High Risk Podiatry in a Vascular Setting; A new paradigm in Diabetic Foot Disease?

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A new paradigm?

* Foot ulceration 101
* Assessing Perfusion – a new challenge
* Pressure Injuries

Stairway to Amputation

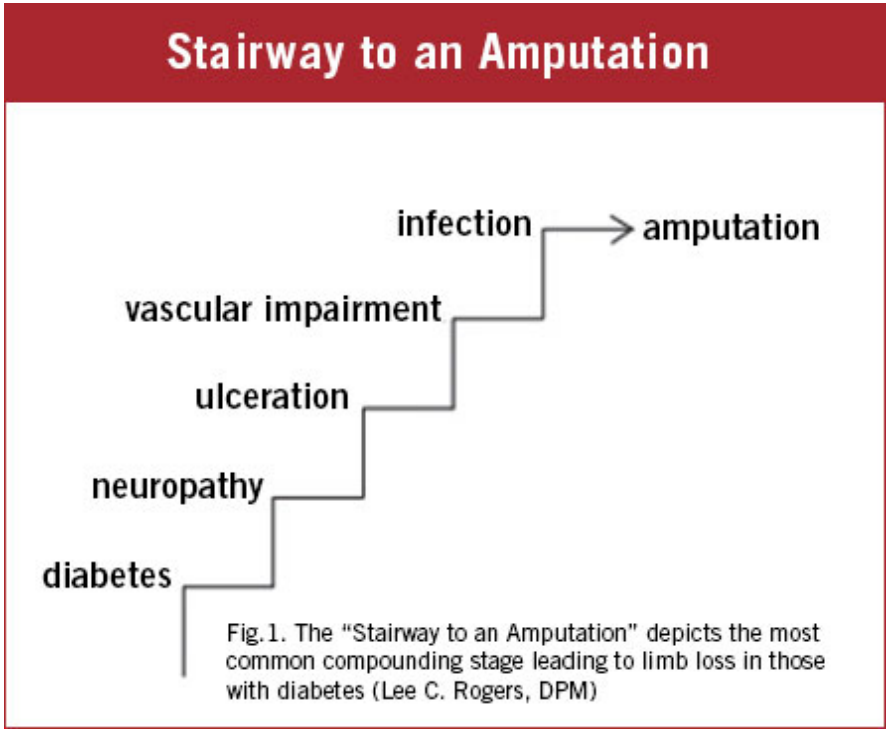


Fig. 1. The "Stairway to an Amputation" depicts the most common compounding stage leading to limb loss in those with diabetes (Lee C. Rogers, DPM)

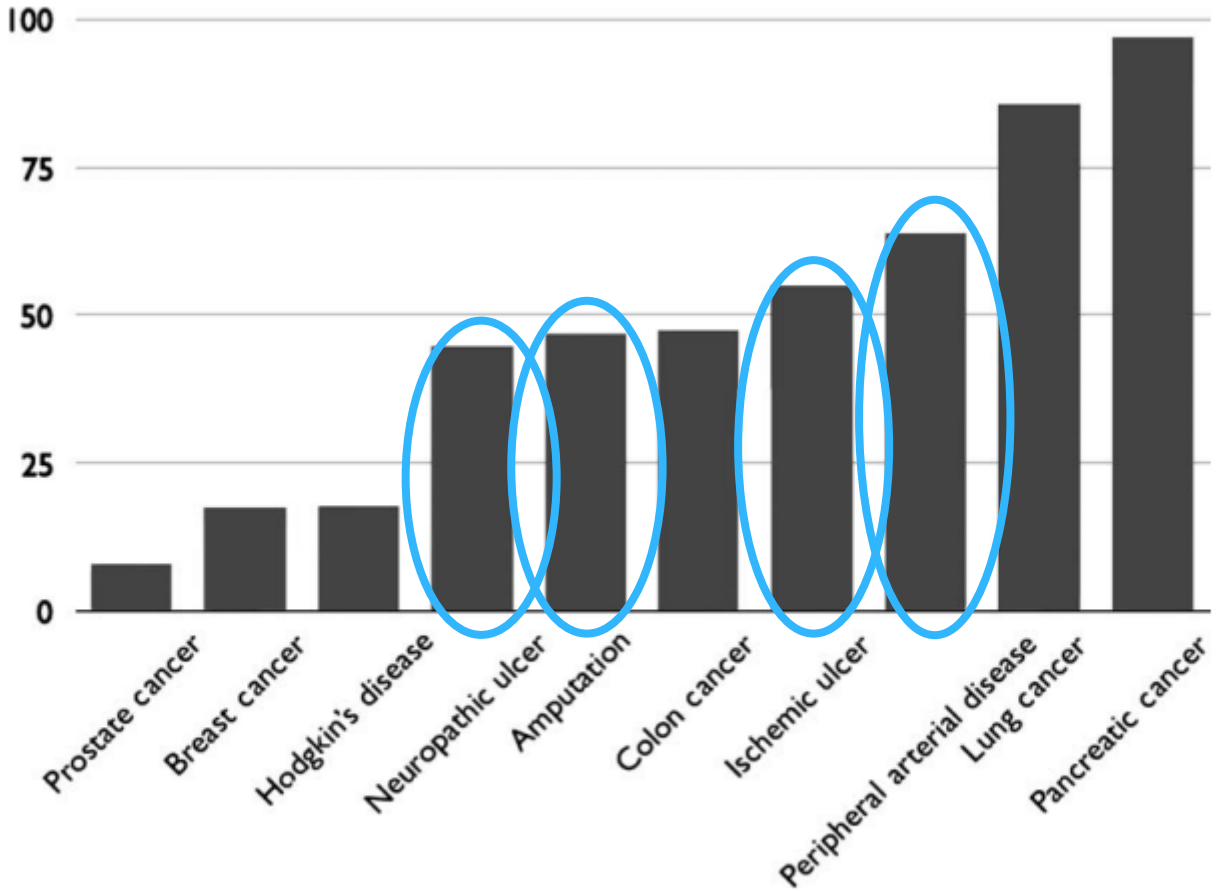


Figure 1. Five-year mortality (%). Perhaps now is the time to change our discussion with health-care administrators, policy makers and especially ourselves. The disease state that many of us treat routinely is, quite literally, killing our patients at a rate comparable to cancer. Addressing this issue aggressively may alter this and make a difference for millions of people worldwide.

* Armstrong, D. G., Wrobel, J., & Robbins, J. M. (2007). Guest Editorial: Are diabetes-related wounds and amputations worse than cancer. Int Wound J,4(4), 286-87.

Diabetes and feet

* Peripheral Neuropathy – greatest risk factor for plantar foot ulceration
  * Unnoticed injury
* Structural deformity – increased pressure
* Peripheral Arterial Disease – poor healing

Loss of protective sensation (LOPS)

* UKPDS – 13% of patients at T2DM diagnosis had severe sensory loss
* Peripheral sensory neuropathy primary factor in 60-90% of all diabetic foot ulcers
* Glove and stocking distribution
* Daily foot inspections/examinations
* Poor glycaemic control and duration of disease

* Pain is God's greatest gift to mankind
  * Paul Brand

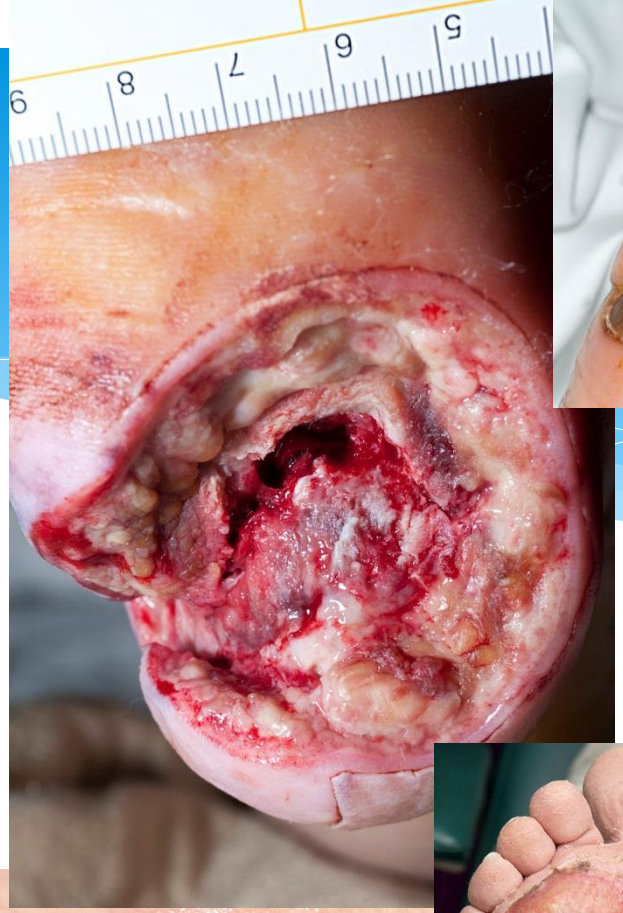
Peripheral Neuropathy

* Sensory
* Motor
* Autonomic
  * Charcot Foot

* Numerous causes (eg diabetes, ETOH abuse, Syphilis, Leprosy, renal failure, HIV, CMT, spina bifida, spinal cord injury, stroke and Rheumatoid Arthritis, chemotherapy etc)
* Painful Neuropathy

Sensory Neuropathy

* Loss of temperature, pain and pressure sensation
* Increases chance of unnoticed foot injury
  * Burns (physical, chemical)
  * Cuts (accidental, self inflicted)
  * Pressure lesions (corn, callus, blisters)
* Wounds may develop and progress to a lower extremity amputation
* Inability to sense foot position (falls-trauma)




HydroTac.
Zetuvit. Plus
TenderWet.
1800 605 839
www.hartmann.com


HydroTac.
Zetuvit. Plus
TenderWet.

Motor Neuropathy

* Loss of intrinsic muscle function
  * Decreases foot stability
  * Muscle atrophy
  * Altered foot structure
  * Development bony prominences
  * Increased focal pressure areas

* Fat pads pushed upwards proximally (fullness noted at base of toes)

Autonomic Neuropathy

* Loss of flare response
  * Infection may not present clinically
* Loss of function of skin structures
  * Sweat glands, atrophic skin changes
* Arterio-venous shunting
  * May lead to neuropathic osteoarthropathy (Charcot)

Peripheral Arterial Disease

* Increased risk of ulceration
  * Tissue ischaemia
  * Atrophic skin changes
  * Less resilient
* Following ulceration development
  * Retards wound healing
  * Increases risk of infection
  * Increases risk of amputation
* Increased morbidity and mortality

Peripheral Arterial Disease

* **Macrovascular disease**
  * Occlusive
  * Often repairable
  * Atherosclerosis of arteries
  * Calcification of arteries
  * Always check pulses lower limb

* **Microvascular Disease**
  * Not occlusive, basement membrane thickening, not repairable
  * Caused by changes in the structure of the arteries and blood cells
  * Plays a component in the development of peripheral neuropathy
  * Leads to poor O2 perfusion in tissues and delays healing of wounds

Assessing perfusion and managing ischaemia; a new paradigm?

Why is PAD important in DFD?

* A changing disease pattern
  * Femoral vs tibial disease
* Evolving goals/end points
  * Pain management/QoL vs Wound healing
* Improved techniques
  * Stents, DCB, DEB, DES etc

* FMC 2013 40% Endovascular vs 60% Open
* FMC 2016 70% Endovascular vs 30% Open
* FMC 2017 91% Endovascular vs 8% Open

Open vs Endovascular

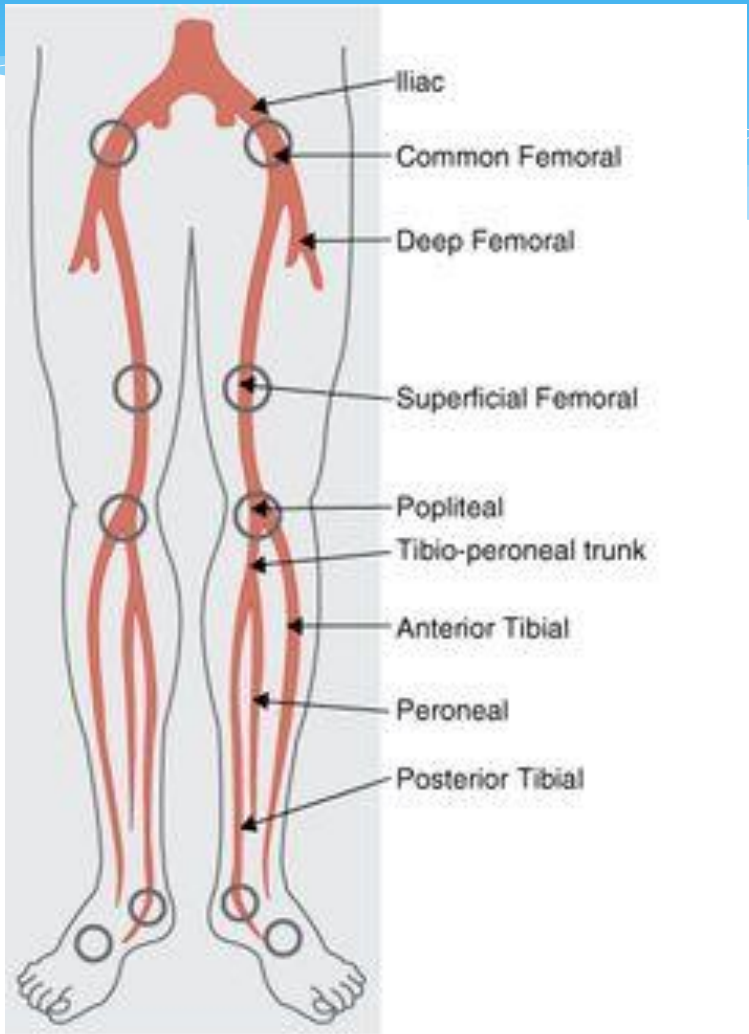
Open

* Longer patency rates
* Not always targeted
* Need a target vessel
* Need a suitable conduit
* GA
* Large wound
* Lengthy recovery

Endovascular

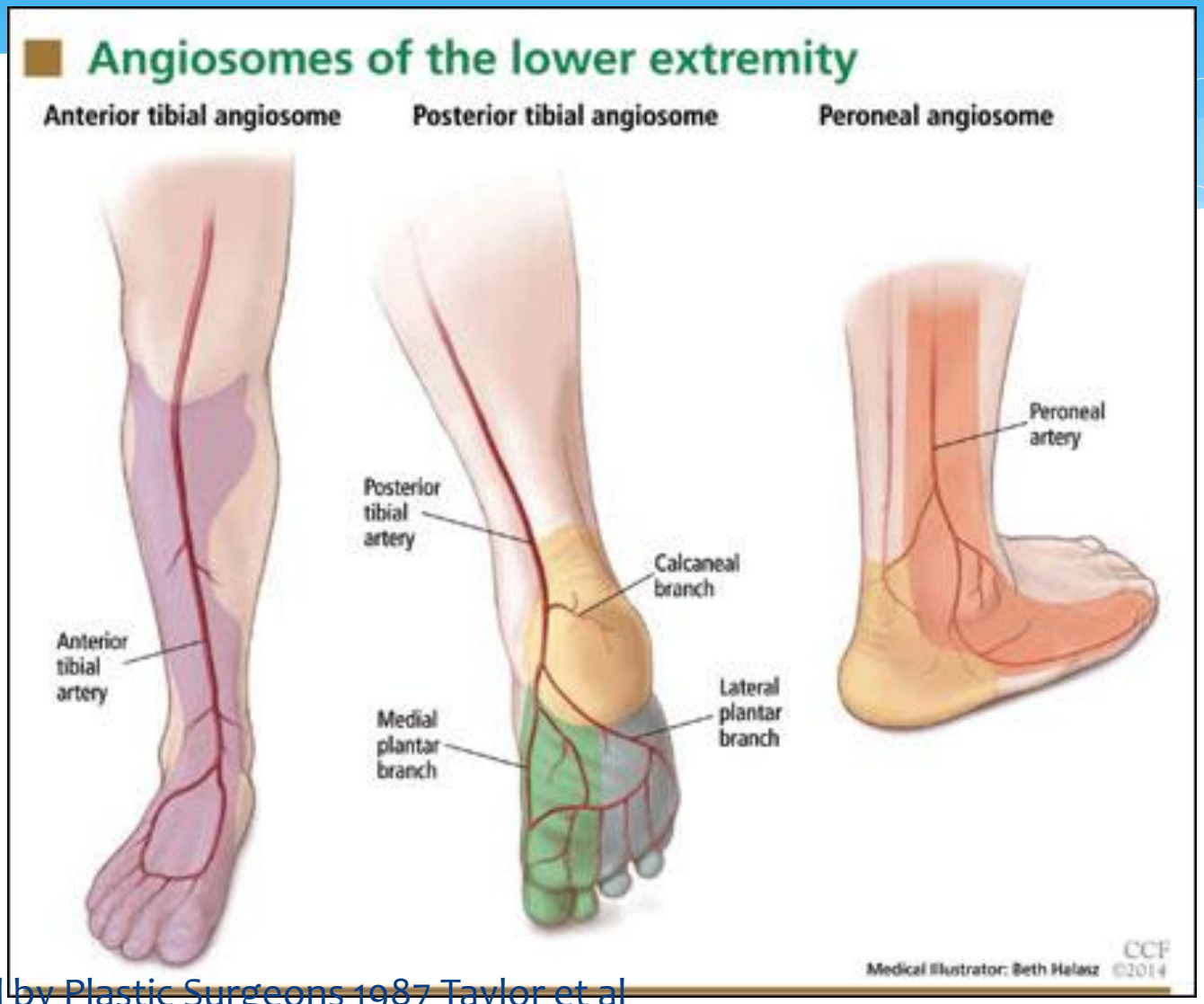
* Shorter patency rates
* Shorter hospital stay
* No need for GA
* Targeted revascularisation
* Minimal wound
* Can traumatise/'trash' distal vessels

Anatomy Refresher



Source: Levitov A, Mayo PH, Slonim AD: *Critical Care Ultrasonography*: http://www.accessanesthesiology.com

Angiosome concept



* Developed by Plastic Surgeons 1987 Taylor et al

Mr P

* 55 year old male
* Diesel Mechanic (works 12+ hour days)
* Smoker
* T2DM (Moderate control HbA1c 7-9%) 10 years duration
* Morbid Obesity (168kg)

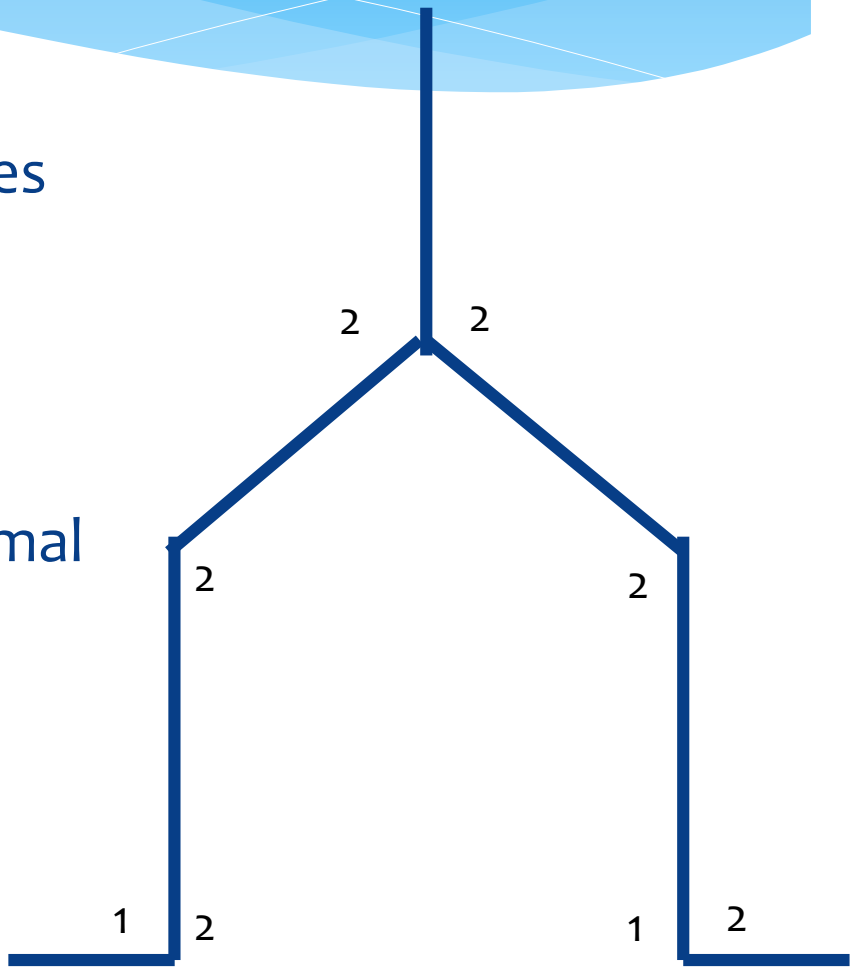
* Chronic wound since 2012 plantar L/hallux
  * Heals and then breaks down

Mr P

Mr P

* Monofilament – Absent all sites
* Vibration perception – absent
* Reflexes – reduced

* Feet warm, pink, cap refil normal
* Hair growth present
* No claudication or rest pain



Mr P

6 months later…

Reassess

Mr P

* Warm, pink feet
* No claudication
* No rest pain
* Hairy
* Normal capillary refill time
* Pedal pulses present

* Smoker
* Previous stent

Ischaemic

* Cool, pale feet
* Claudication
* Rest Pain
* No hair
* Reduced capillary refill time
* Absent/reduced pulses

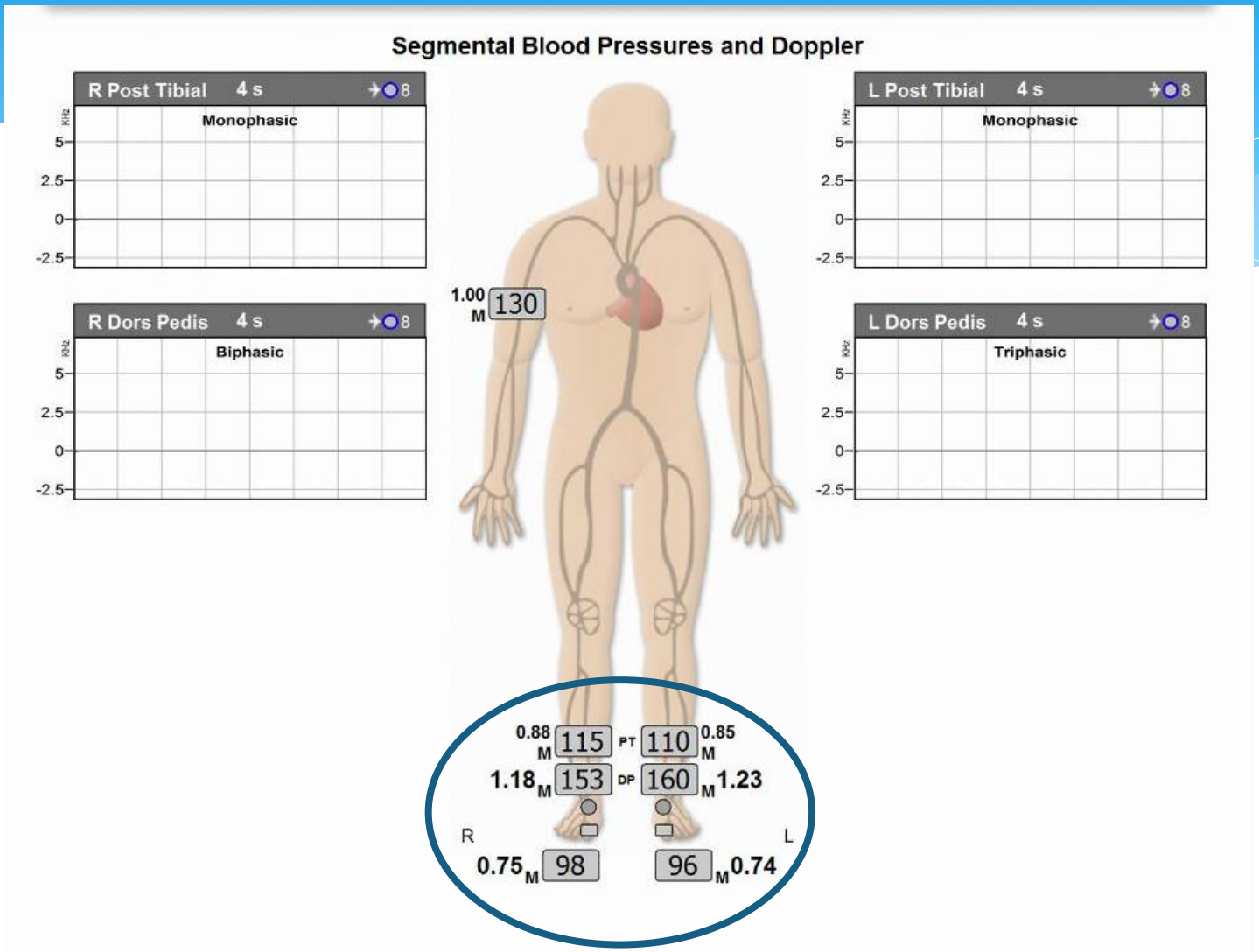
Investigate Further

* ABI
  * Ankle/brachial pressure index

$$\frac{\text{Highest ankle pressure}}{\text{Brachial pressure}} = \text{ABI}$$

* TBI
  * Systolic pressure >55mmHg to achieve healing

ABI	
>1.2	Incompressible
0.9 – 1.2	Normal
0.8 – 0.9	Mild PAD
0.5 – 0.8	Moderate PAD
<0.5	Severe PAD


Segmental Blood Pressures and Doppler
R Post Tibial 4 s
Monophasic
L Post Tibial 4 s
Monophasic
R Dors Pedis 4 s
Biphasic
L Dors Pedis 4 s
Triphasic
KHz
5
2.5
0
-2.5
1.00 M 130
0.88 M 115 PT 110 0.85 M
1.18 M 153 DP 160 M 1.23
R
L
0.75 M 98
96 M 0.74

6 months later…

Reassess

* Regular debridement ✓
* Appropriate dressings ✓
* Offloading ✓
* Improved glycaemic control ✓
* Improved diet ✓
* Quit smoking ✗ (but had reduced)
* Infection ✗
* Nasties (Biopsy – chronic ulcerative changes) ✗

* Wound healed ✗

* Reassess perfusion

Mr P

1 (ALL)

Sonographer: VB

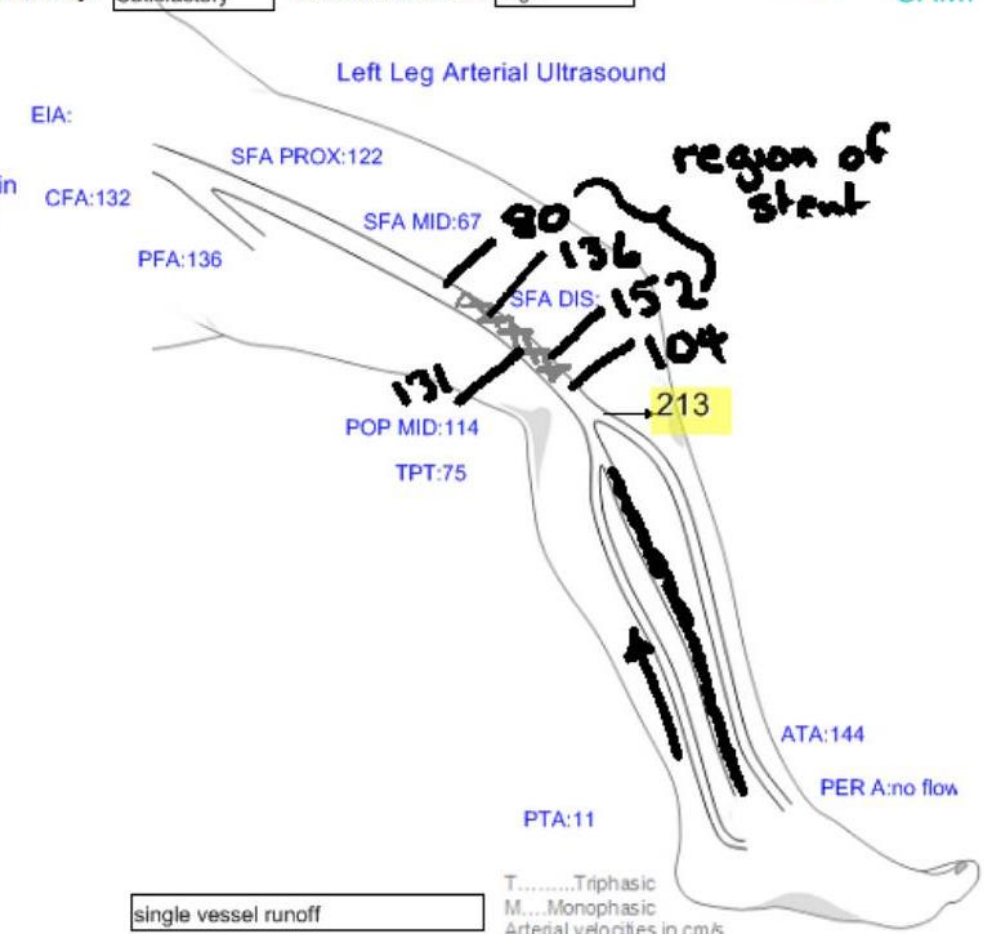
Technical Quality: Satisfactory

Confidence Level: High

SA Health SAMI

Comment:
Phx distal SFA Stent
triphasic flow to distal SFA
Retrograde flow seen in PTA
No flow in Peron Art
ATA has good mono phasic flow origin not seen but proxmal velocity appears quite high. no stenosis seen

Left Leg Arterial Ultrasound



single vessel runoff

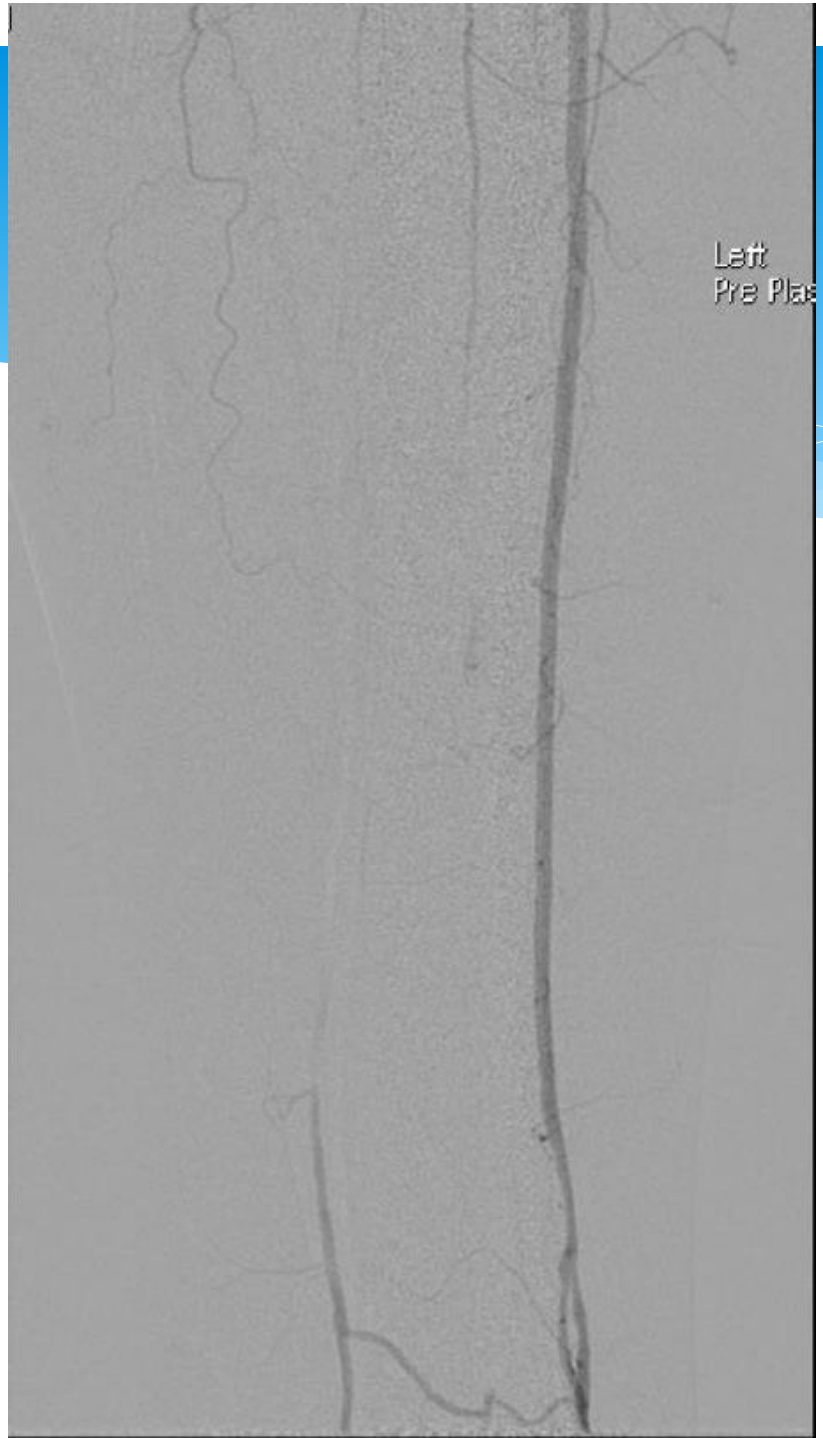
6 months later…


Flinders Private Hospital
Dr. Mosel
000059029
M Jun 11 1961
Left
Sep 30 2018
15:05:42
(Filt. 3)
(Shut.)
FOV: 30x30 cm
LAO: 0.4 deg
CAU: 0.1 deg
L: 89.8 deg
Tilt: 0 deg
Mag = 1.00
FL: ROT:
XA 750x750
Seq: 1
FRAME = 9 / 14
MASK = 1


Hospital
Left

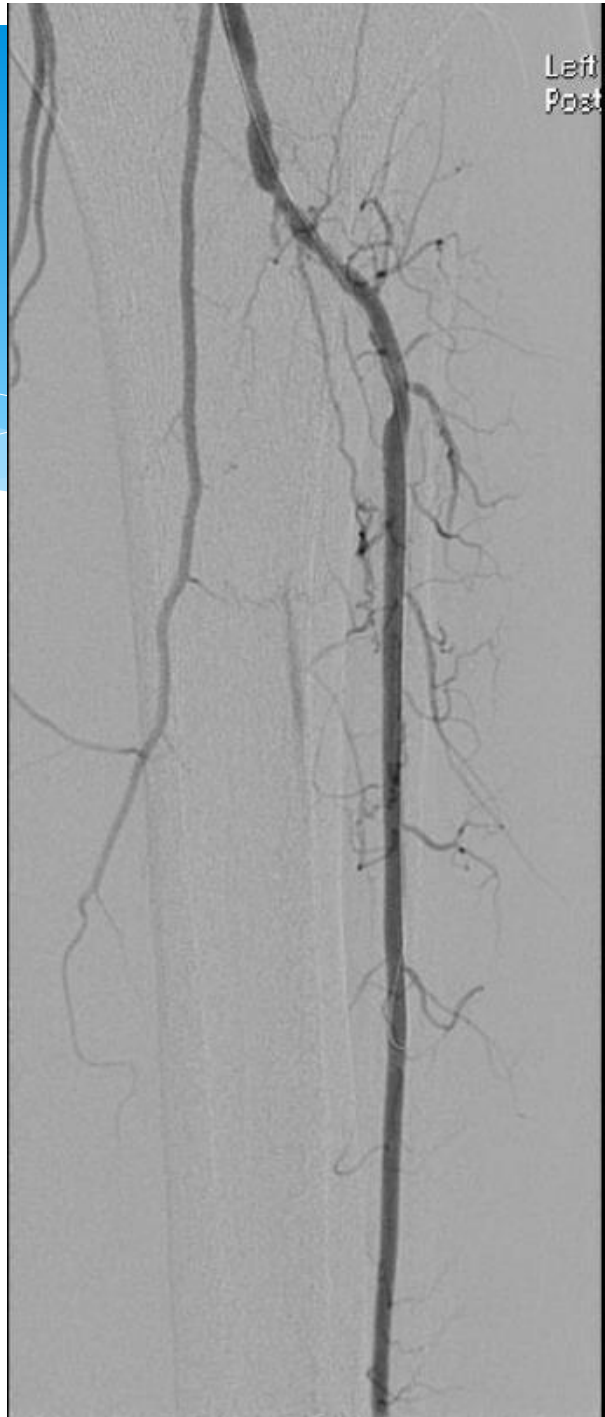

Left


Left


Left
Pre Plas


MEDICAL SYSTEMS
nders Private Hospital
Mosel
PETHERBRIDGE WAYNE DONALD
0000590
M Jun 11 19
Left
Pre Plasty
Sep 30 20
15:10:
(Filt.
(Shu
V: 30x30 cm
Seq
FRAME = 8 /
MASK =
ag = 1.00
ROT:
750x750


Left
Pre


Left
Post


MEDICAL SYSTEMS
nders Private Hospital
Mosel
PETHERBRIDG Hospital
Left
Pre Pla
V: 30x30 cm
ag = 1.00
ROT:
750x750


Left
Post 2nd Plasty

The ideal…


Dr P PUCKRIDGE
RIGHT
POST ANGIOPLASTY
RUNOFF
FOV: 30x30 cm
RAO: 44.5 deg
CAU: 1.1 deg
: 89.5 deg
Tilt: 0 deg
Mag = 1.00
FL: ROT:

Things to consider

* Assessing perfusion is challenging!
  * Even the experts get it wrong
* If at first you don't succeed, try again (and again!)
* Technology and treatments are evolving (so use them)
* Not always successful, not always problem free

Pressure Injuries

Pressure Injuries

* Avoidable adverse event
* Amputees are encouraged to use their heel to reposition in bed
* High risk group
  * Diabetes
  * Obesity
  * Peripheral Arterial Disease
  * Renal impairment or failure
  * Anaemia
  * Smoking

Braden PI Risk Assessment

* Most reliable structured risk assessment scale
* Not sensitive for this patient group
* Patients who developed PI scored low to medium risk despite being high risk

No Risk	Low Risk	Medium Risk	High Risk
19-23	15-18	13-18	12 or below OR/ 13-14 and in a high risk clinical group

Preventative Offloading Measures

* Nothing
* Alternating Air Mattress
* Dressings
* Sheep Skin Heel Protectors
* Pressure Relieving Ankle Foot Orthoses
* *Heelift* Suspension Boot

* No standardised approach
* No standardised education

The Injury

* Pressure, friction and shear
* Typically present as a blister
* Posterior injury usually with plantar involvement
* Worse on alternating air mattress
* Challenging to manage

Conclusion

* Multifactorial reasons for ulceration
* The role of ischaemia is often significant, yet poorly identified and managed
* Keep referring