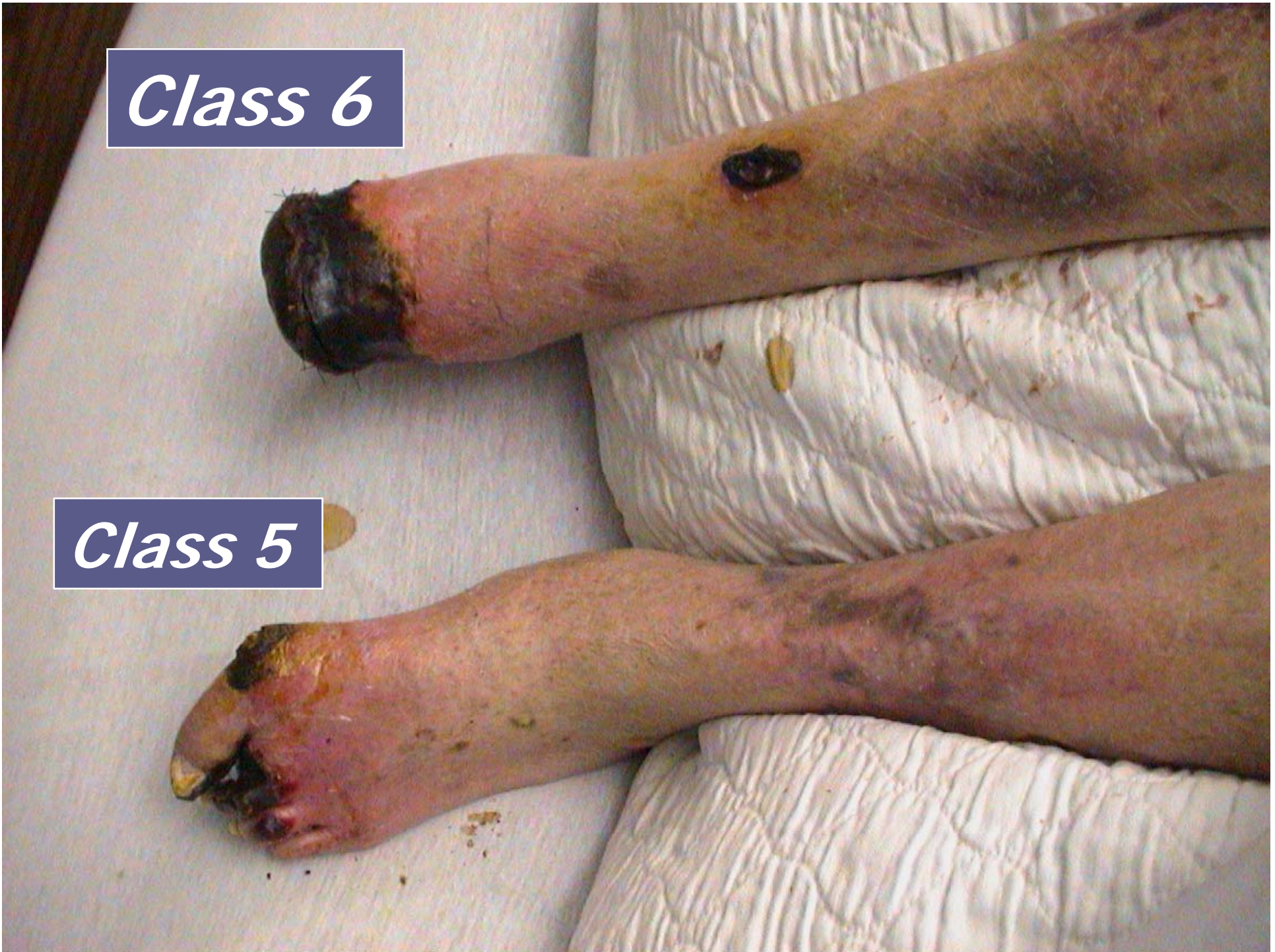
- Arterial perfusion is inadequate – Tissue necrosis occurs
- Infection big worry. Someone has to be monitoring for infection.





*Class 6*

*Class 5*



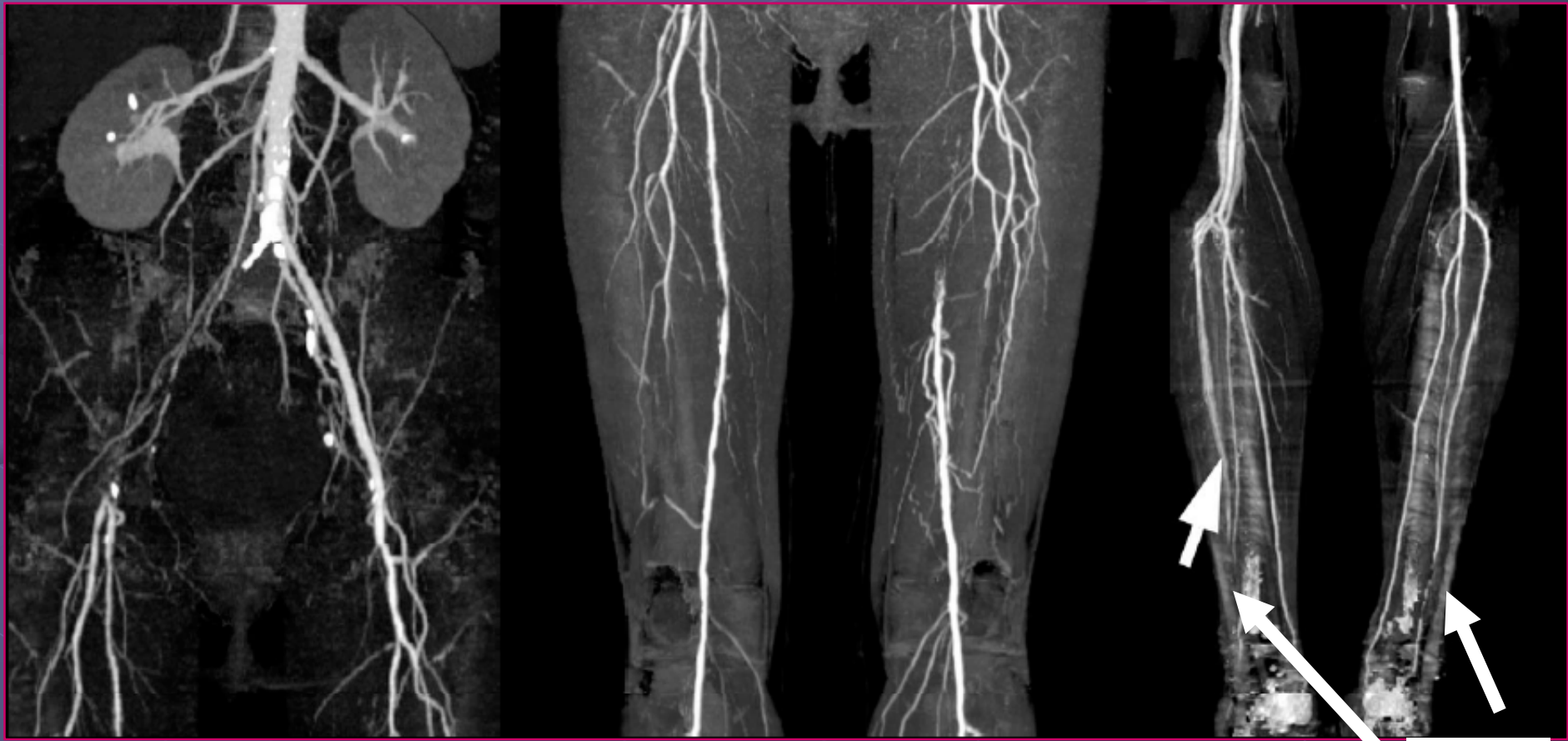
# Occlusive Patterns are Predictable

Factors: Diabetic +/- Aged +/- Smoker

- Obstructions always multivessel, incl trifurca.
  - **Blood must traverse  $\geq 2$  collat. Bed**
  - **Loses pressure, and critical flow volume/min**
- Non-diabetic ( will be  $>75$  &/or Smoker)
  - **Multilevel** ( $\geq 2$ : Iliac +/- SFA +/- trifurcation, but less severe trifurcation.)
- Diabetic
  - If non-smoker, & not  $>75$ 
    - **Single level:** Only trifurcation (but all 3, & severe)
  - If smoker &/or  $>75$ 
    - **Two levels:** Iliac +/- SFA + 2 trifurcstion (less severe)



CTA of CLI: smoker, not DM or >75  
(Bone artifacts, and Ca+ are problems for dx BTK,  
but BTK unlikely if not DM or aged. So CTA ok)

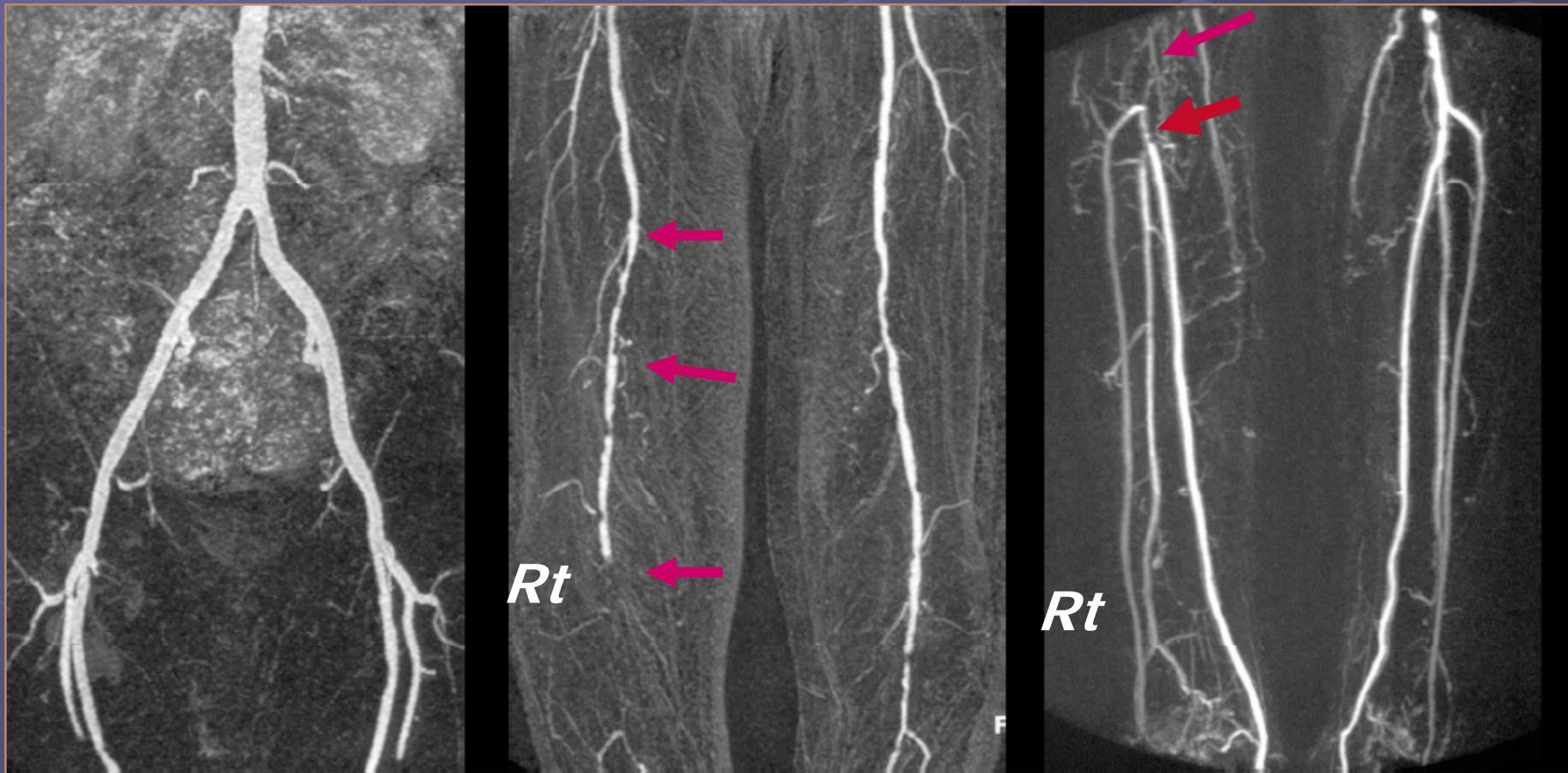


*Real?*

**MRA:** excellent for diabetic & aged as trifurcation disease likely, & Ca<sup>+</sup>, bone subtraction artifacts not possible.

- Neither Ca nor bone are a problem
  - Better trifurcation images
- Problems: expense, stents, duration, pacemaker, claustrophobia, older units.

MRA of CLI pattern in Smoker;  
(not diabetic or aged so minimal BTK)  
SFA + Popl. + TP. trunk = minimal BTK, well seen.





# What is often not seen on CTA & MRA?

- FOOT
- With older MRA can use knee coil
- Can be crucial information to guide you in advising patient of likelihood of initial technical success plus likelihood of healing.

# Diabetic + Rt foot ulcer

## MRA of Pedal Vessels



All trifurcation =  
long  
occlusions

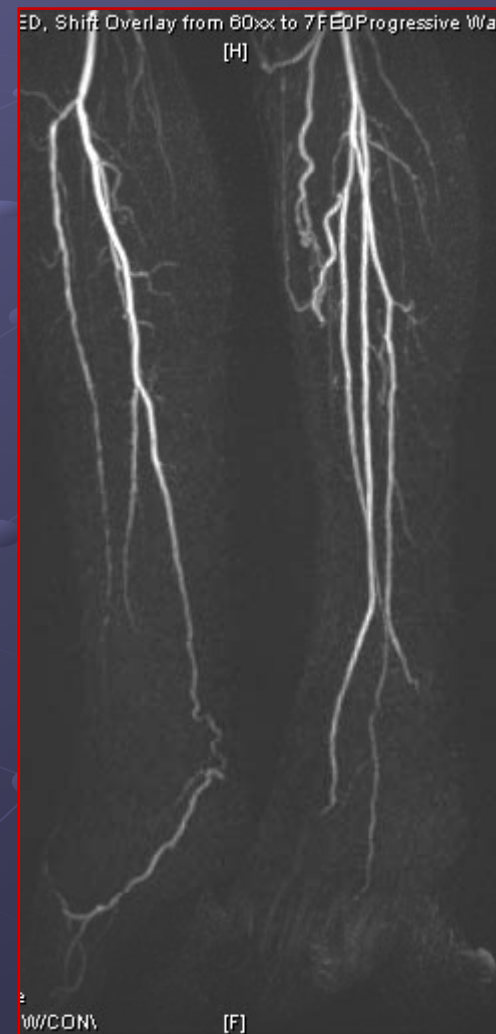
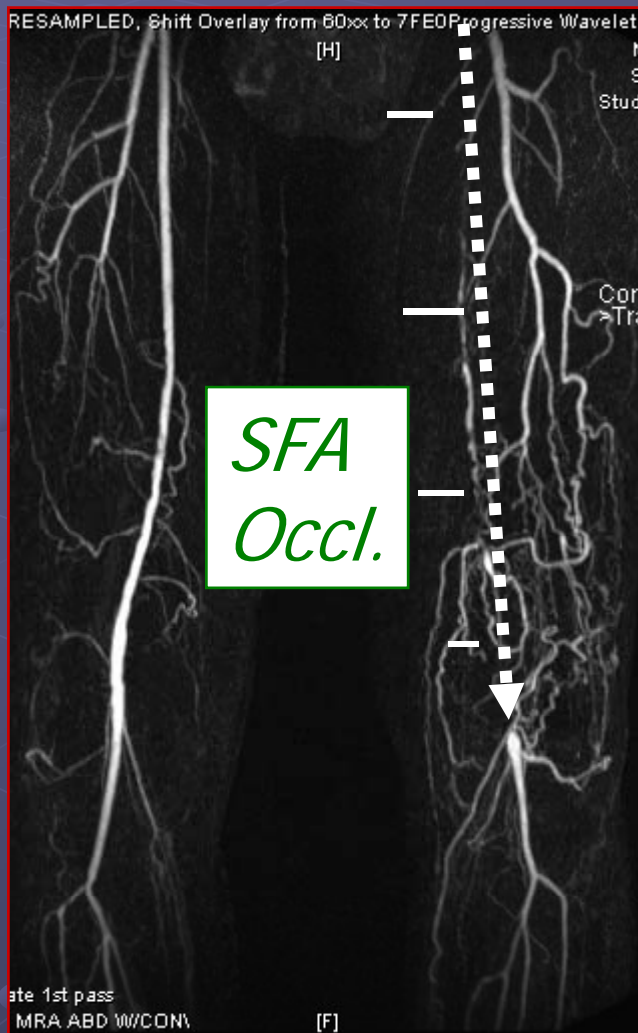
Hard to: get open  
& keep open

Good distal  
target for bypass.  
Probably best  
for the Surgeon



# Cases

Old (83) & prev. smoker, but not Diabetic.  
So multilevel, but minimal BTK.



*Recanalizing Iliacs leaves only 1 level of significant obstruction (SFA) & ulcer heals.*

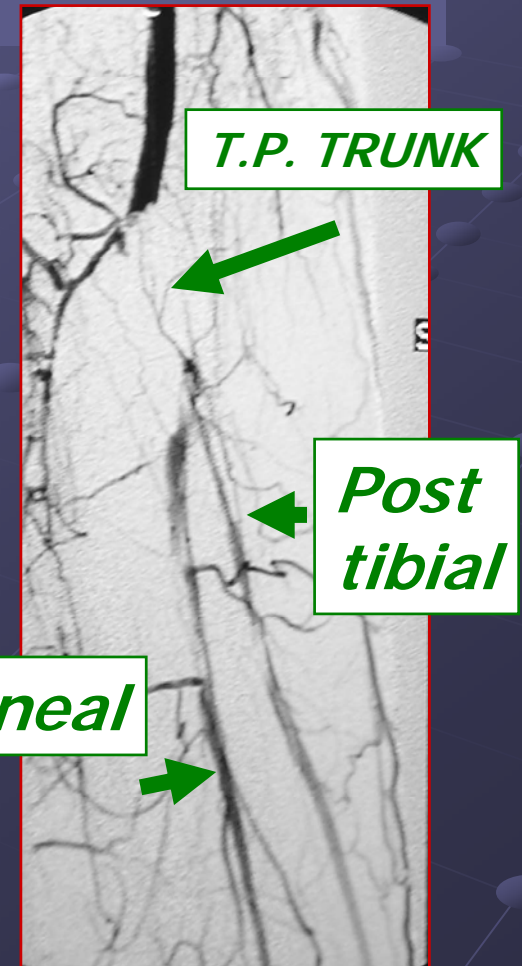




Pain Free, No longer depressed.  
Wife happier too as both now sleeping

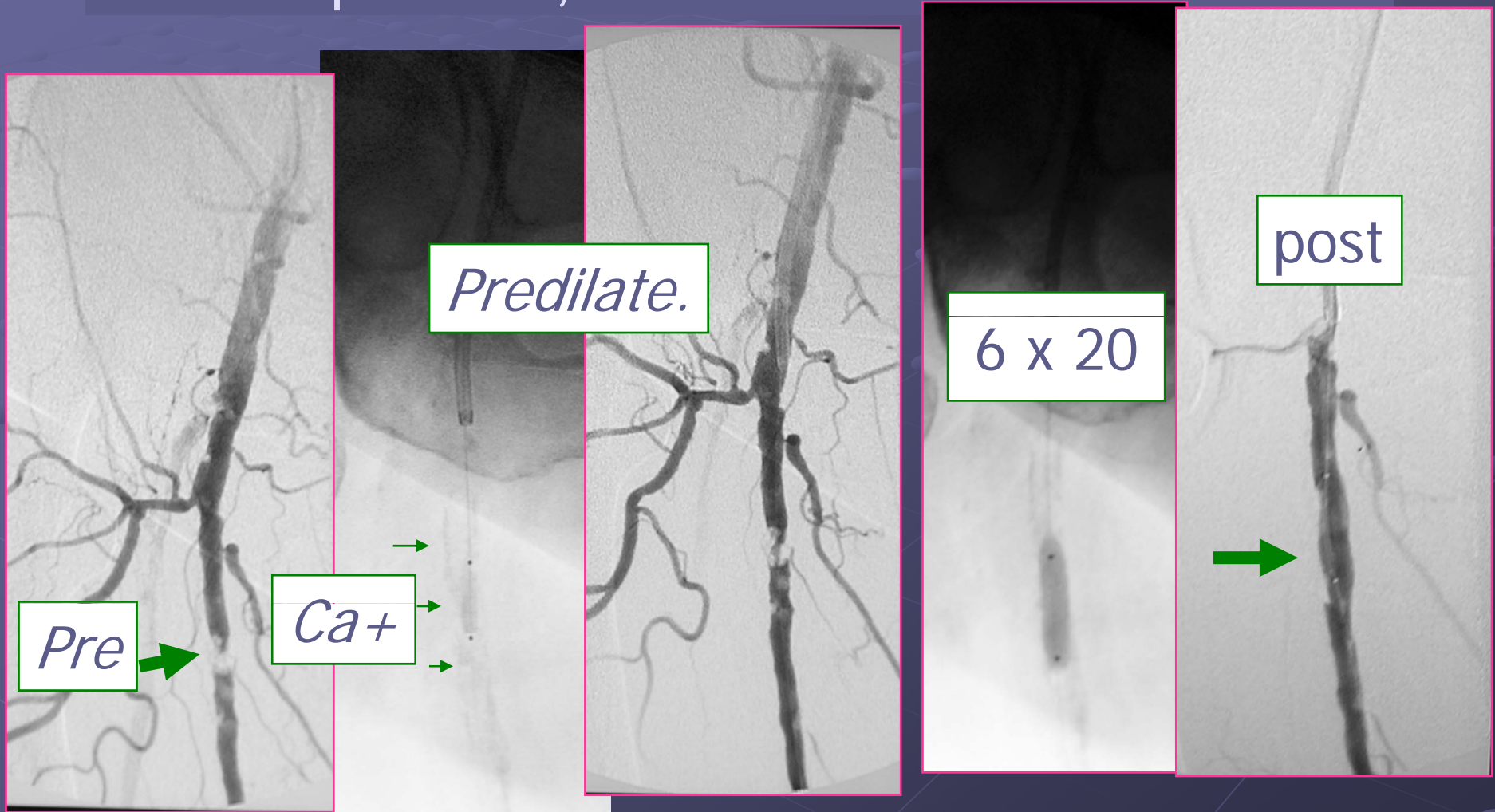


Diabetic & smoker Rt foot ulcer, but not >75. Multilevel, but less extensive BTK than if only DM. So, easier to Rx, & faster healing.





Choose Cutting Balloon for very focal, Calcified, high grade lesion → No dissection, good lumen despite Ca+, 99% stenosis & no stent.



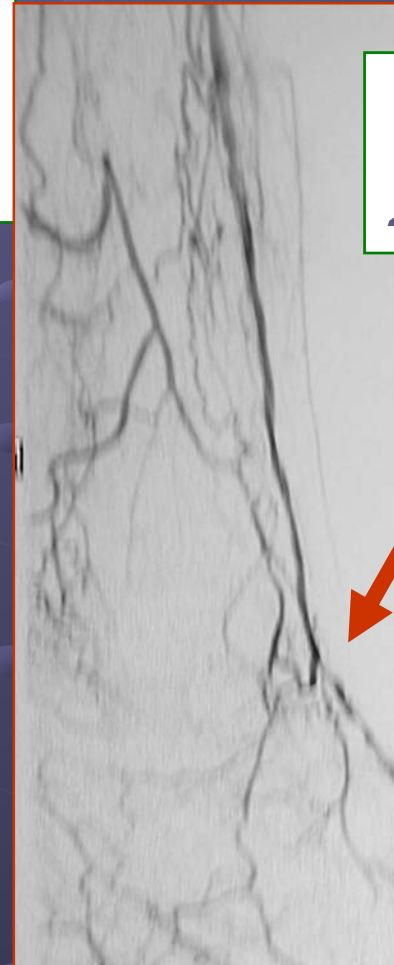
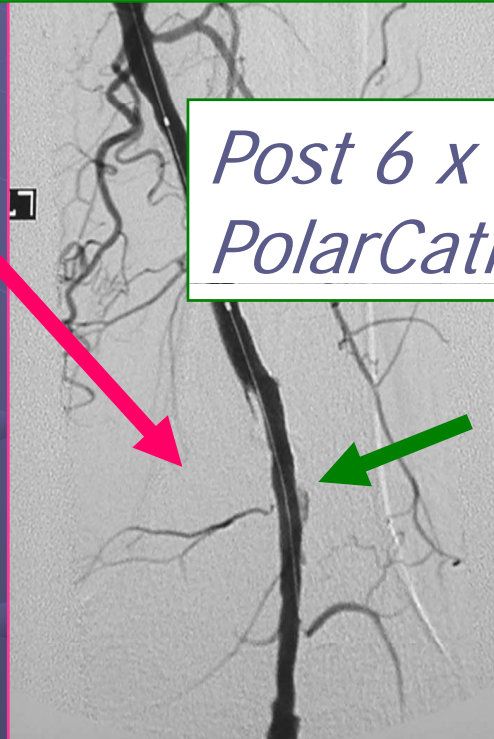
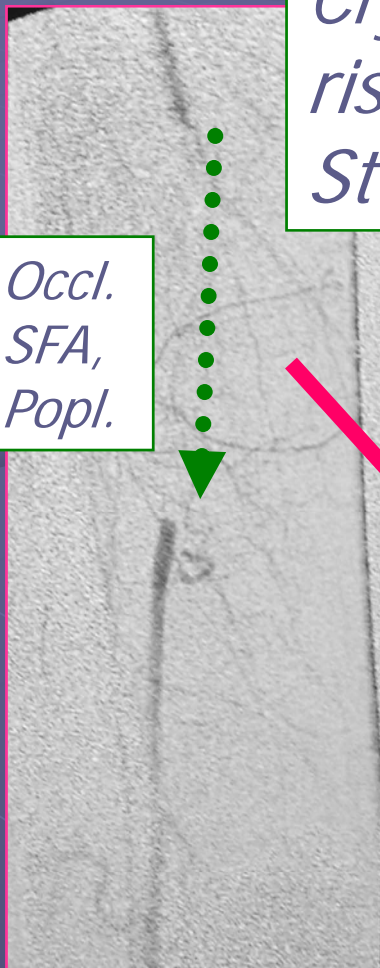
# Diabetes & Smoker & >75 → Multilevel (Popl & more BTK), occl PT, Peron, stenotic DP

*Cryoplasty minimizes  
risk of dissection & no  
Stent in popliteal*

*Occl.  
SFA,  
Popl.*

*Post 6 x 60  
PolarCath*

*Laser or  
2 mm CBA*



# Chronic Critical Ischemia

- 69 y.o. IDDM.
  - Former smoker
- Toe ULCERS

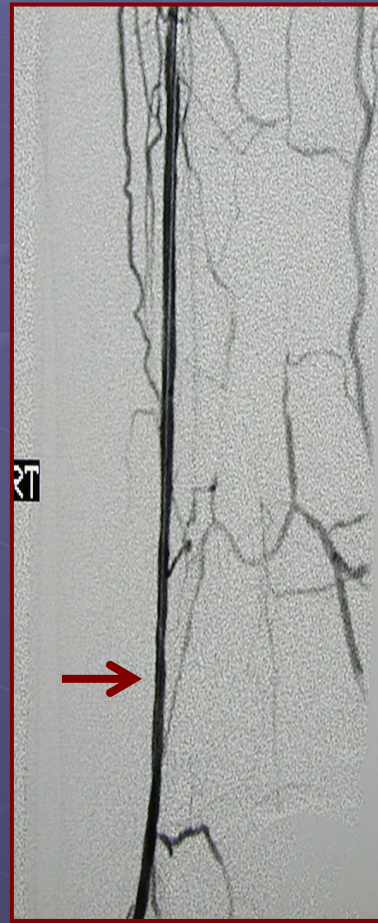
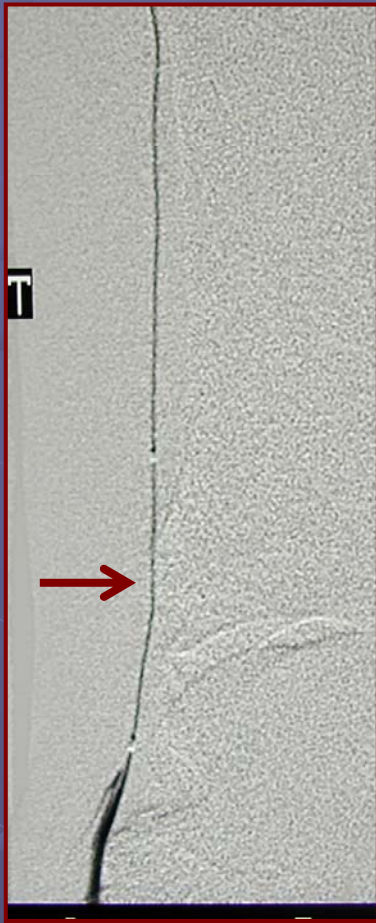
*Above knee:  
Popliteal occl.  
Rx with stent*

Occlusions (all trif.)  
Ant. Tib. (segmental)  
Post. Tib. (long)  
Peroneal (long)

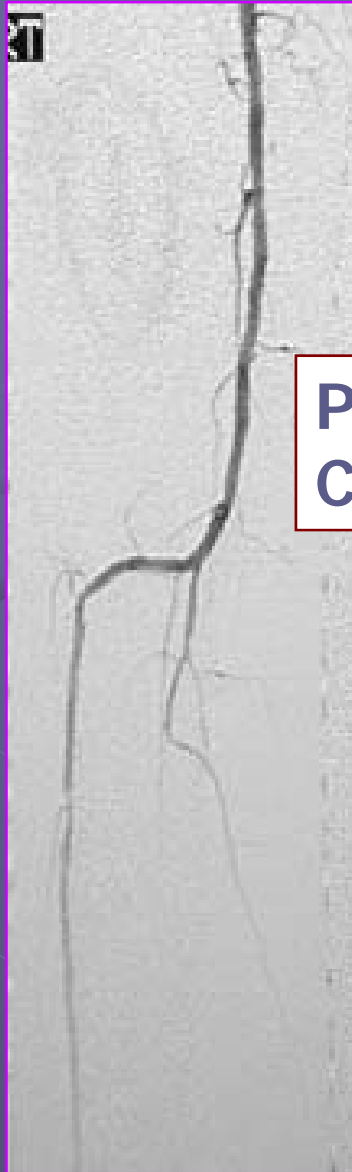




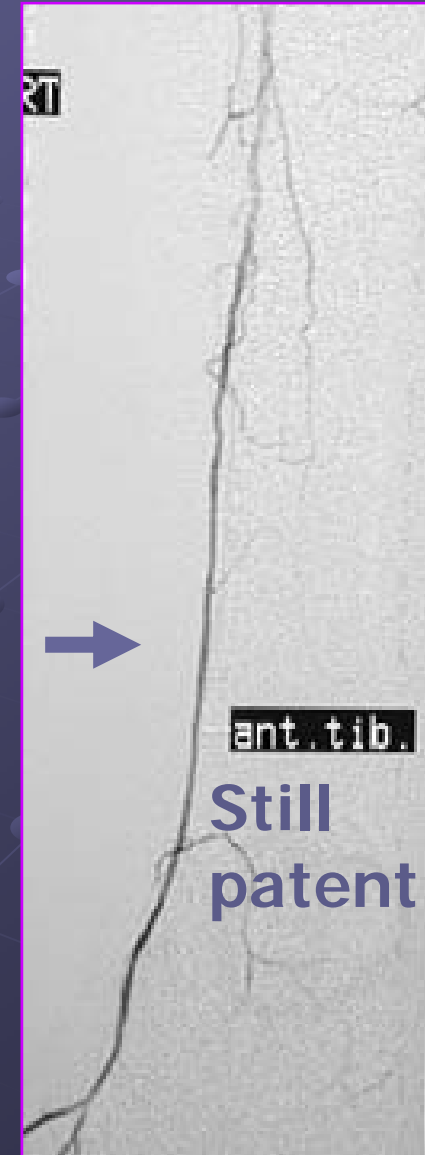
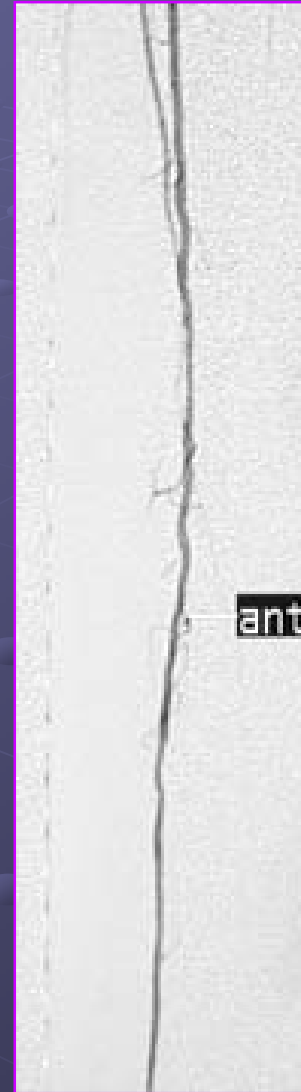
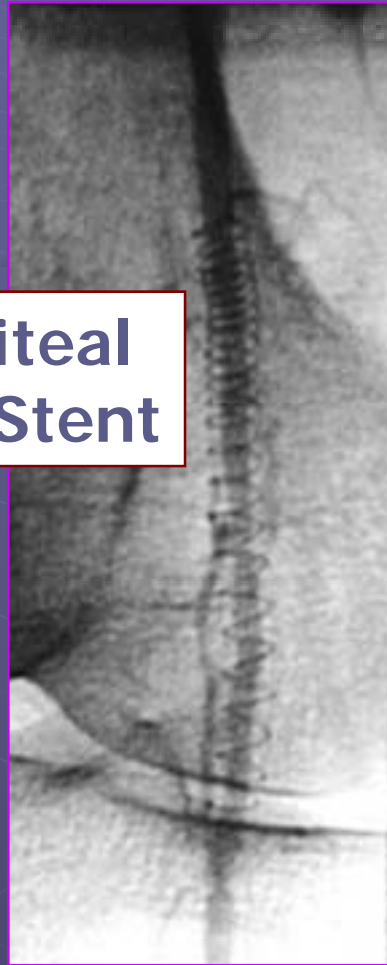
# RECANALIZATION & CUTTING BALLOON



# 34 mo post "Cutting Balloon"



**Popliteal  
Coil Stent**



**Still  
patent**

Rest pain: IDDM,  
former smoker. So  
above & below  
knee obstructions.

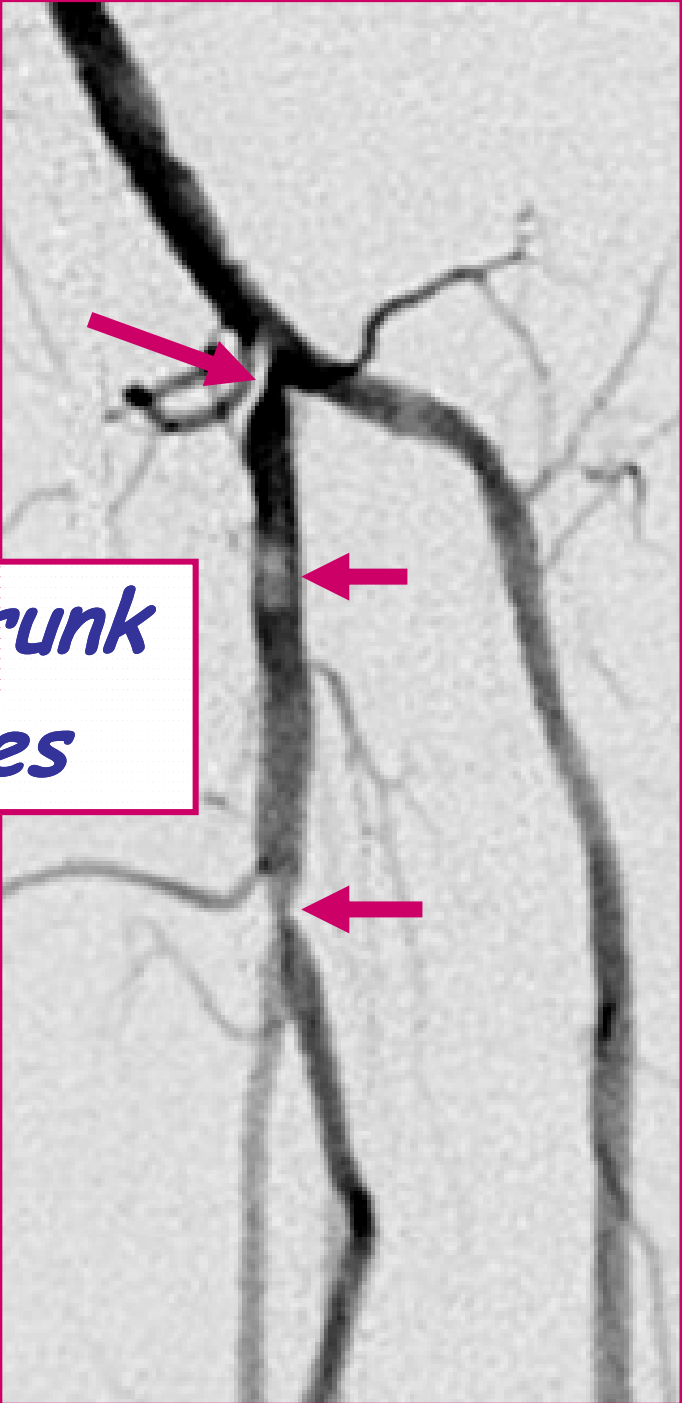
*Mid & distal  
SFA stenoses*



*ATK  
Popliteal  
stenosis*







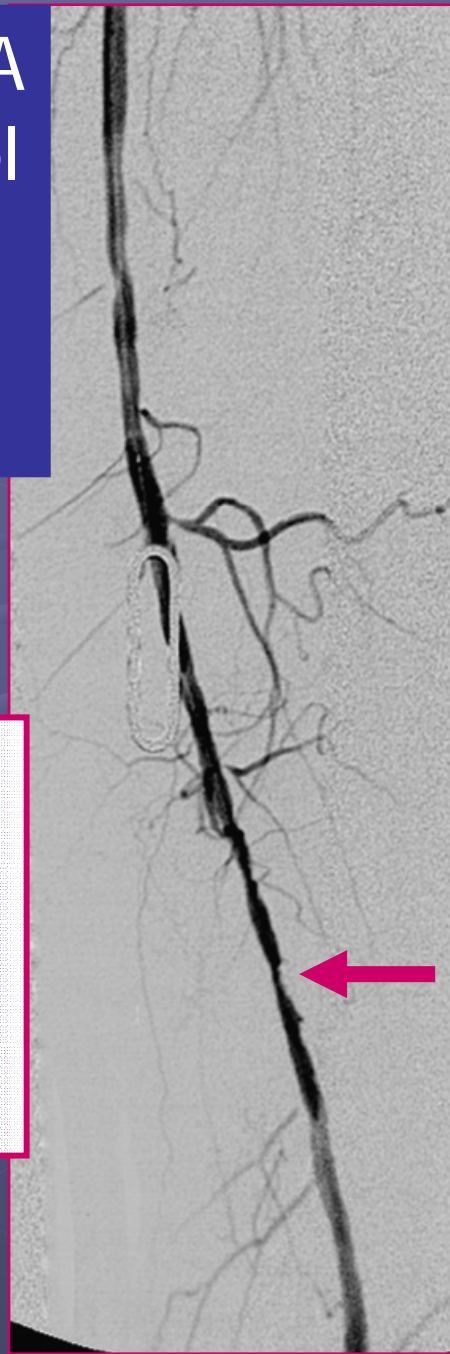
*3 tp trunk stenoses*



*Stenosis Dorsalis Pedis*

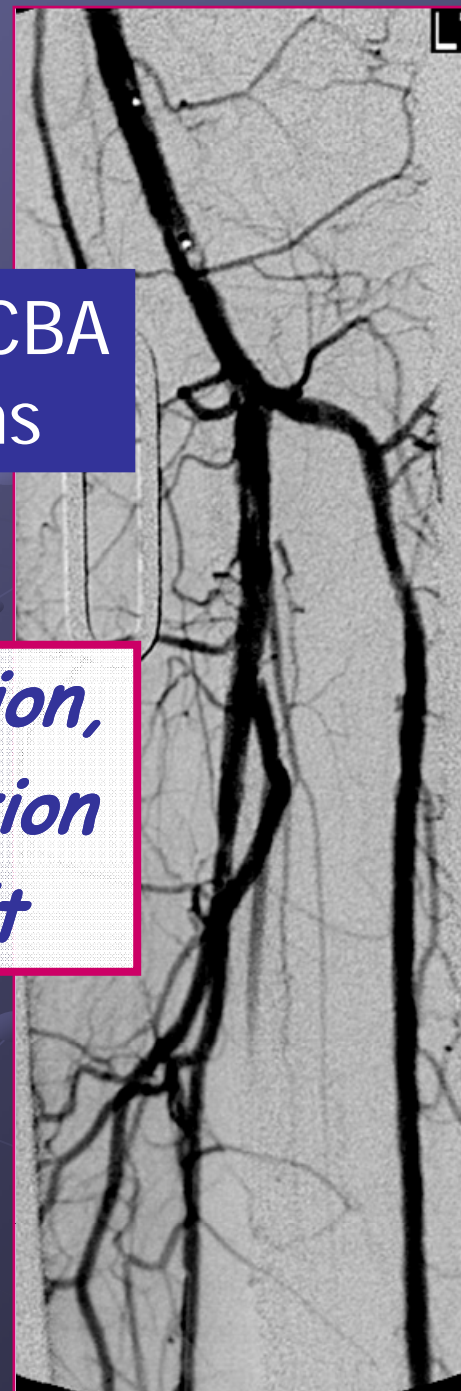


Post 4 mm CBA  
Mid SFA + popl  
& adjunctive  
5 mm POBA  
distal SFA



*1 Residual  
Stenosis,  
Distal SFA  
(40%)*

Post 4 mm CBA  
3 BTK lesions



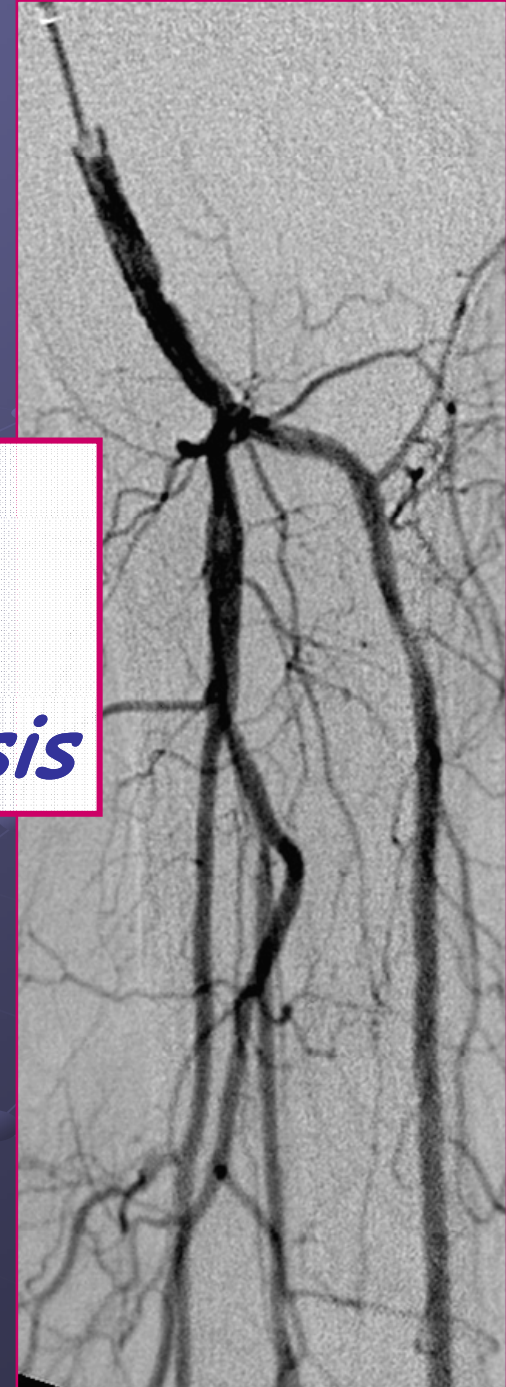
*No dissection,  
or bifurcation  
plaque shift*

Claudication  
@ 18 mo

*18 mo  
1 ATK  
restenosis  
(Adductor  
Canal)*

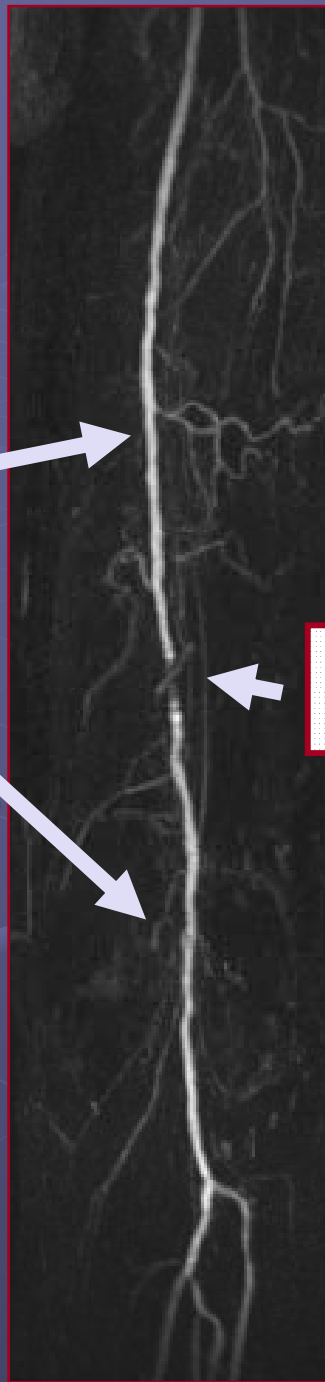


*18 mo  
No BTK  
restenosis*



*36 mo  
MRA for  
other leg*

*No ATK  
restenosis*



*Stent*

*No BTK  
restenosis*



[F]



## TLR after cutting balloon

@ 24 mo (3 – 44)

Fem-popl = 29/137 (21%).

**Trifurcation = 4/94 (4.2 %).**

TLR for CLI > Claudicants (29% vs. 9%)

But primarily fem-popl restenosis (multiple).

Claudicants also restenose fem-popl,

but not trifurcation so they claudicate less & don't need repeat Rx.

**Lesson: Rx trifurcation lesions in claudicant.**

**SFA remains most likely to restenose.**

# Future

- CLI = Multivessel disease
- But ALL have trifurcation disease
  - Trifurcation disease = Diabetes &/or Aged
- Rapidly increasing % of population are aged &/or have diabetes
  - so more & more trifurcation disease.

# Bad News & Good News

- **BAD = More & more CLI**
- **GOOD = More & better treatments**
  - 80% limb salvage is to be expected
  - Maintain independence & Quality of Life
- **Treat as early as possible**
  - Don't hesitate to promptly retreat
  - Restenosis is not failure.
  - 2<sup>nd</sup> Rx are faster, easier, more durable.



# Which Tool?

- All yield initial success of ~90%  
\_ limb salvage @ 12 mo ~ 70-80%
- Patency not tightly correlated with salvage
- Consider cost, ease of use
- Atherectomy for eccentric Ca lesions you would not stent: CFA, popliteal
- Laser if subacute thrombus or tiny lumen
- CBA if focal stenosis, bifurcation, eccentric
- Orbital for multiple, Ca lesions
- Turbo Laser & Cryo for in-stent restenosis



**Maybe... “it is not worth the effort & expense to prevent amputation.”**





***She & her  
family do  
not agree !!!***



Thank You



# Worsening Wave Forms

09/2005





# In-Stent Restenosis @ 2 mo.

