Practical Wound Care

Jessica T. Pierce, M.D.
Medical Director
VMFH Wound Care and Limb Preservation

GOALS:

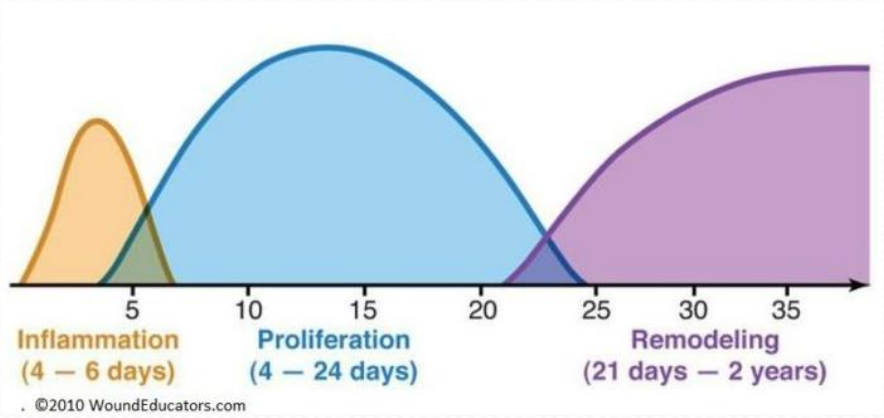
- Review the principles and concepts of wound healing
- Understanding different modalities used to treat common wounds in the outpatient and inpatient settings

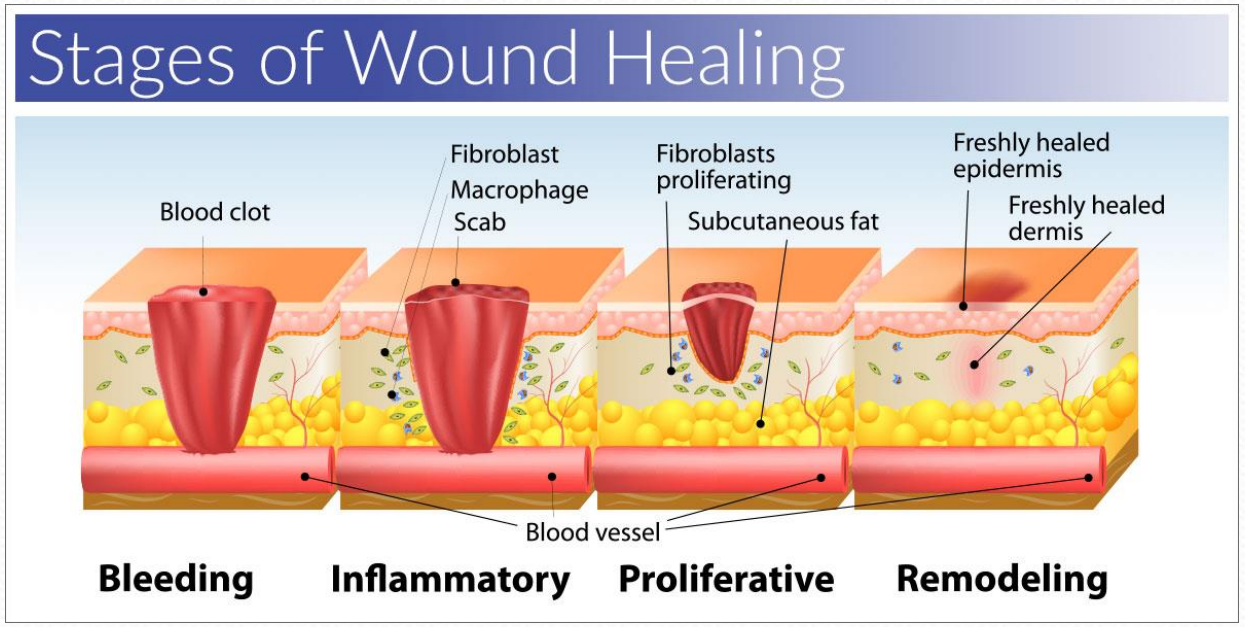
Disclosures:

none

4 PARTS OF NORMAL WOUND HEALING

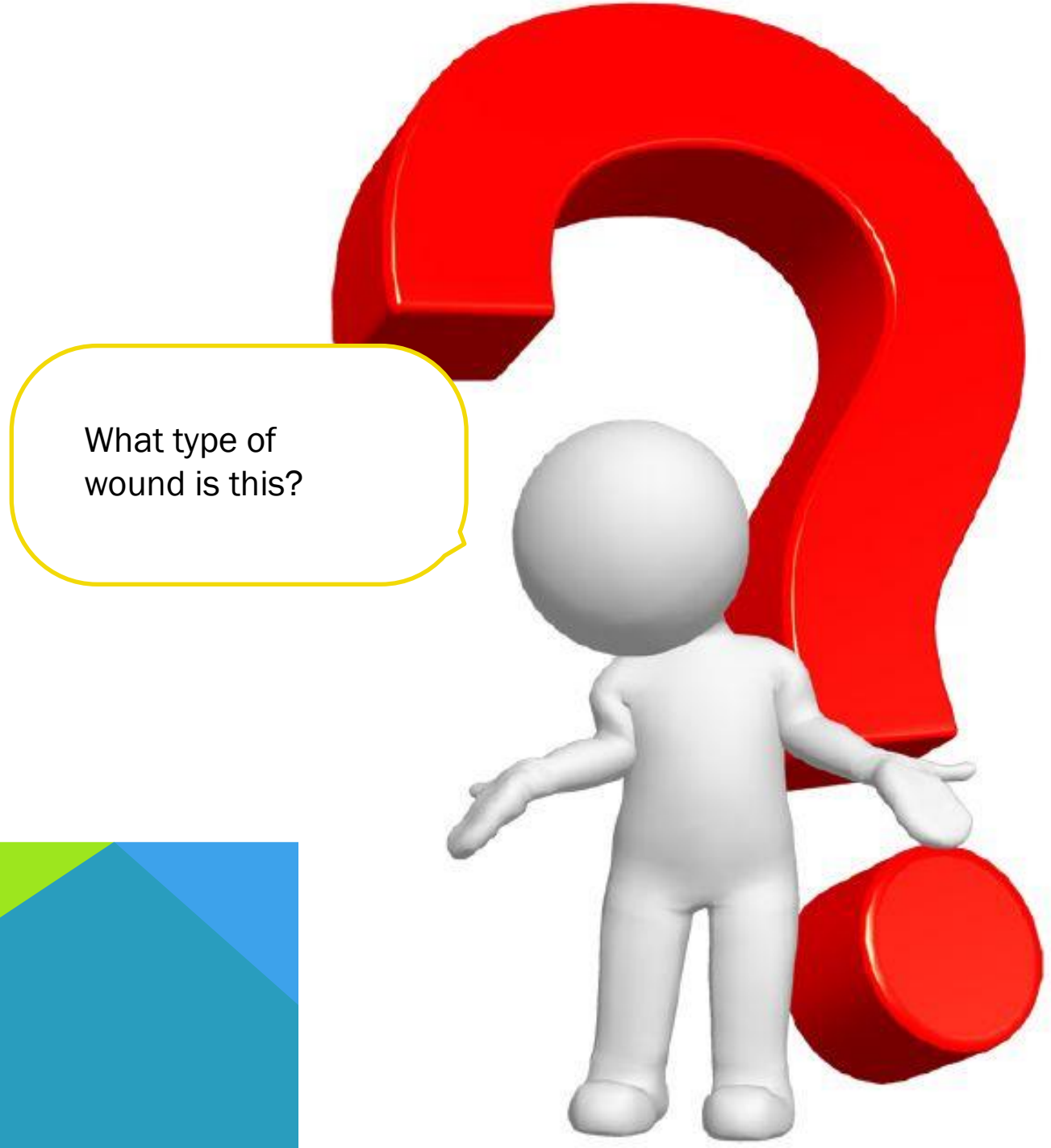
1. Vascular Response (Hemostasis)
2. Inflammatory Response (Inflammation)
3. Proliferative Phase (Granulation, Epithelialization)
4. Maturation Phase (Reconstruction phase)





A wound that has failed to proceed through an orderly and timely reparative process to produce anatomic and functional integrity of the injured site.

A wound becomes an ulcer after 3 weeks.


What type of wound is this?

venous arterial diabetic pressure

Feature	Ulcer Type			
	Venous	Arterial	Neuropathic Diabetic	Pressure
Underlying condition	Varicose veins, previous deep-vein thrombosis, obesity, pregnancy, recurrent phlebitis	Diabetes, hypertension, smoking, previous vascular disease	Diabetes, trauma, prolonged pressure	Limited mobility
Ulcer location	Area between the lower calf and the medial malleolus	Pressure points, toes and feet, lateral malleolus and tibial areas	Plantar aspect of foot, tip of the toe, lateral to fifth metatarsal	Bony prominences, heel
Ulcer characteristic	Shallow and flat margins, moderate-to-heavy exudate, slough at base with granulation tissue	Punched out and deep, irregular shape, unhealthy wound bed, presence of necrotic tissue, minimal exudate unless infected	Deep, surrounded by callus, insensate	Deep, often macerated
				
Condition of leg or foot	Hemosiderin staining, thickening and fibrosis, eczematous and itchy skin, limb edema, normal capillary refill	Thin shiny skin, reduced hair growth, cool skin, pallor on leg elevation, absent or weak pulses, delayed capillary refill, gangrene	Dry, cracked, insensate, calluses	Atrophic skin, loss of muscle mass
Treatment	Compression therapy, leg elevation, surgical management	Revascularization, antiplatelet medications, management of risk factors	Off-loading of pressure, topical growth factors	Off-loading of pressure; reduction of excessive moisture, shear, and friction; adequate nutrition

https://resident360.nejm.org/clinical-pearls/evaluation-and-management-of-lower-extremity-ulcers

VENOUS ULCERS

70-90% of all Lower Extremity Wounds.

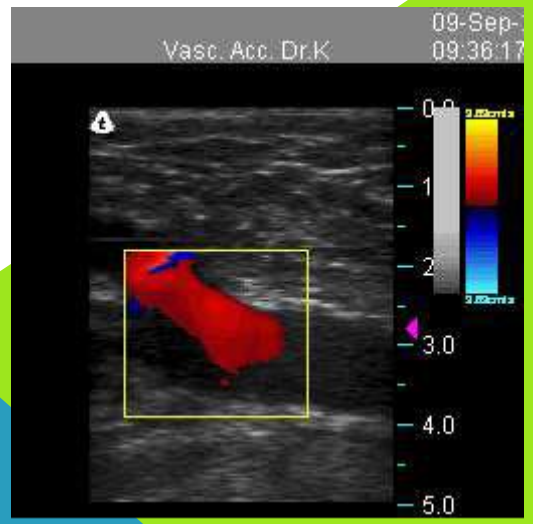
Up to one-third of treated patients experience four or more episodes of recurrence (60-70 % within 5 years).

Prevalence in USA - 600,000 annually.

Annual cost of treating VLU in the US - $2.5-3.5 billion.

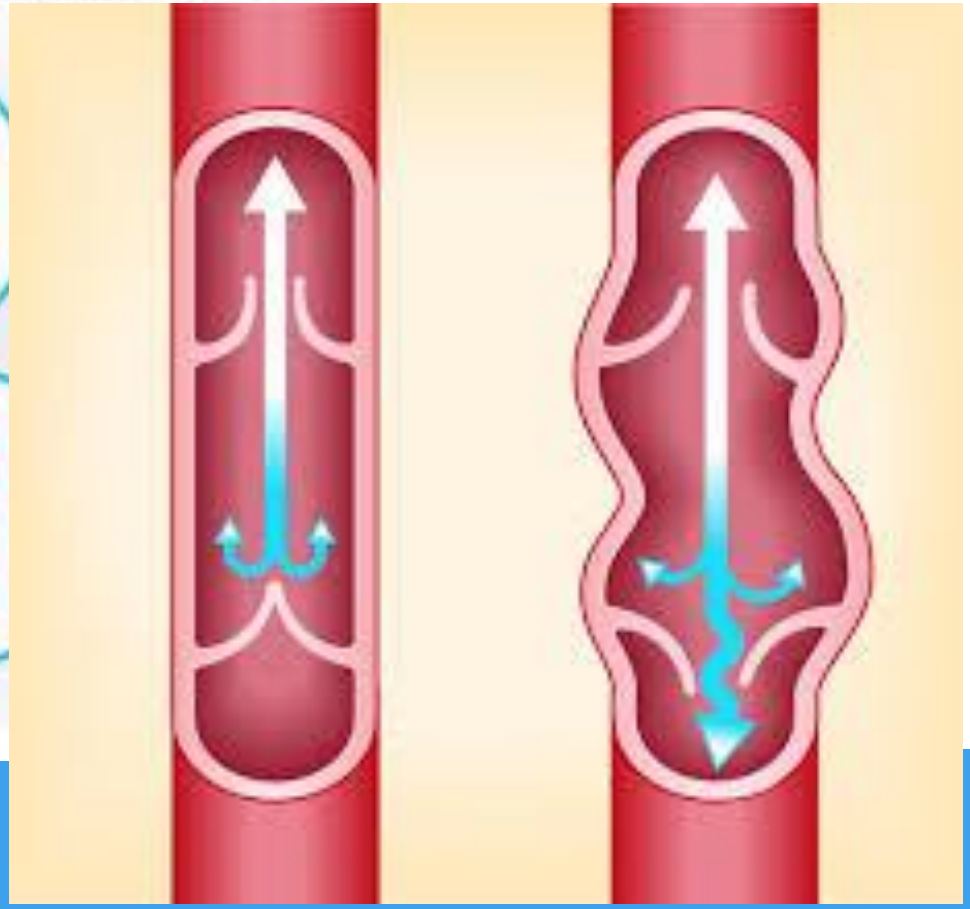
Compliance is difficult.

>50% take over 6 mo to heal.

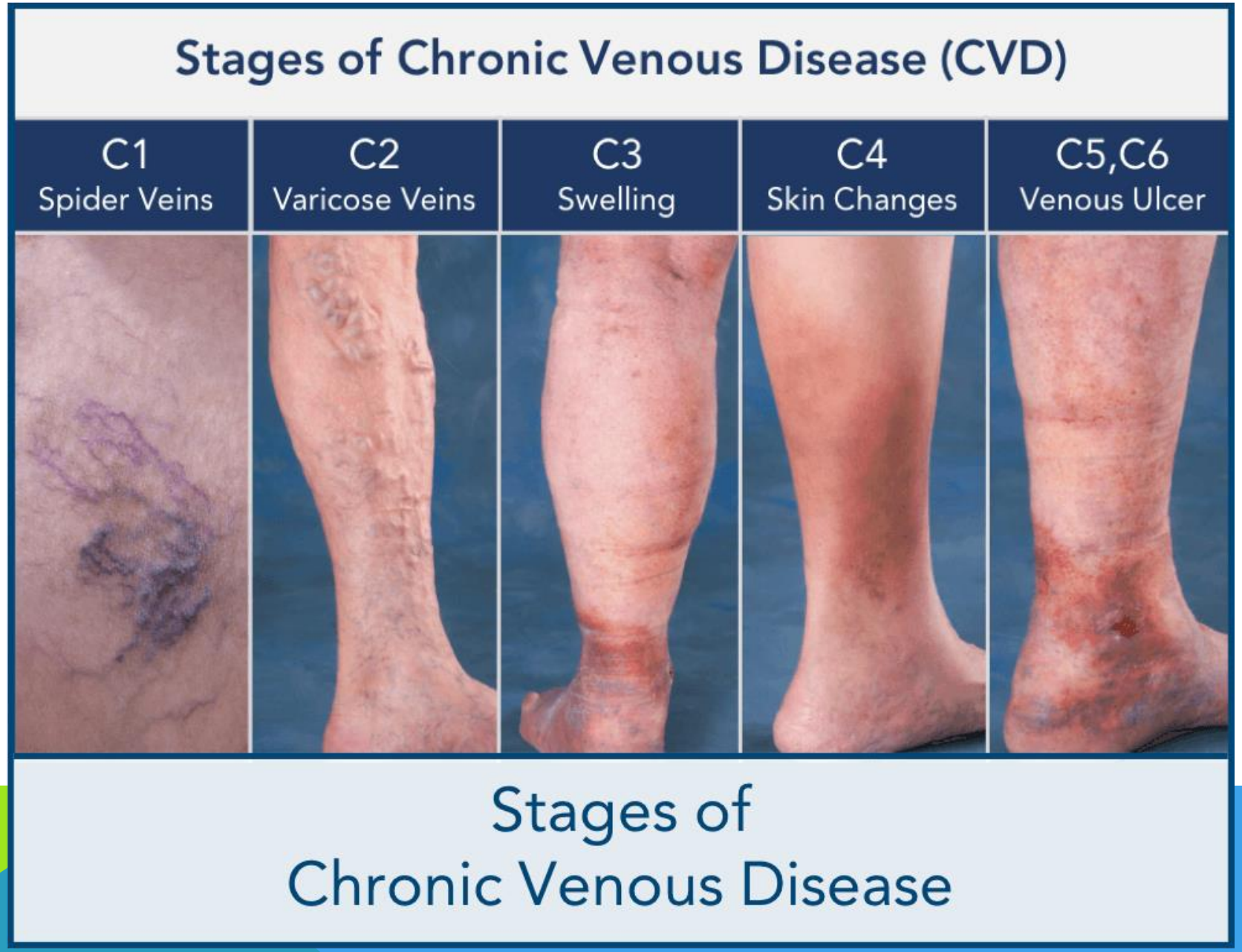


Chronic venous insufficiency

A condition where the walls and valves of the vein do not function effectively



https://texasheartandvein.com/varicode-veins-venous-insufficiency/



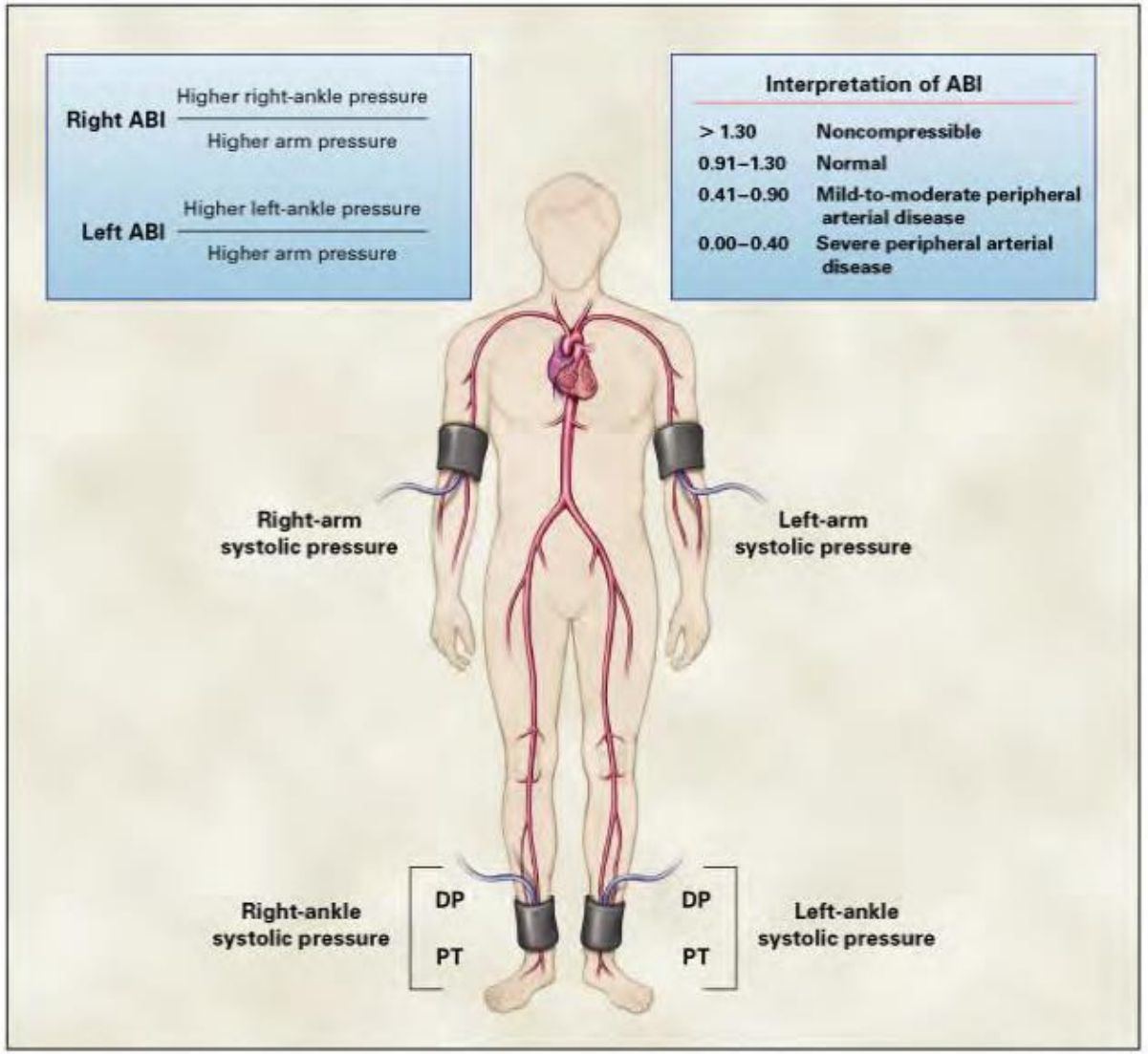
https://www.dallasvi.com/blog

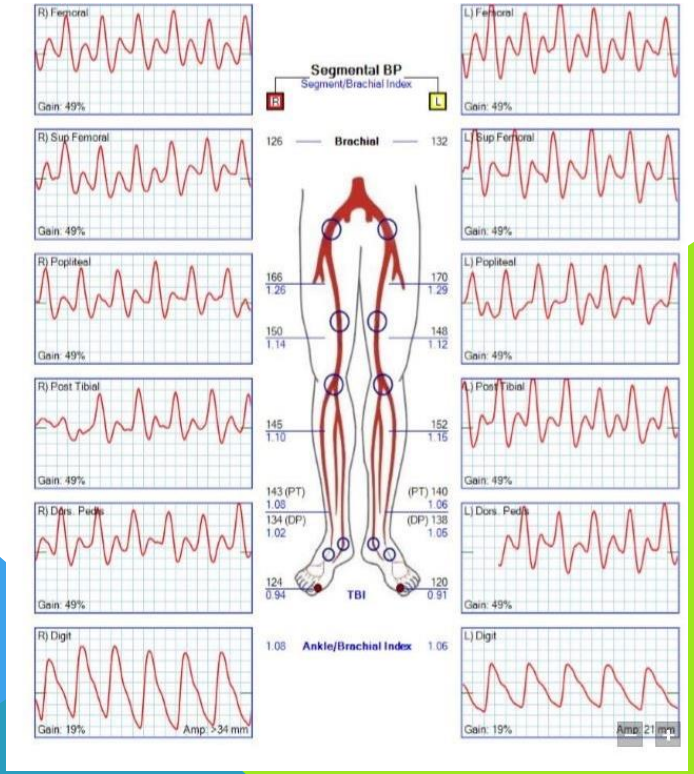
Order venous reflux study or specify “evaluate for venous reflux” in the order.

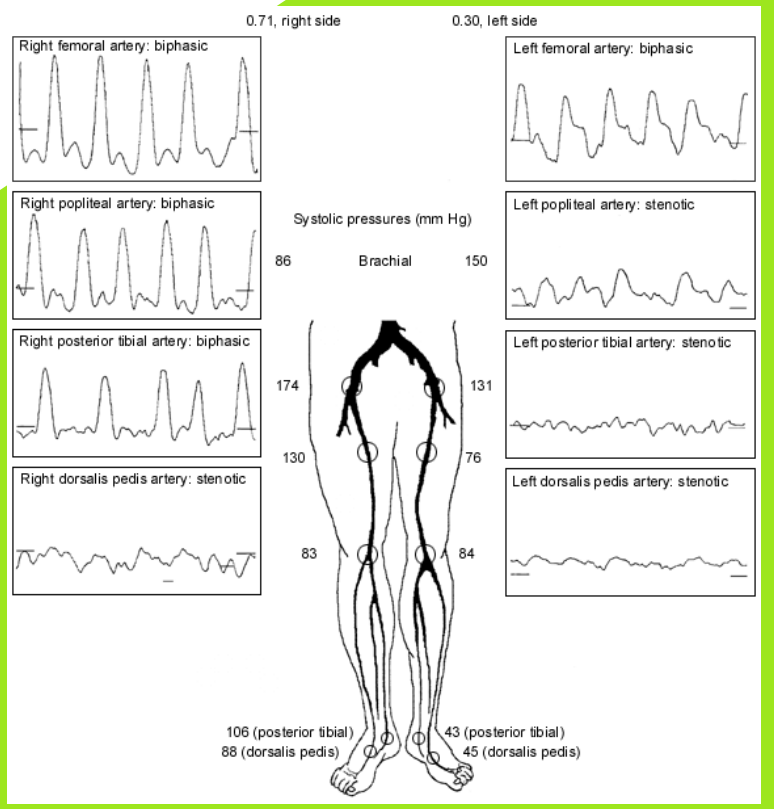
Otherwise you will get a r/o DVT study!

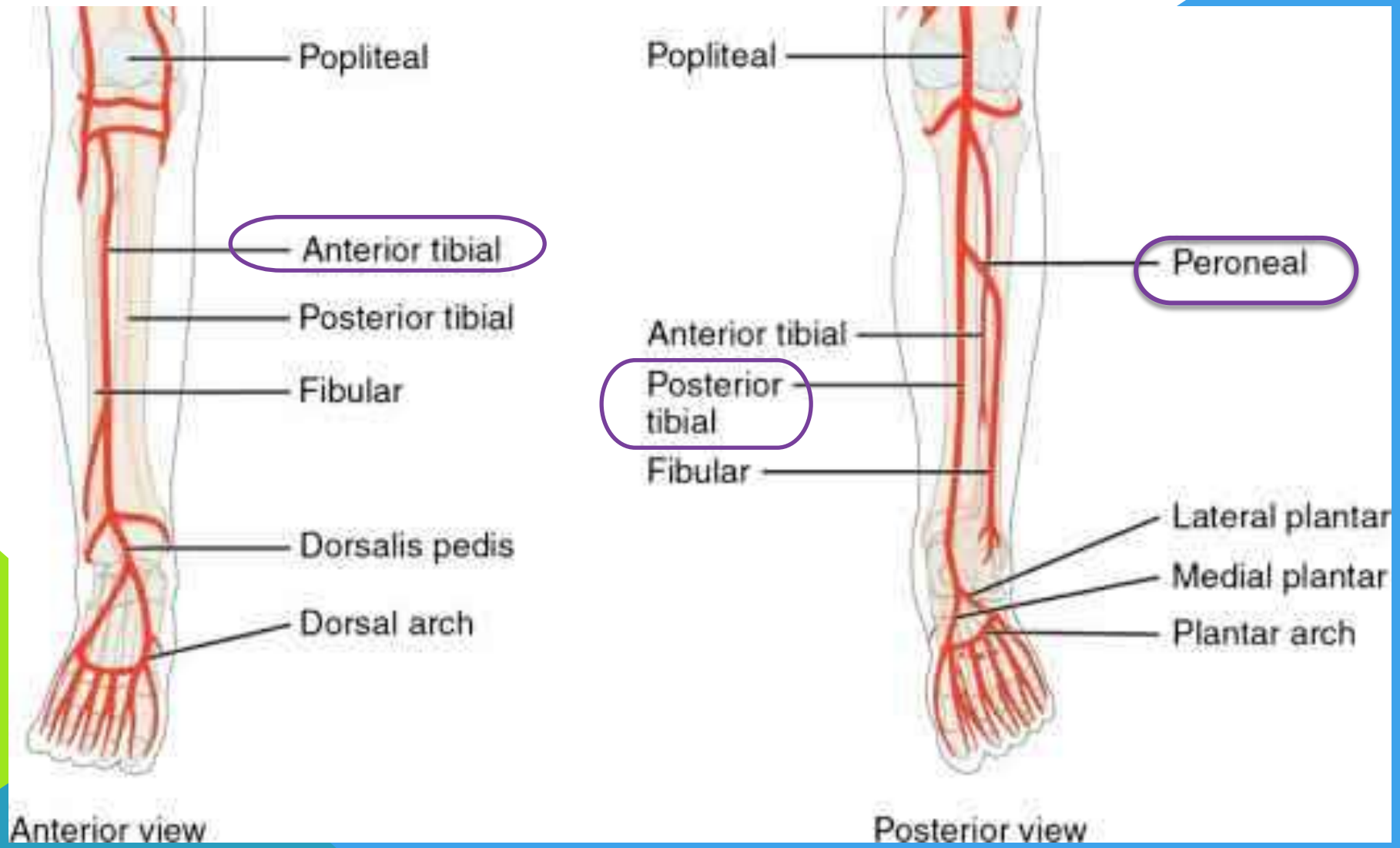
ARTERIAL ULCERS

Between toes or tips of toes
Over phalangeal heads
Around lateral malleolus
Areas subjected to trauma/rubbing footwear
Even wound margins
Punched out appearance
Pale, deep wound bed
Blanched peri-wound tissue
Extreme pain
Cellulitis
Minimal exudate
Gangrene/necrosis


Right ABI
Higher right-ankle pressure
Higher arm pressure
Left ABI
Higher left-ankle pressure
Higher arm pressure
Interpretation of ABI
> 1.30 Noncompressible
0.91–1.30 Normal
0.41–0.90 Mild-to-moderate peripheral arterial disease
0.00–0.40 Severe peripheral arterial disease
Right-arm systolic pressure
Left-arm systolic pressure
Right-ankle systolic pressure
DP
PT
DP
PT
Left-ankle systolic pressure

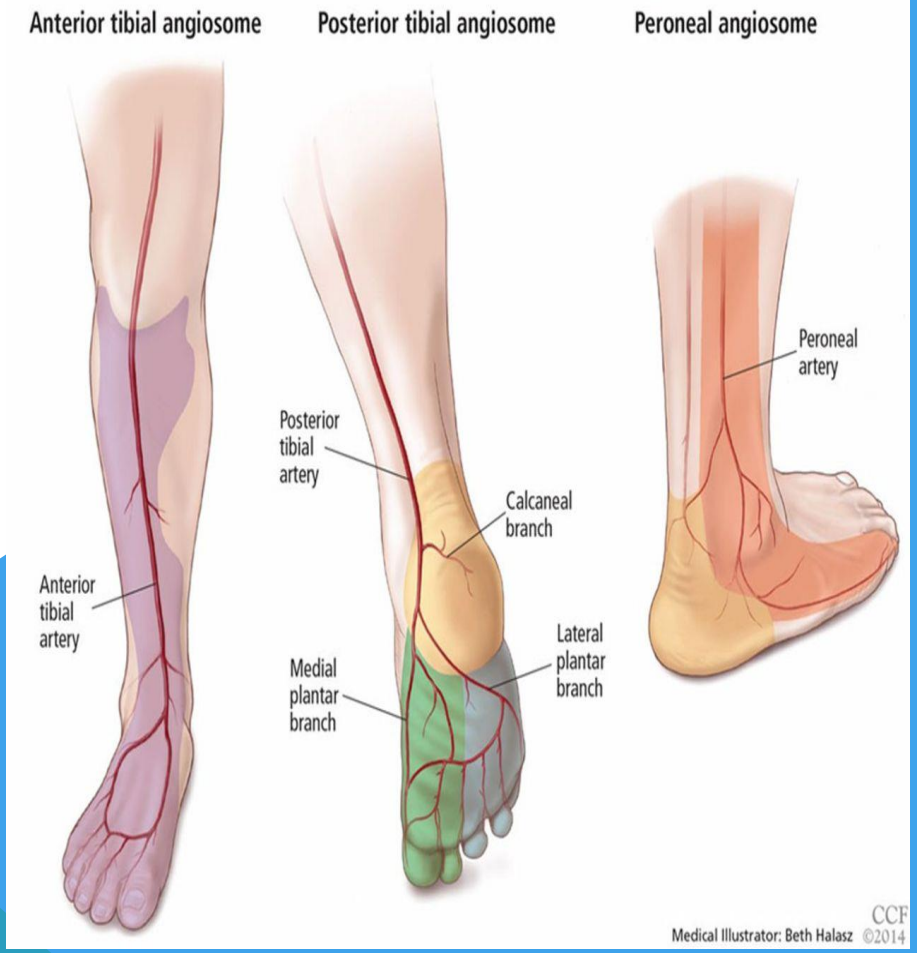

R) Femoral
L) Femoral
Gain: 49%
Segmental BP
Segment/Brachial Index
R
L
R) Sup Femoral
L) Sup Femoral
126
Brachial
132
R) Popliteal
L) Popliteal
166
1.26
170
1.29
150
1.14
148
1.12
R) Post Tibial
L) Post Tibial
145
1.10
152
1.15
143 (PT)
1.08
134 (DP)
1.02
(PT) 140
1.06
(DP) 138
1.05
R) Dors. Pedis
L) Dors. Pedis
124
0.94
TBI
120
0.91
R) Digit
L) Digit
1.08
Ankle/Brachial Index
1.06
Gain: 19%
Amp: >34 mm
Amp: 21 mm


0.71, right side
0.30, left side
Right femoral artery: biphasic
Left femoral artery: biphasic
Right popliteal artery: biphasic
Left popliteal artery: stenotic
Systolic pressures (mm Hg)
86
Brachial
150
Right posterior tibial artery: biphasic
Left posterior tibial artery: stenotic
174
131
130
76
Right dorsalis pedis artery: stenotic
Left dorsalis pedis artery: stenotic
83
84
106 (posterior tibial)
88 (dorsalis pedis)
43 (posterior tibial)
45 (dorsalis pedis)

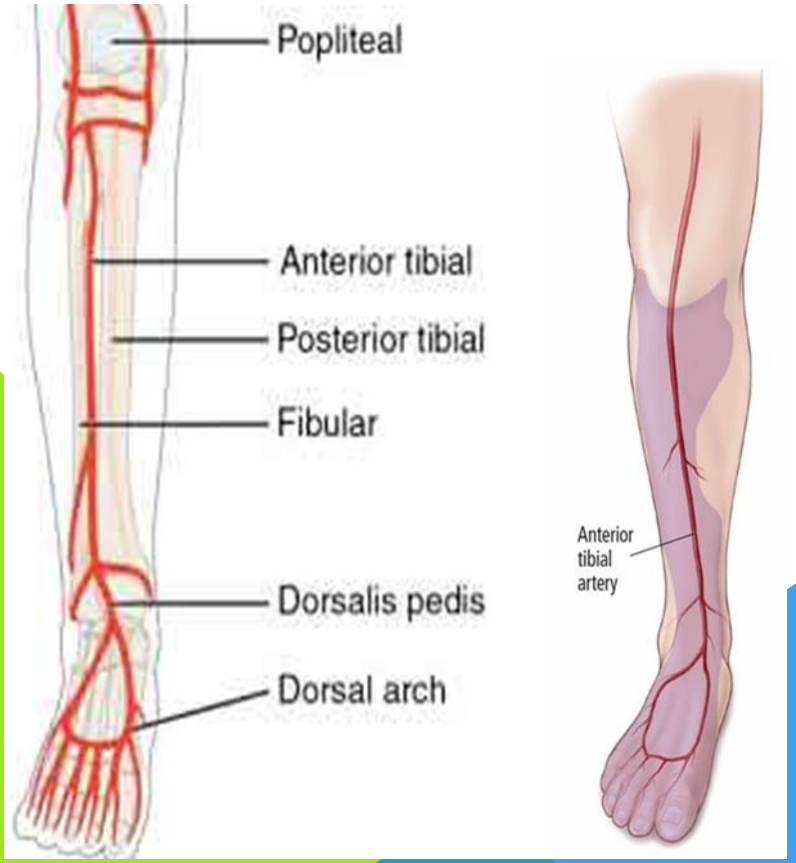


Christopher P. Cheng,Chapter 10 - Lower Extremity Arteries,Editor(s): Christopher P. Cheng, Handbook of Vascular Motion, Academic Press, 2019

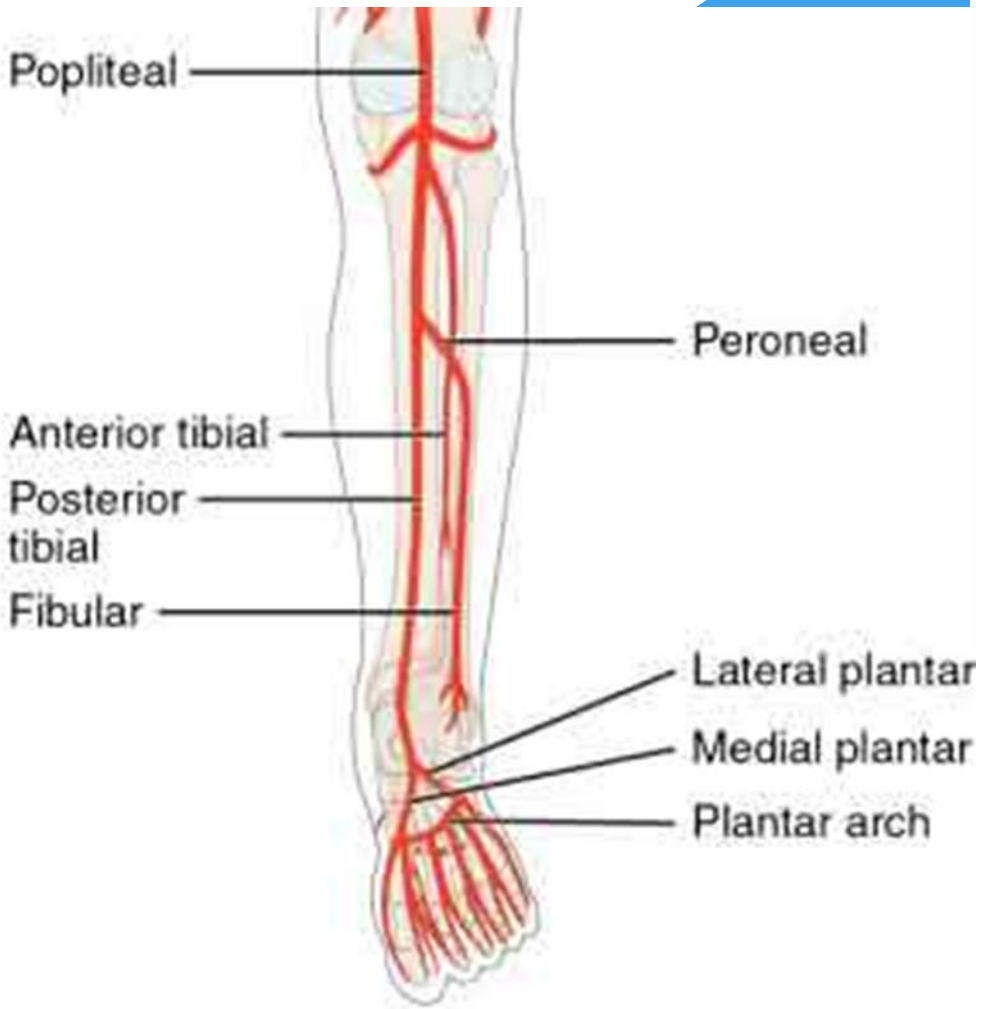
Angiosomes of the lower extremity

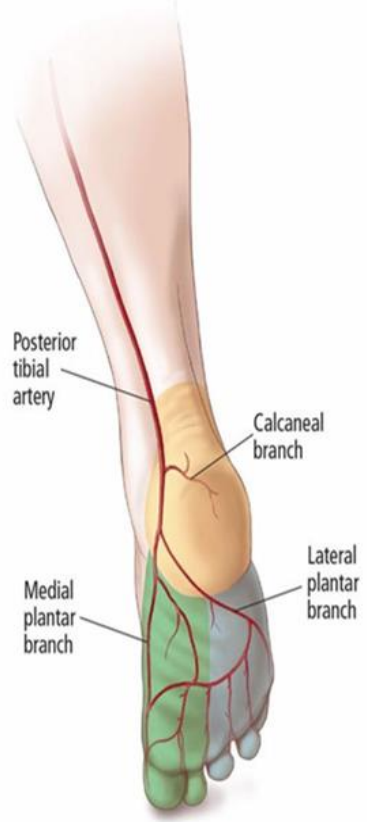


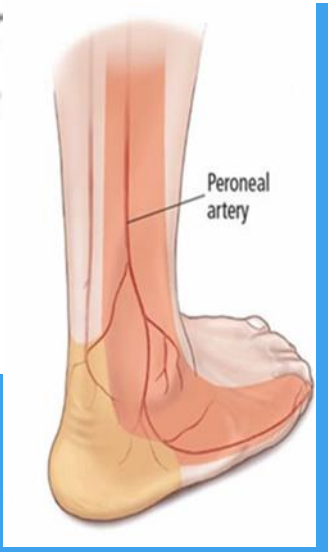
Angiosome and Tissue Healing.Fujii M, Terashi H.Ann Vasc Dis. 2019 Jun 25;12(2):147-150. doi: 10.3400/avd.ra.19-00036.

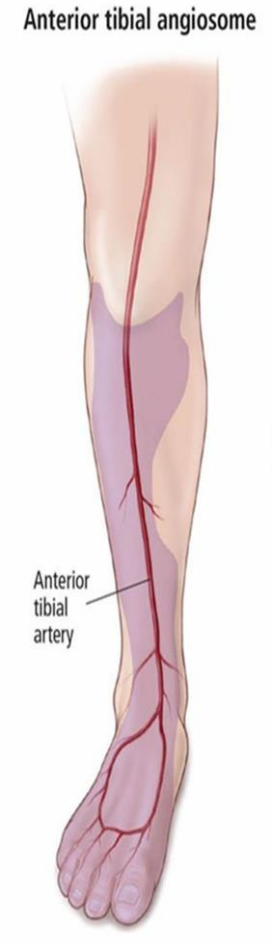

Popliteal
Anterior tibial
Posterior tibial
Fibular
Dorsalis pedis
Dorsal arch

Anterior tibial artery


Popliteal
Peroneal
Anterior tibial
Posterior tibial
Fibular
Lateral plantar
Medial plantar
Plantar arch


Posterior tibial artery
Calcaneal branch
Medial plantar branch
Lateral plantar branch


Peroneal artery


Anterior tibial angiosome
Anterior
tibial
artery

Diabetic Foot Ulcers

Diabetes, trauma, prolonged pressure	
Plantar aspect of foot, tip of the toe, lateral to fifth metatarsal	
Deep, surrounded by callus, insensate	
	
Dry, cracked, insensate, calluses	
Off-loading of pressure, topical growth factors	

DFU

Every 1.2 seconds someone develops a diabetic foot ulcer (DFU). Armstrong, Boulton, Bus, NEJM, 2017

Seconds Count: Every 7 seconds someone dies from diabetes. Every 20 seconds someone is amputated.

International Diabetes Federation / Diabetesatlas.org, Armstrong, et al, Diabetes Care 2013

More than 90% of people with diabetic peripheral neuropathy are unaware they have it.

Bongaerts, et al, Diabetes Care, 2013

Low survival prognosis

DFU 3-year cumulative mortality rate of 28%

Amputated patients approaching 50% mortality

67%percent of all lower extremity amputation patients have diabetes

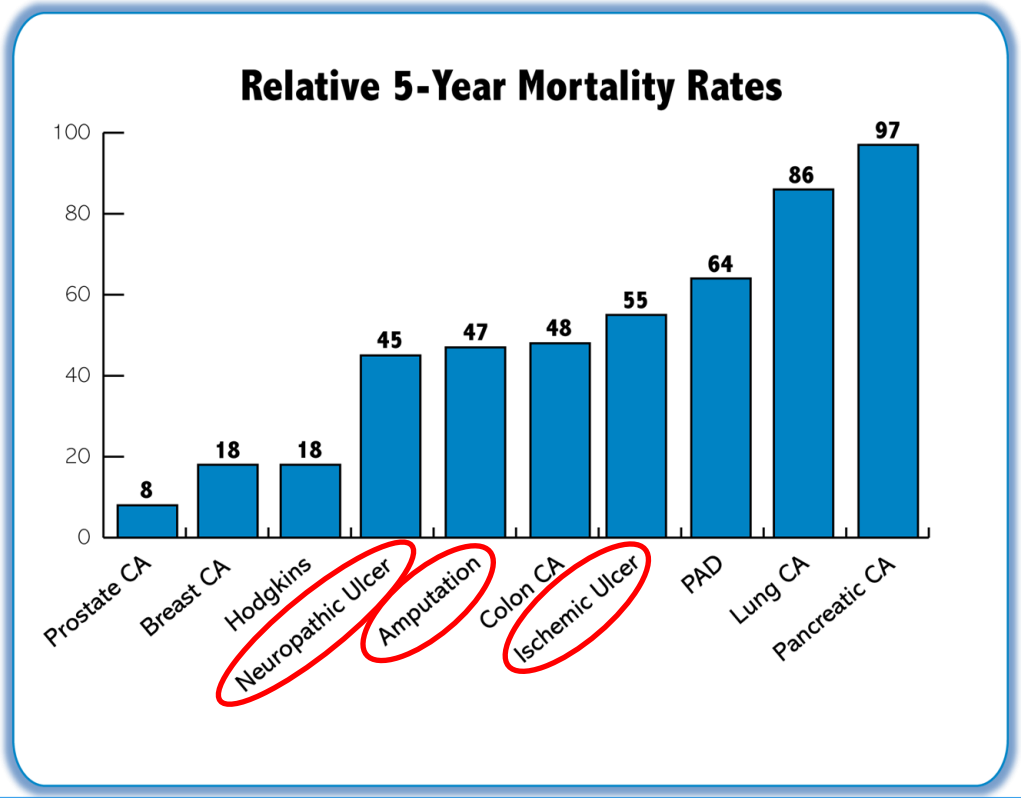
Recurrence rate is 66%

Lower-extremity amputation rate 28 X that of people without diabetes

5-year survival rate after one major lower extremity amputation is about 50%

Once amputation occurs, 50% of patients will develop an ulcer in the contralateral limb within 5 years

International Wound Journal Vol 4 No 4; 2007



DFU

ALWAYS examine the vascular status of patients with DM and a foot ulcer.

50% of these patients will have PAD

They might not give classic arterial symptoms!!!!

M.Á. Tresierra-Ayala, A. García Rojas, Association between peripheral arterial disease and diabetic foot ulcers in patients with diabetes mellitus type 2, Medicina Universitaria,Volume 19, Issue 76, 2017,Pages 123-126

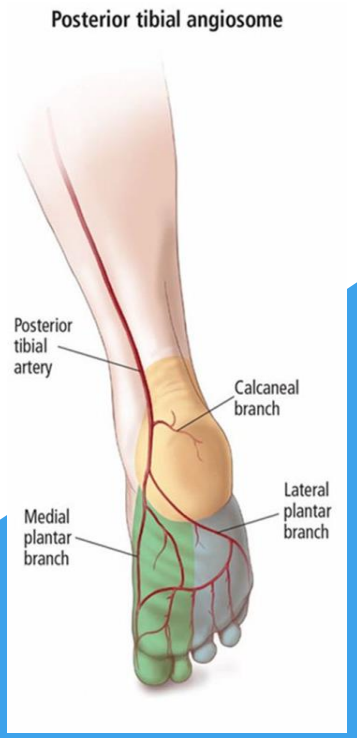
A1C levels ≥8% and fasting glucose levels ≥126 mg/dl are associated with increased likelihood of LEA in patients with DFUs.

Lane KL, Abusamaan MS, Voss BF, Thurber EG, Al-Hajri N, Gopakumar S, Le JT, Gill S, Blanck J, Prichett L, Hicks CW, Sherman RL, Abularrage CJ, Mathioudakis NN. Glycemic control and diabetic foot ulcer outcomes: A systematic review and meta-analysis of observational studies. J Diabetes Complications. 2020 Oct;34(10):107638. doi: 10.1016/j.jdiacomp.2020.107638. Epub 2020 May 22. PMID: 32527671; PMCID: PMC7721205.


EXPECTATION


REALITY

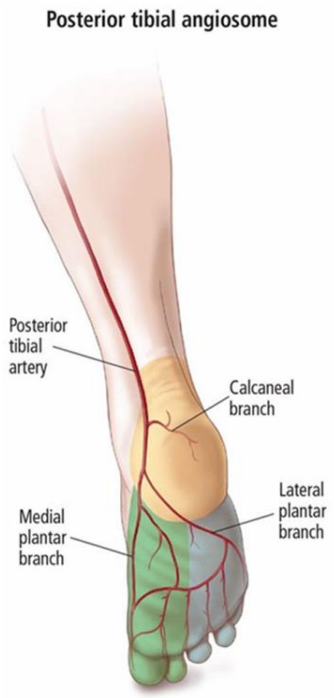
AND…
Why is it still here?

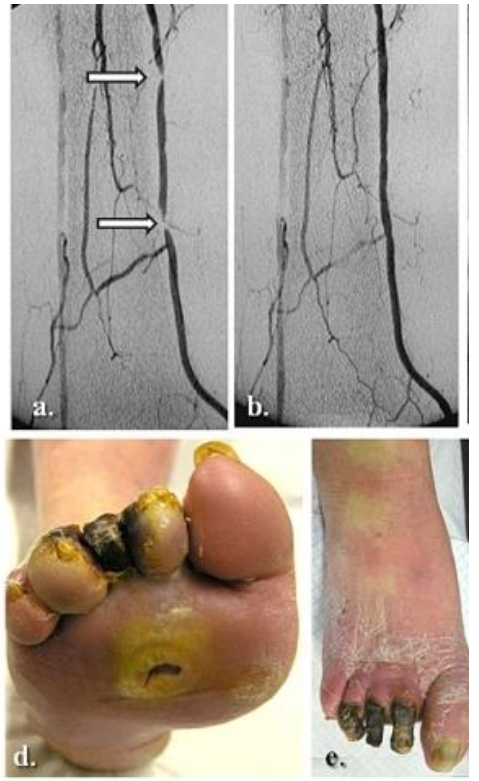

Posterior tibial angiosome
Posterior tibial artery
Calcaneal branch
Lateral plantar branch
Medial plantar branch


a.
b.
d.
e.

MIXED ULCERS!!!

Coexistence of arterial and venous disease is estimated to be present in up to 26% of patients with lower extremity ulcerations.





Nelzén O, Bergqvist D, Lindhagen A. Leg ulcer etiology—a cross sectional population study. J Vasc Surg. 1991;14:557-564.

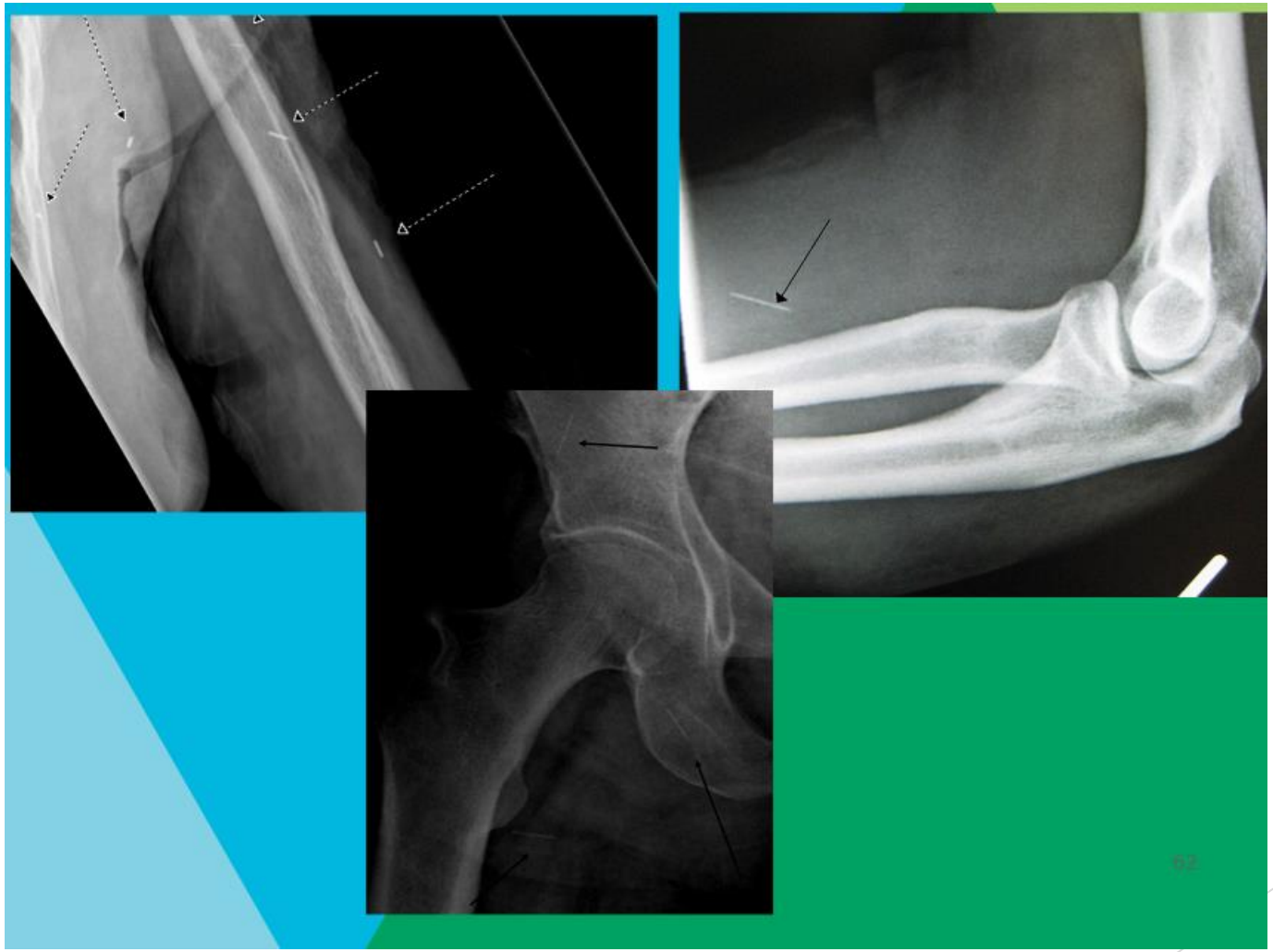
MIXED ULCERS

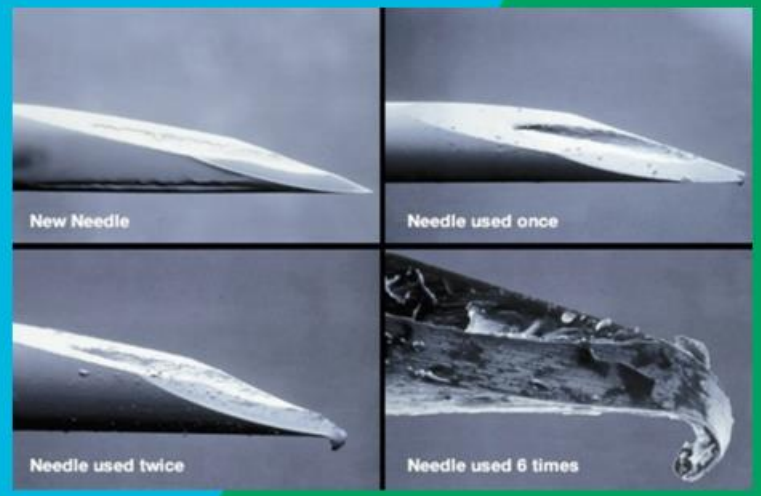
- Some patients will have **both arterial and venous disease** & they develop ulcerations from mixed etiologies.

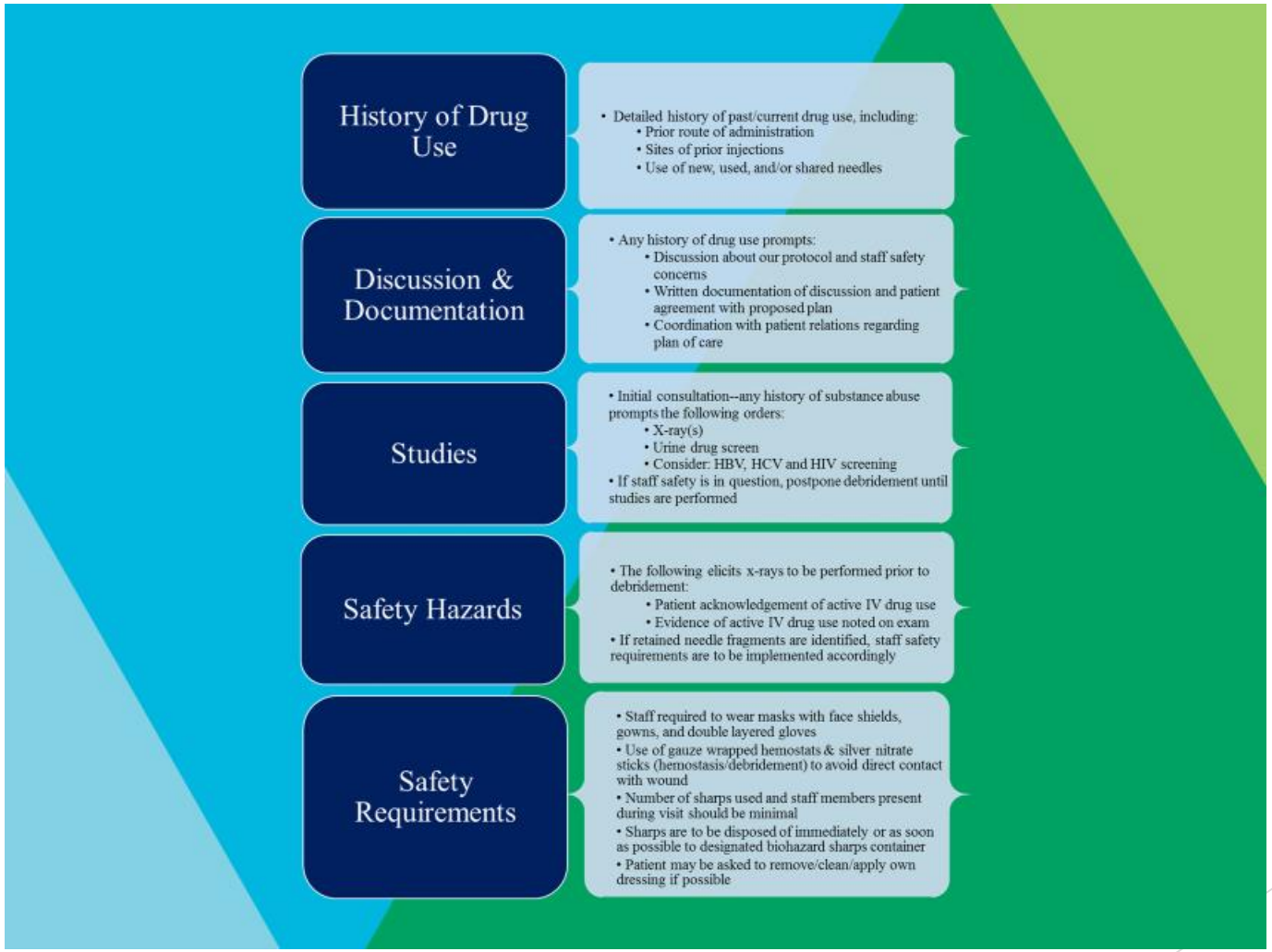
- The dominant disease process **must** be teased out and **treated first**.

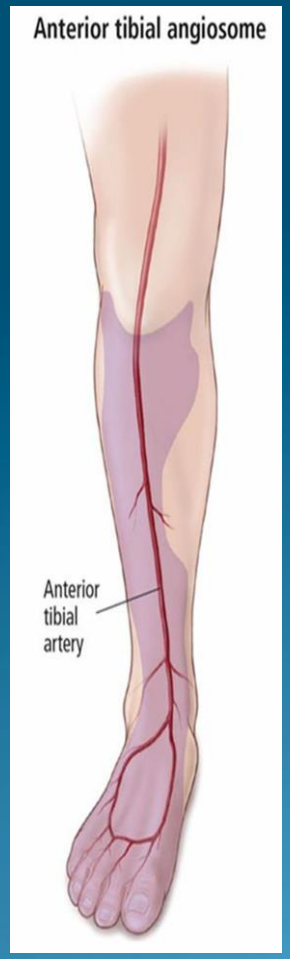
- Clinical history and physical examination are critical in diagnosis, including comorbid conditions, history of arterial or venous disease, prothrombotic states, quality of symptoms, and location of the ulcer.

Adam DJ, Naik J, Hartshorne T, et al. The diagnosis and management of 689 chronic leg ulcers in a single-visit assessment clinic. Eur J Vasc Endovasc Surg. 2003;25:462-468.
Androulakis AE, Giannoukas AD, Labropoulos N, et al. The impact of duplex scanning on vascular practice. Int Angiol. 1996;15:283-290.




New Needle
Needle used once
Needle used twice
Needle used 6 times


History of Drug Use
• Detailed history of past/current drug use, including:
• Prior route of administration
• Sites of prior injections
• Use of new, used, and/or shared needles
Discussion & Documentation
• Any history of drug use prompts:
• Discussion about our protocol and staff safety concerns
• Written documentation of discussion and patient agreement with proposed plan
• Coordination with patient relations regarding plan of care
Studies
• Initial consultation--any history of substance abuse prompts the following orders:
• X-ray(s)
• Urine drug screen
• Consider: HBV, HCV and HIV screening
• If staff safety is in question, postpone debridement until studies are performed
Safety Hazards
• The following elicits x-rays to be performed prior to debridement:
• Patient acknowledgement of active IV drug use
• Evidence of active IV drug use noted on exam
• If retained needle fragments are identified, staff safety requirements are to be implemented accordingly
Safety Requirements
• Staff required to wear masks with face shields, gowns, and double layered gloves
• Use of gauze wrapped hemostats & silver nitrate sticks (hemostasis/debridement) to avoid direct contact with wound
• Number of sharps used and staff members present during visit should be minimal
• Sharps are to be disposed of immediately or as soon as possible to designated biohazard sharps container
• Patient may be asked to remove/clean/apply own dressing if possible


Anterior tibial angiosome
Anterior
tibial
artery

How to Treat:

**********MOST IMPORTANT**********

Think of a wound as a surrogate marker for disease.

Manage the Medical Conditions!!!!

HOW TO TREAT:

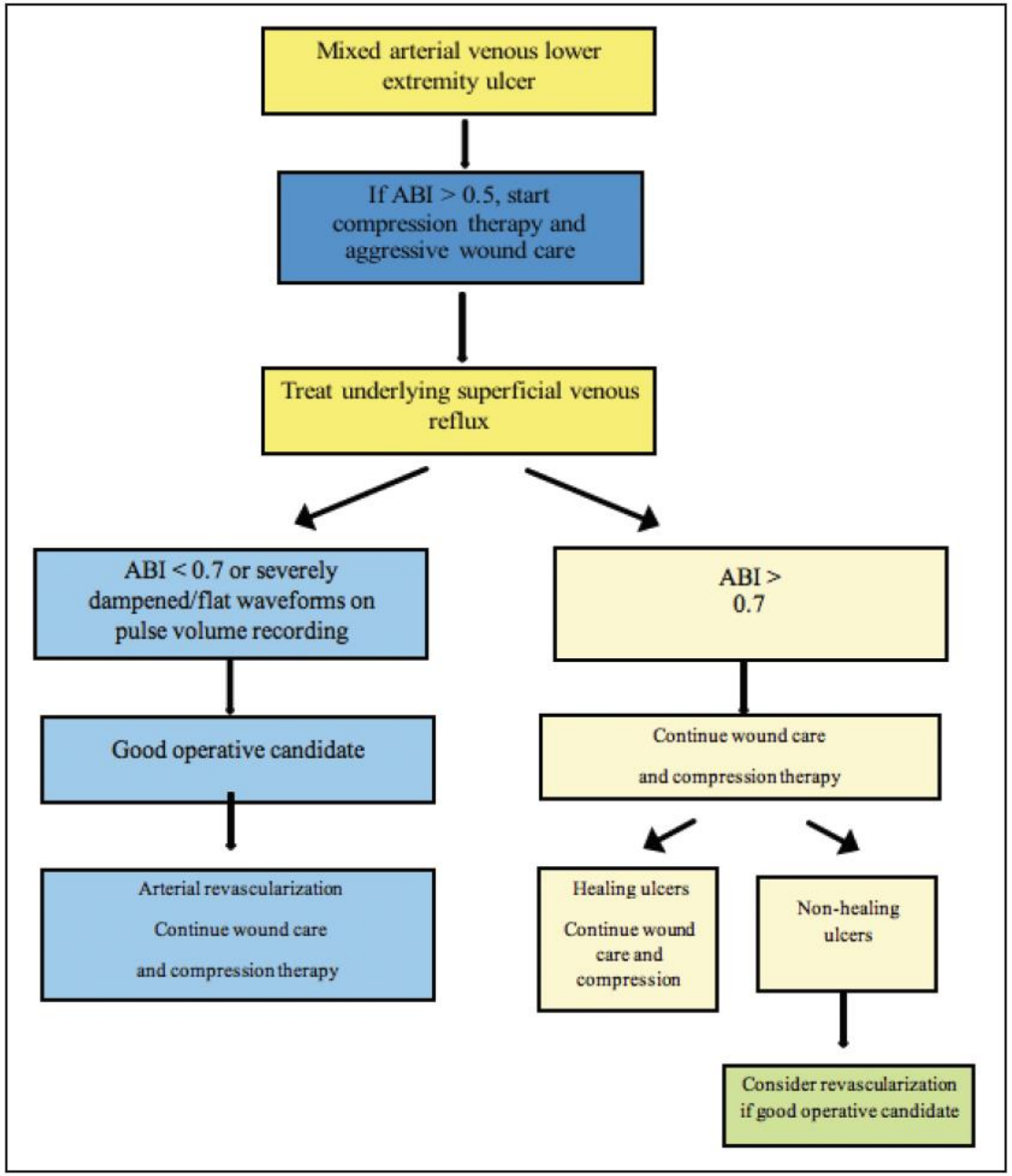
- SOAP AND WATER!!!
- Cover with gauze or alginate
- Change daily and PRN
- Elevate, calf pump exercises

ALL PATIENTS WITH LOWER EXTREMITY ULCER:

- Noninvasive diagnostic tests of choice include ABI for diagnosis of peripheral arterial occlusive disease
- Duplex ultrasound for venous reflux or thrombosis

Androulakis AE, Giannoukas AD, Labropoulos N, et al. The impact of duplex scanning on vascular practice. Int Angiol. 1996;15:283-290

Lazarides MK, Giannoukas AD. The role of hemodynamic measurements in the management of venous and ischemic ulcers. Int J Low Extrem Wounds. 2007;6:254-261



Treatment algorithm for patients with mixed arterial and venous lower extremity ulceration. Nasim Hedayati, John G Carson, Yung-Wei Chi, et al, Vascular Medicine (Volume 20, Issue 5) pp. 8,

CASE #1


CeraVe
DEVELOPED WITH DERMATOLOGISTS
SA Cream
for
Rough & Bumpy Skin
Exfoliates & moisturizes while helping to restore the protective skin barrier
3 ESSENTIAL CERAMIDES


Tubigrip


MEDLINE
ABD Pads
Extra Absorbent

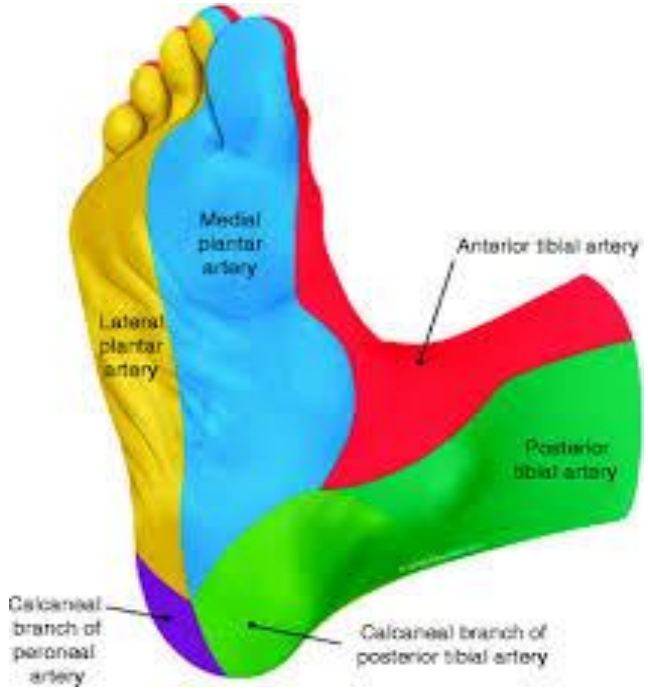
CASE #2

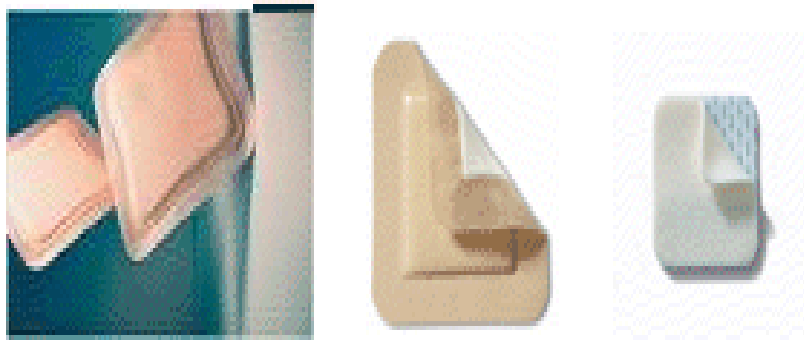
arterial

venous

CASE #3

Venous
Arterial
?DM/neuropathy
Pressure





Mustapha J.A., Saab F.A. (2014) Angiosome Directed Interventions. In: Dieter R., Dieter, Jr. R., Dieter, III R. (eds) Endovascular Interventions. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-7312-1_58

CASE#4


Walgreens
10%
Povidone-
Iodine
Solution
FIRST AID ANTISEPTIC


MEDLINE
REF NON25812
NON-STERILE | NON-STÉRILE | NO ESTÉRIL
WOVEN GAUZE SPONGES
ÉPONGES DE GAZE TISSÉ
ESPONJAS DE GASA TEJIDA
8 x 4 IN (20.32 x 10.16 CM)
200
REF NON25412
200


COVIDIEN
REF 8884431605
Xeroform
Occlusive Petrolatum Gauze Strip
5" x 9" (12.7 cm x 22.9 cm)
Made in USA

THANK YOU