EXTREMITY CASE STUDIES, PEARLS, TRICKS, AND TECHNIQUES

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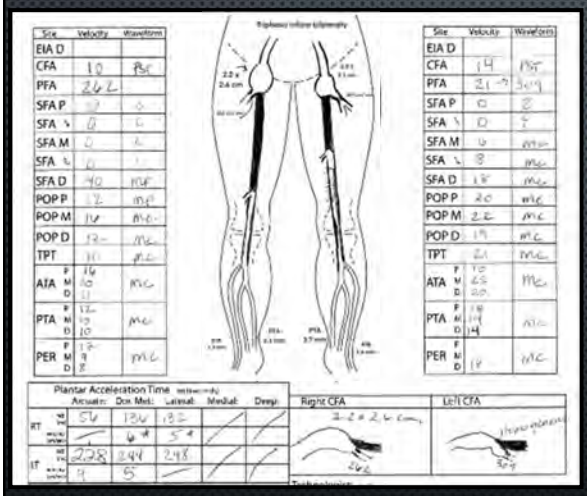
DISCLOSURES

- CSI Consultant
- Philips Consultant

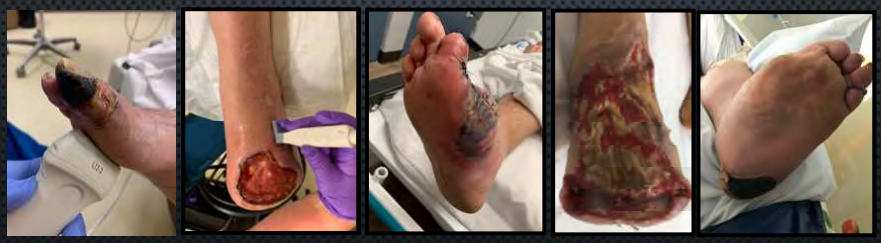


ARTERIAL DUPLEX ULTRASOUND

ABI

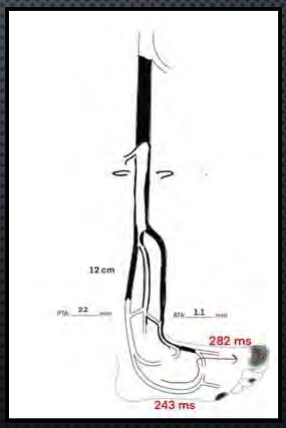
TBI

TCPO2

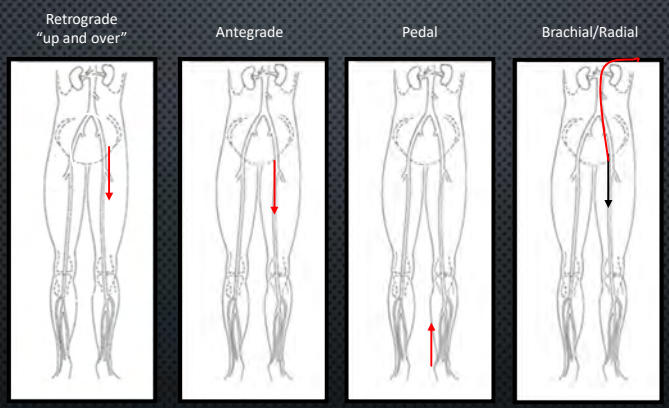


8 KEY ELEMENTS

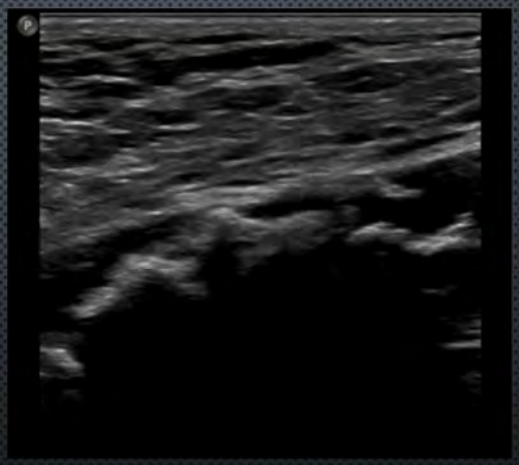
1) Access options for endovascular intervention
2) Additional information of the Profunda
3) Details of the SFA occlusion (CTO cap morphology)
4) Level of SFA reconstitution
5) Runoff details and options for Pedal Access
6) Communicating Arteries
7) Pedal Acceleration Time (PAT)
8) Pedal Flow Hemodynamics



ACCESS OPTIONS



- Plaque characteristics
- High SFA/PFA bifurcation
- Aneurysmal



CFA plaque

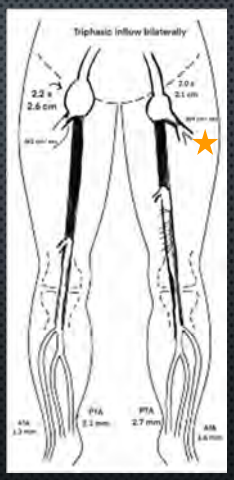
Endovascular options:

- Pedal
- CFA
- Radial/Brachial

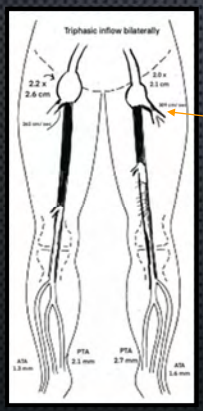
Open surgery options:

- Fem to **above** knee Popliteal bypass graft-
Can use vein or synthetic material (propaten)

- Fem to **below** knee Popliteal bypass graft-
Use vein – low patency rate with synthetic material

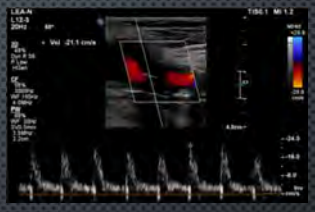


PROFUNDA EVALUATION



Profunda: 306 cm/sec

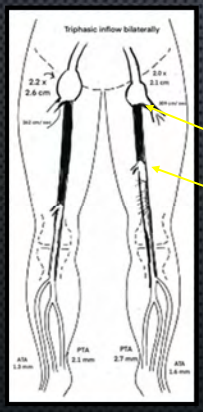
(*) CLTI patients - scan to the 1st or second order branch



Origin

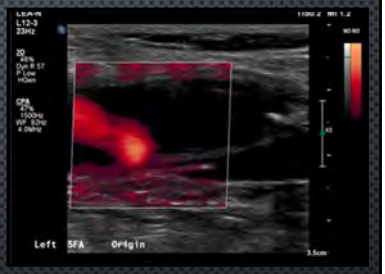
1st Order branch
309 cm/sec

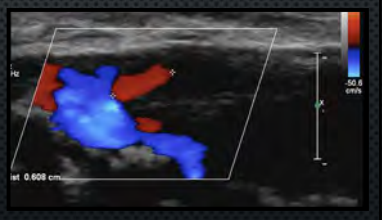
SFA OCCLUSION



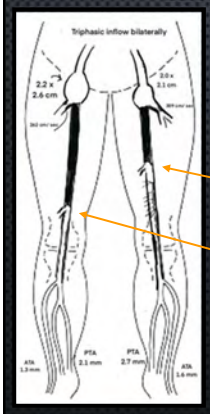
Flush Occlusion

Concave cap from the foot





LEVEL OF SFA RECONSTITUTION



- Long CTO to cross?
- Is there vein for a conduit?
- PTFE or Composite?

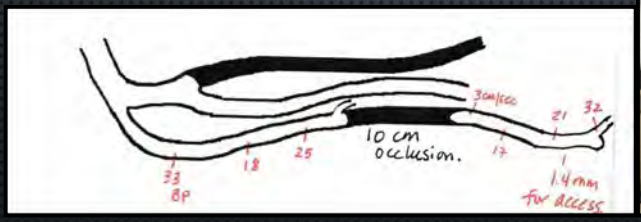
Above the knee bypass

Below the knee

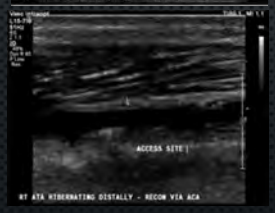
Distal Target

RUNOFF DETAILS AND PEDAL ACCESS OPTIONS

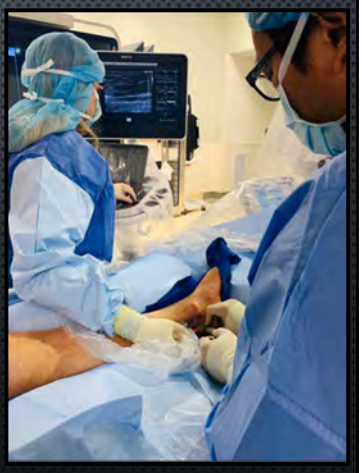
- Tibial stenosis
- Calcified ?
- Length of occlusion
- Pedal Diameters

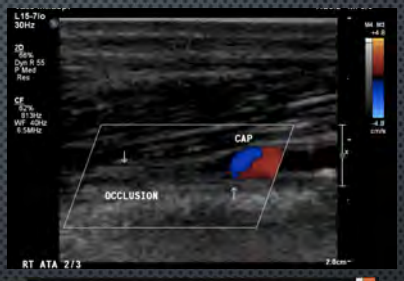


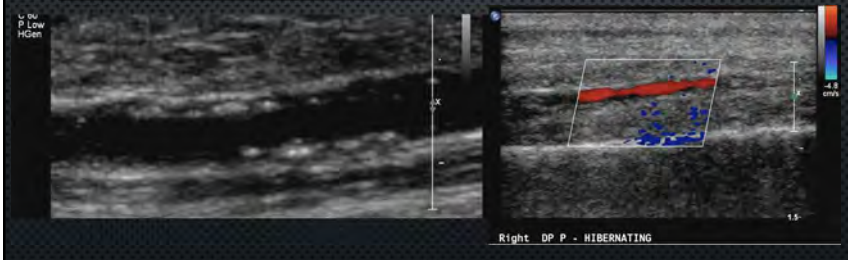
RUNOFF DETAILS AND PEDAL ACCESS OPTIONS



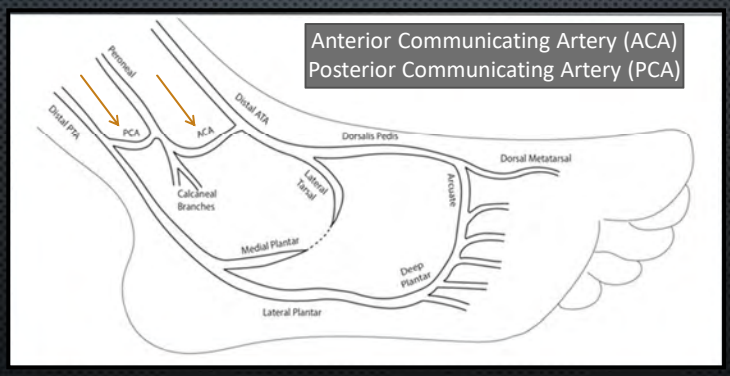
- AP Diameter
- Plaque Morphology



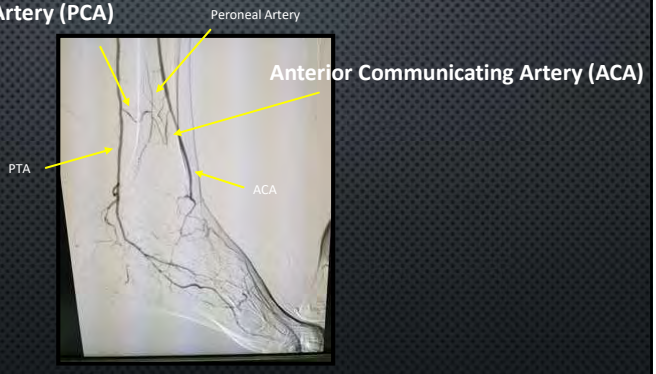




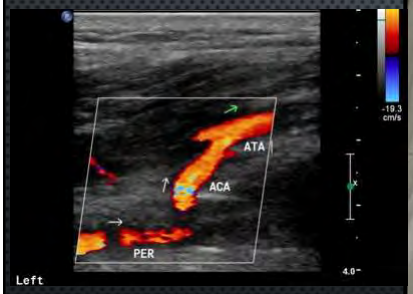
COMMUNICATING ARTERIES

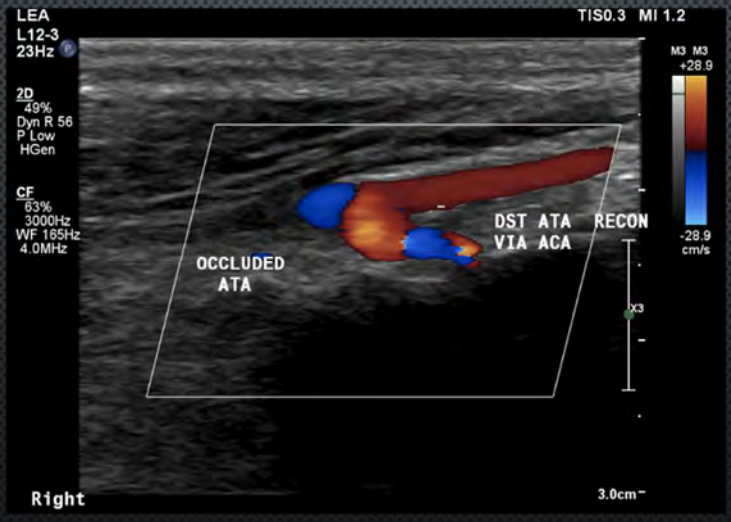


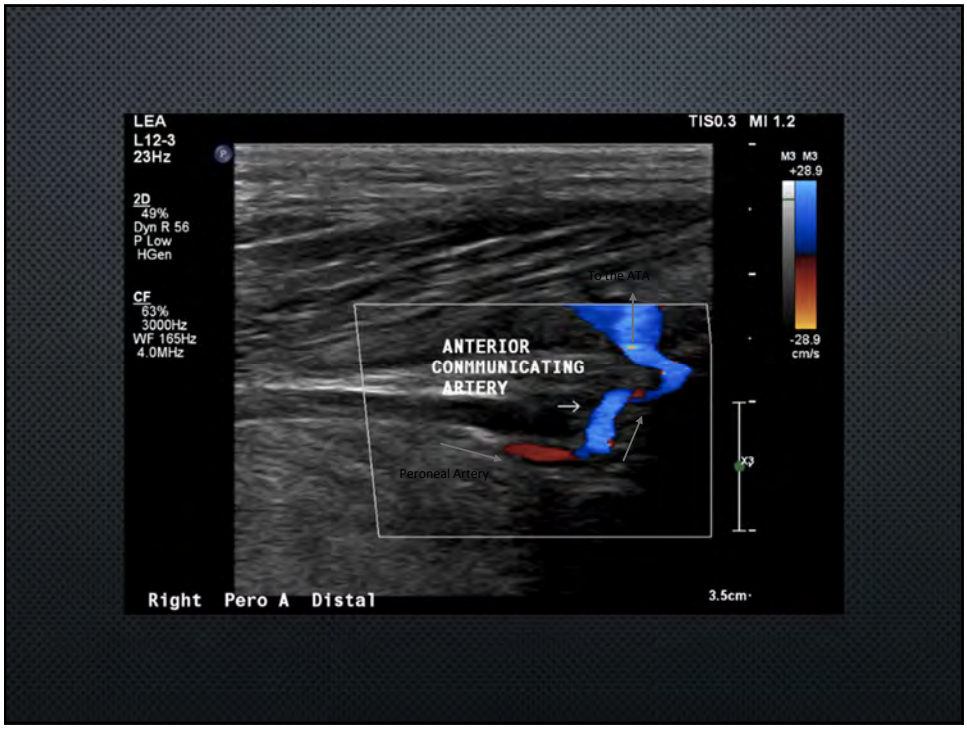
Posterior Communicating Artery (PCA)

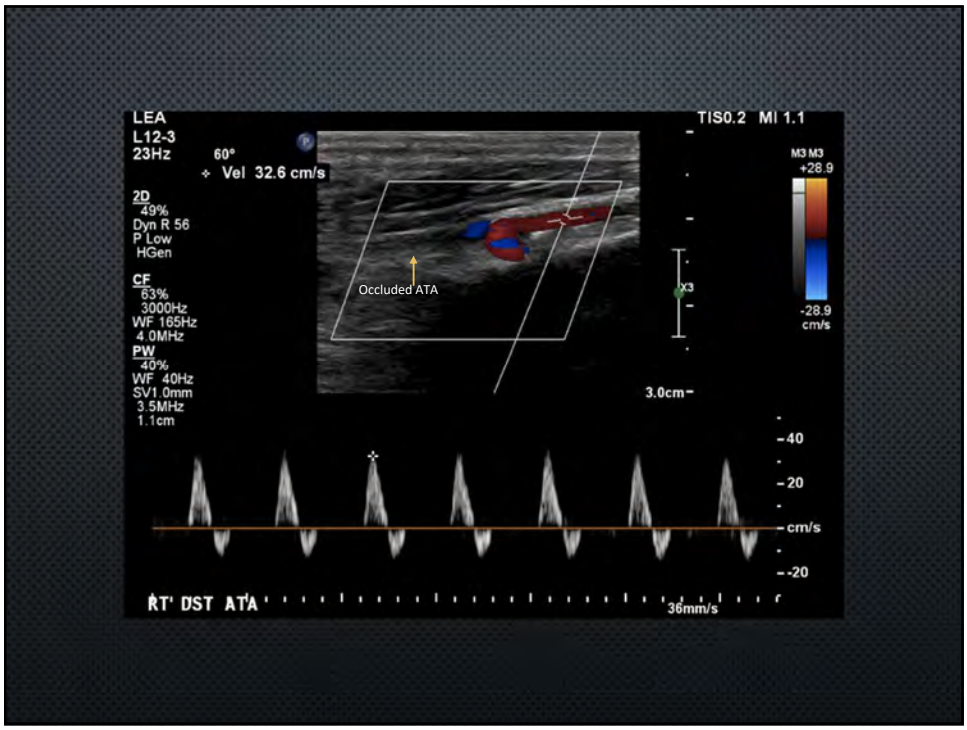


VIEW FOR THE ACA - LATERAL APPROACH

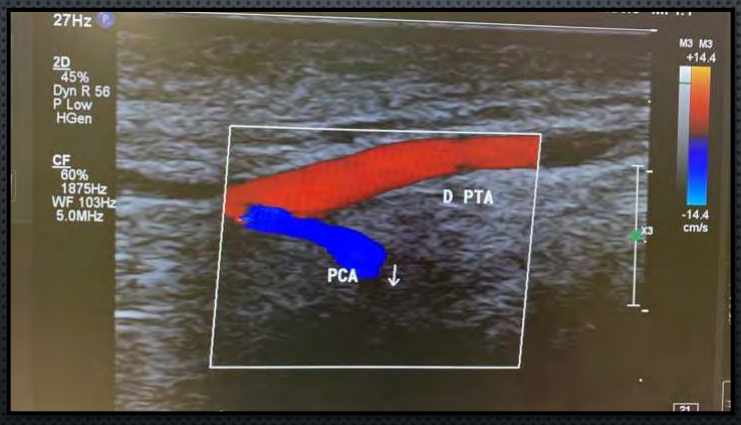




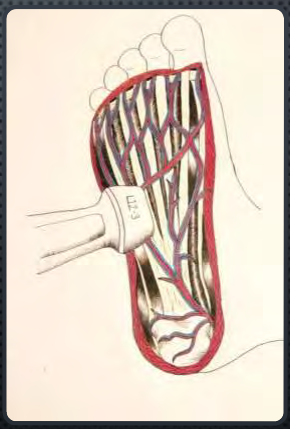

LEA
L12-3
23Hz
2D
49%
Dyn R 56
P Low
HGen
CF
63%
3000Hz
WF 165Hz
4.0MHz
TIS0.3 MI 1.2
M3 M3
+28.9
-28.9
cm/s
Distal ATA
ANTERIOR
COMMMUNICATING
ARTERY
Peroneal Artery
Right Pero A Distal
3.5cm


LEA
L12-3
23Hz
60°
Vel 32.6 cm/s
2D
49%
Dyn R 56
P Low
HGen
CF
63%
3000Hz
WF 165Hz
4.0MHz
PW
40%
WF 40Hz
SV1.0mm
3.5MHz
1.1cm
TIS0.2 MI 1.1
M3 M3
+28.9
-28.9
cm/s
Occluded ATA
3.0cm
40
20
cm/s
-20
RT DST ATA
36mm/s

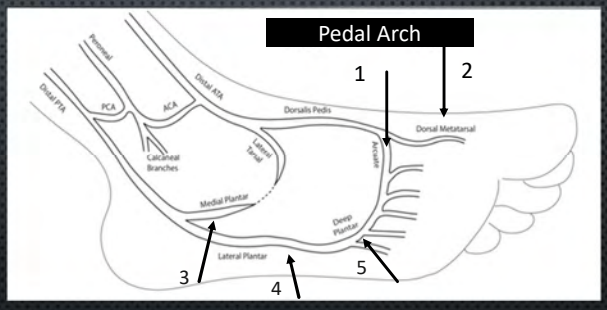
VIEW FOR THE PCA - MEDIAL APPROACH



PEDAL ACCELERATION TIME(PAT) AND PEDAL ARCH DUPLEX

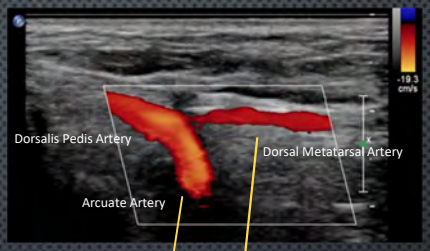


1) Arcuate Artery
2) Dorsal Metatarsal
3) Medial Plantar
4) Lateral Plantar
5) Deep Plantar

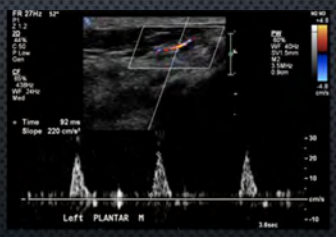


1) Arcuate Artery

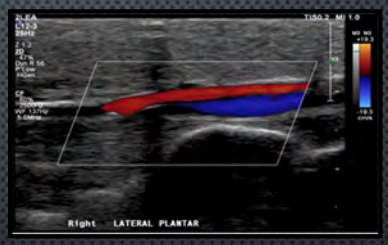
2) Dorsal Metatarsal Artery

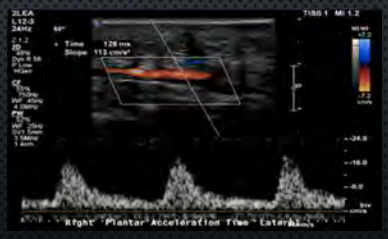


3) Medial Plantar Artery



4) Lateral Plantar Artery



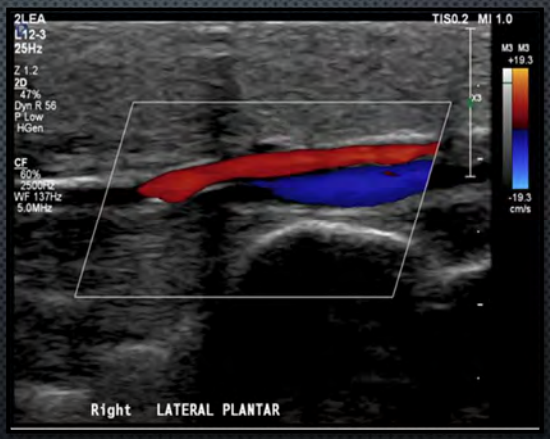


5) Deep Plantar Artery

1. Correct probe orientation

2. Decrease color scale

3. Adjust the color box appropriately



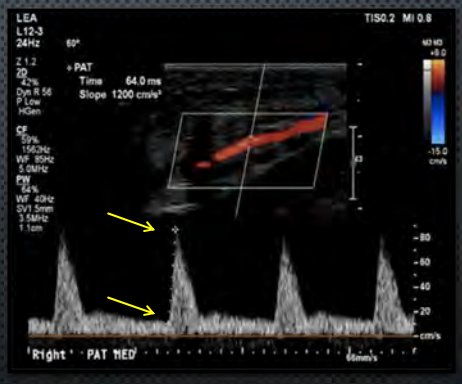
CORRECT MEASURING TECHNIQUE

1. Medium sweep speed

2. Decrease scale to fill ¾ of the spectra
** very important

3. Time/slope

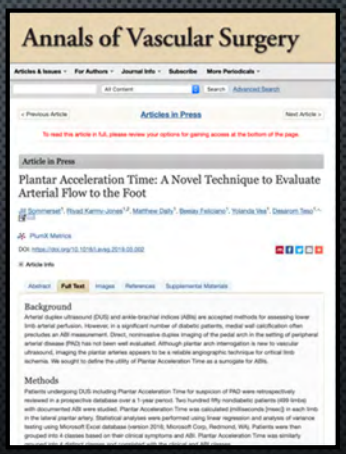
4. Onset of systole to the peak of systole



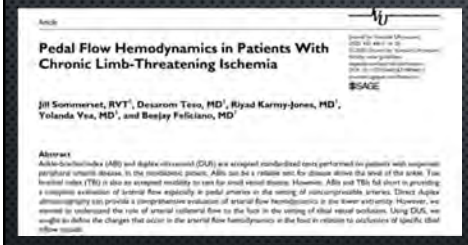
PAT CRITERIA

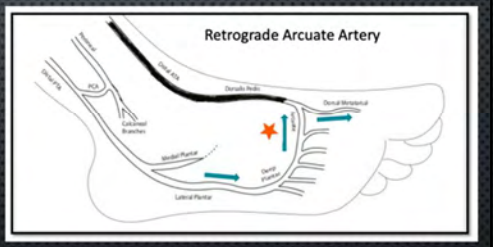
	No Ischemia Class 1	Mild Ischemia Class 2	Moderate Ischemia Class 3	Severe Ischemia Class 4
Clinical Symptoms	Asymptomatic	Less than 2 block claudication	Greater than 2 block claudication	CLTI (Tissue Loss, rest pain)
PAT	20 – 120 ms	121 – 180 ms	181 – 224 ms	Greater than 225ms
ABI	1.3 – 0.90	0.89 – 0.69	0.68 – 0.50	0.49 – 0.00

Sommerset et al AVS 2019

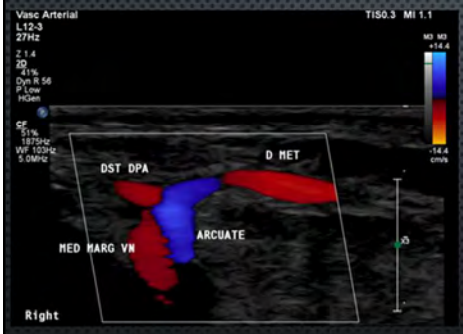


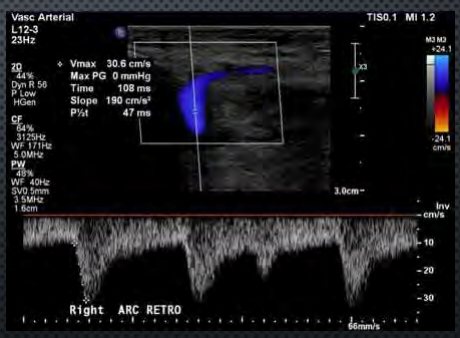
PEDAL FLOW HEMODYNAMICS

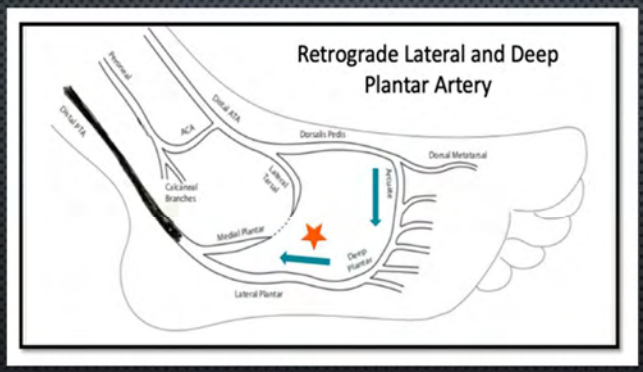




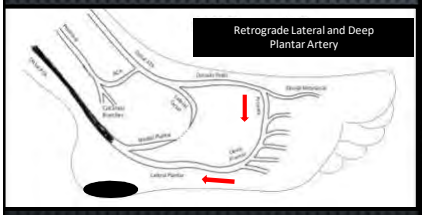
Arcuate can be retrograde

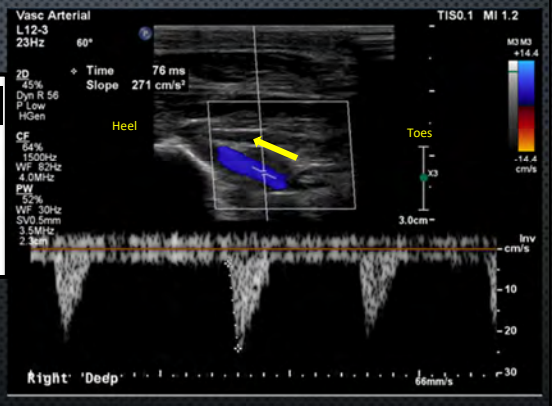




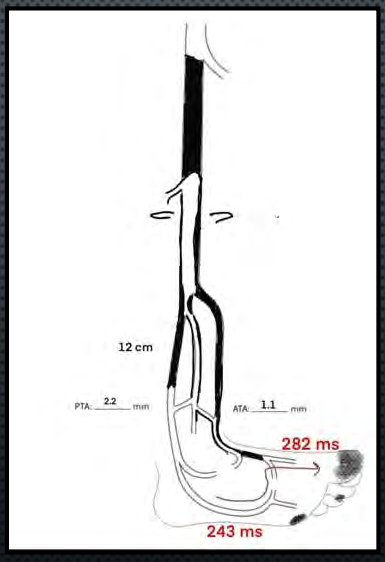


Lateral and/or Deep Plantar can be retrograde



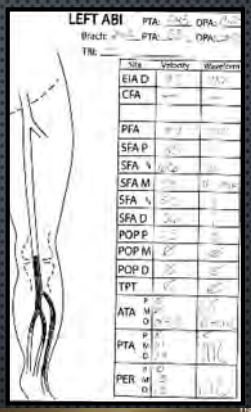


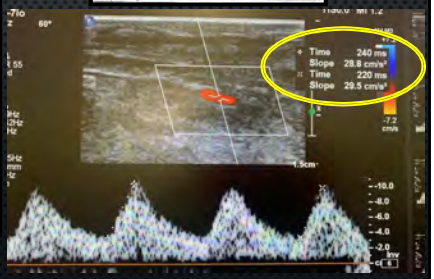
Put it all together



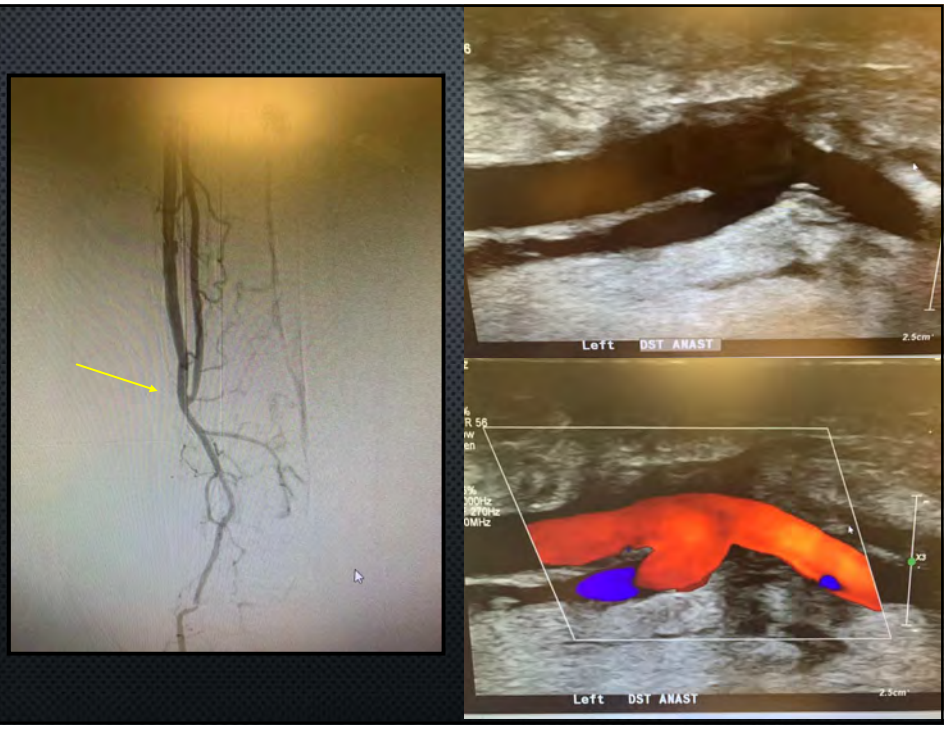
CASE ILLUSTRATIONS

VALUE IN DETAILED DUPLEX IN THE CLTI PATIENT





Pre op - PAT: 260ms class 4



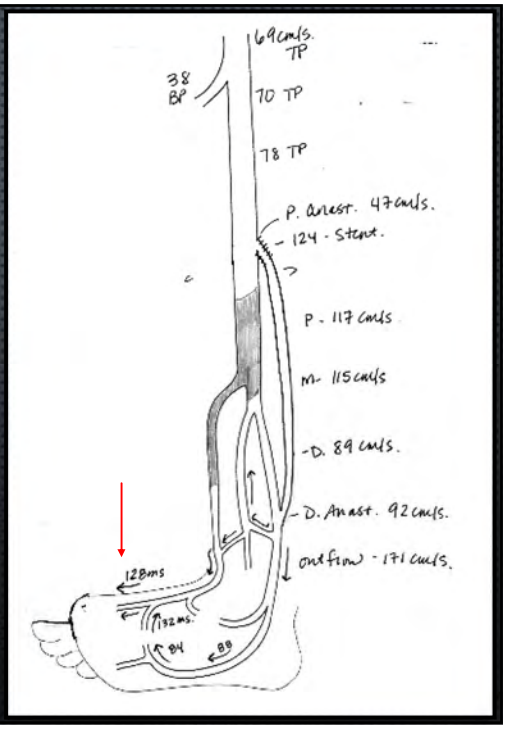
SFA – distal PTA bypass

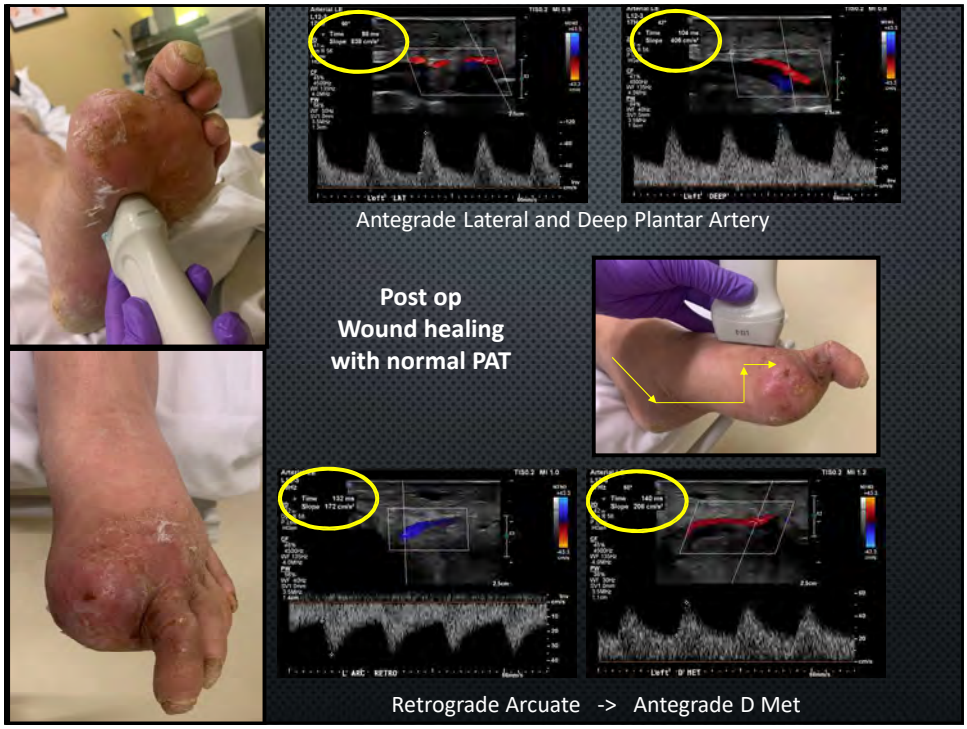
Pedal Flow Hemodynamics:

Antegrade lateral plantar -> deep plantar

Retrograde flow to the Arcuate Artery with antegrade flow in the Dorsal Metatarsal Artery.

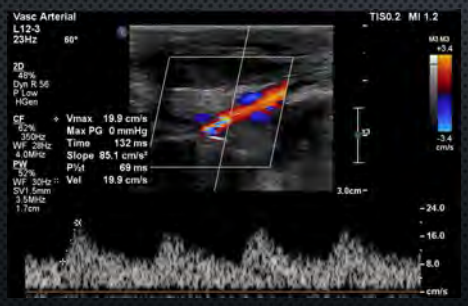
Normal PAT by indirect revascularization.





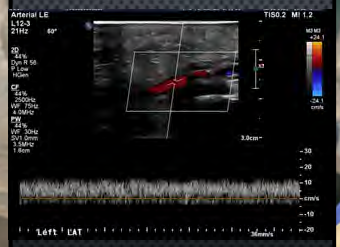
CASE ILLUSTRATION

- 72 year old diabetic male presented with left foot gangrene and infection.
- Previous right transmetatarsal amputation.
- Imaging studies showed severe left Iliac disease and SFA occlusion.

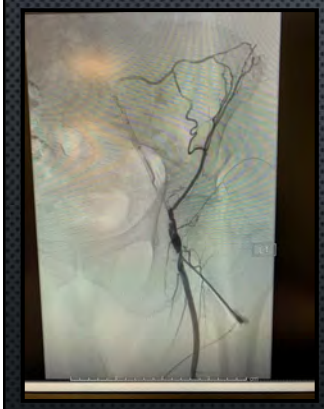


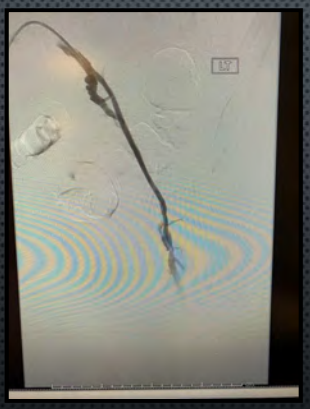
Class 2 PAT – 132ms

ROUTINE SURVEILLANCE

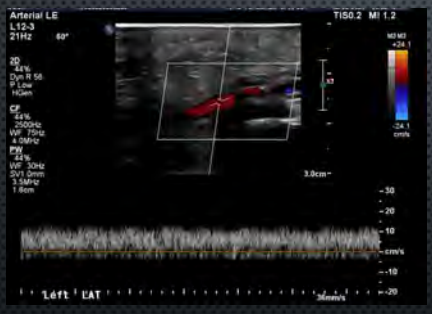


Interval change to
Class 4 PAT



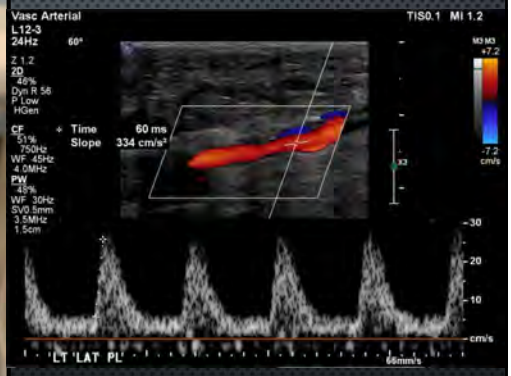


Pre procedure
Class 4



Immediate post bypass
Class 2


1 week post op
Class 1 PAT
84ms

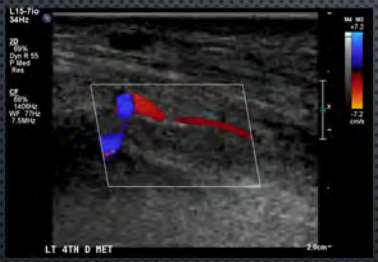


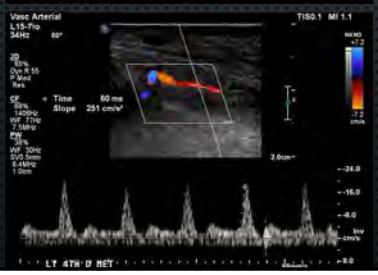
3 weeks post op

Class 1 PAT

84ms

DUPLEX ULTRASOUND DEFINED ANGIOSOME





Occluded ATA and DPA
Indirect flow from the posterior circulation

Class 1 PAT
60ms

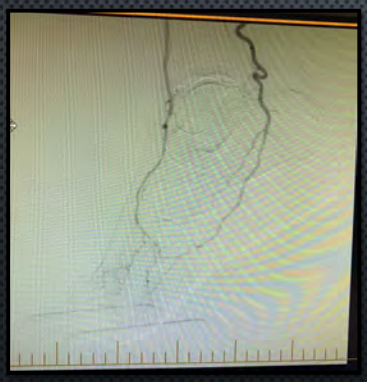
Cath lab

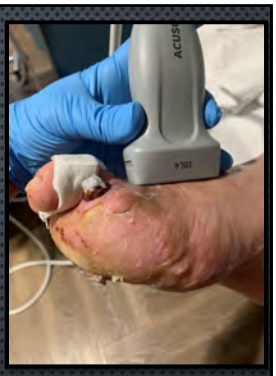
OR

Outpatient Surveillance of Wound Healing

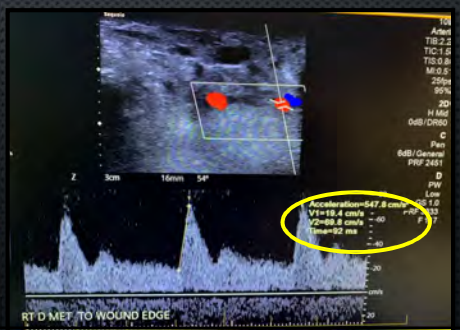
ROLE OF PAT IN DECISION MAKING

NEUROPATHIC
NORMAL PAT



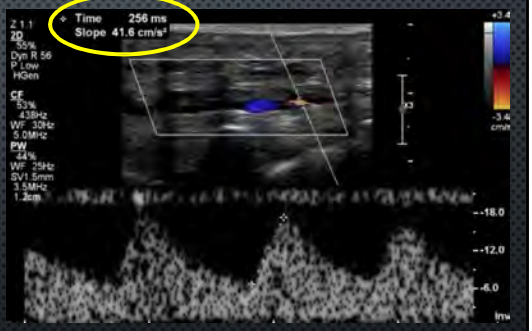


CLASS 1 - PAT 92ms



	No Ischemia Class 1	Mild Ischemia Class 2	Moderate Ischemia Class 3	Severe Ischemia Class 4
Clinical Symptoms	Asymptomatic	Greater than 2 block claudication	Less than 2 block claudication	CLTI (Tissue loss, rest pain)
PAT	20-120ms	121-180ms	181-224ms	Greater than 225ms
ABI	1.3 – 0.90	0.89 – 0.69	0.68 – 0.50	0.49 – 0.00

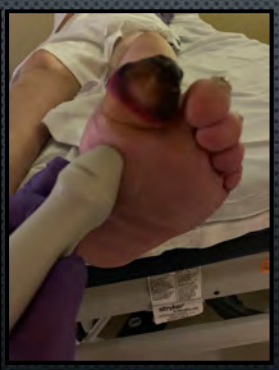
ISCHEMIC
CLTI – ABNORMAL PAT



CLASS 4 PAT - 256ms

	No Ischemia Class 1	Mild Ischemia Class 2	Moderate Ischemia Class 3	Severe Ischemia Class 4
Clinical Symptoms	Asymptomatic	Greater than 2 block claudication	Less than 2 block claudication	CLTI (Tissue loss, rest pain)
PAT	20-120ms	121-180ms	181-224ms	Greater than 225ms
ABI	1.3 – 0.90	0.89 – 0.69	0.68 – 0.50	0.49 – 0.00

NEUROISCHEMIC ABNORMAL PAT



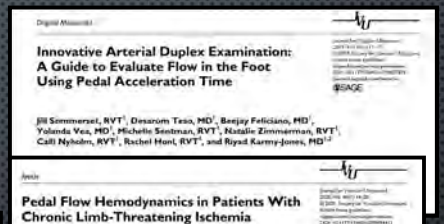
CLASS 4 - PAT 224ms

	No Ischemia Class 1	Mild Ischemia Class 2	Moderate Ischemia Class 3	Severe Ischemia Class 4
Clinical Symptoms	Asymptomatic	Greater than 2 block claudication	Less than 2 block claudication	CLTI (Tissue loss, rest pain)
PAT	20-120ms	121-180ms	181-224ms	Greater than 225ms
ABI	1.3 – 0.90	0.89 – 0.69	0.68 – 0.50	0.49 – 0.00

CURRENT STATE AND FUTURE OF PAT

ELSEVIER

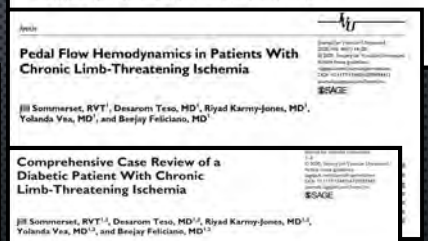
Plantar Acceleration Time: A Novel Technique to Evaluate Arterial Flow to the Foot



Innovative Arterial Duplex Examination: A Guide to Evaluate Flow in the Foot Using Pedal Acceleration Time

SAGE

Jill Sommerset, RVT[1], Desarom Teso, MD[1], Beejay Feliciano, MD[1], Yolanda Vea, MD[1], Michelle Sentman, RVT[1], Natalie Zimmerman, RVT[1], Cali Nyholm, RVT[1], Rachel Honl, RVT[1], and Riyad Karmy-Jones, MD[1,2]



Pedal Flow Hemodynamics in Patients With Chronic Limb-Threatening Ischemia

SAGE

Jill Sommerset, RVT[1], Desarom Teso, MD[1], Riyad Karmy-Jones, MD[1], Yolanda Vea, MD[1], and Beejay Feliciano, MD[1]

Comprehensive Case Review of a Diabetic Patient With Chronic Limb-Threatening Ischemia

SAGE

Jill Sommerset, RVT[1,4], Desarom Teso, MD[1,2], Riyad Karmy-Jones, MD[1,2], Yolanda Vea, MD[1,2], and Beejay Feliciano, MD[1,2]

Abstract

Keywords

Annals of Vascular Surgery

Available online 3 April 2021

In Press, Journal Pre-proof

Clinical Research, Basic Science

Pedal Acceleration Time (PAT): A Novel Predictor of Limb Salvage

Desarom Teso MD[1,2,*], Jill Sommerset RVT[1,2], Matthew Dally MS[3], Beejay Feliciano MD[1,2], Yolanda Vea MD[1,2], Riyad Karmy-Jones MD[1,2]

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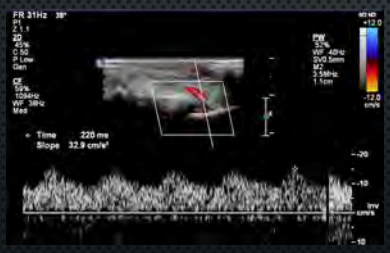
[2] Elson S. Floyd College of Medicine, Washington State University, Pullman, Washington

[3] Oregon Health and Sciences University, Portland, Oregon

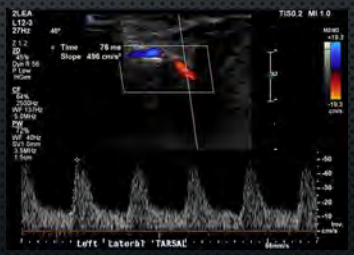
Available online 3 April 2021.

PRE PROCEDURE



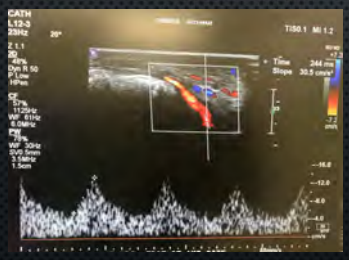
Class 3 - PAT 220 ms

POST PROCEDURE



Class 1 - PAT 76 ms

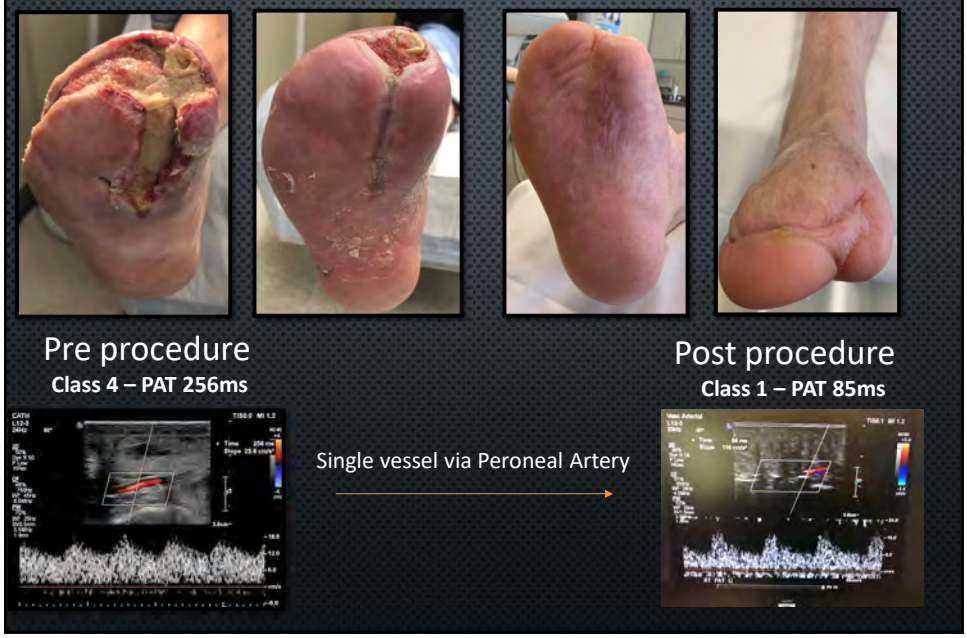
PRE PROCEDURE

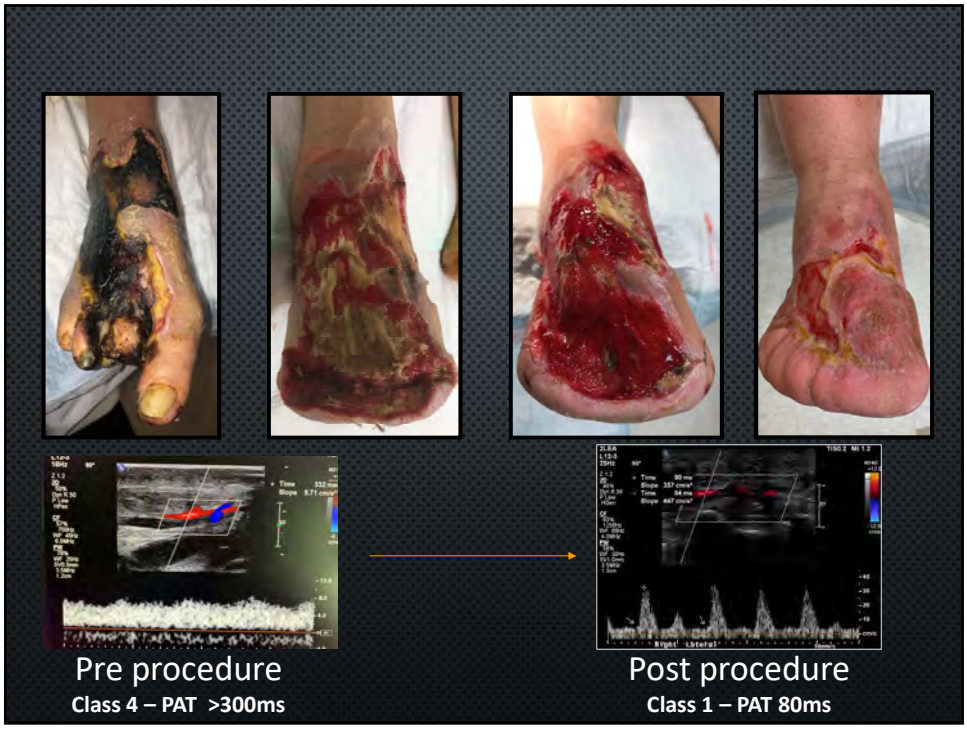


Class 4 – PAT 244ms

POST PROCEDURE

Class 1 – PAT 108ms


Pre procedure
Class 4 – PAT 256ms
Single vessel via Peroneal Artery
Post procedure
Class 1 – PAT 85ms


Pre procedure
Class 4 – PAT >300ms
Post procedure
Class 1 – PAT 80ms

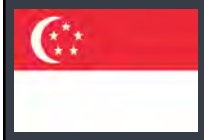
GLOBAL COLLABORATION


Ireland


USA


Australia


Argentina


Singapore


New Zealand


Canada


Mexico

THANK YOU