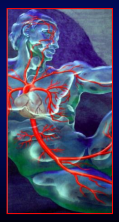
Role Of Duplex Ultrasound In The PAD Workup



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Disclosures

Duplex scanning is THE BEST modality for arterial disease diagnosis…

IN SKILLED HANDS

Conventional Arteriography "Gold Standard"

Limitations

- Cost / Shortages
- Repeatability
- Morphological information
- Technique → Limited projections
  → Pseudo - occlusions
  (up to 70%)

Standard Arteriography : Complications

Local (1 % - 23 %)

- Hematoma
- Pseudoaneurysms
- Arterial Dissection
- Thrombosis
- Embolism

Systemic (2 % - 9 %)

- Vasovagal Attack
- Renal Failure
- CHF
- Allergic Reaction (Anaphylaxis)

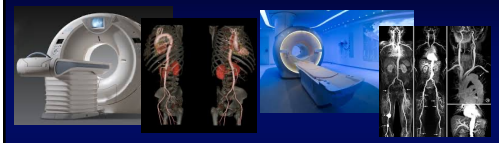
MRA Drawbacks

- Long contraindications list
- Gadolinium-related complications (systemic fibrosis)
- Cost, availability
- Suboptimal resolution in below the knee arteries *

CTA Drawbacks

- Radiation
- High contrast load

CA, CTA, MRI

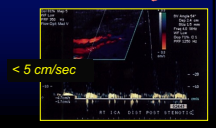


Essentially Luminographies!!!

Duplex Arteriography

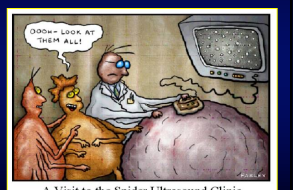
Advantages

- Cost
- Non - invasive
- Mobile / Repeatable
- "Head to toes" assessment
- Arterial wall imaging
- Hemodynamic information
- Very sensitive to low flow!



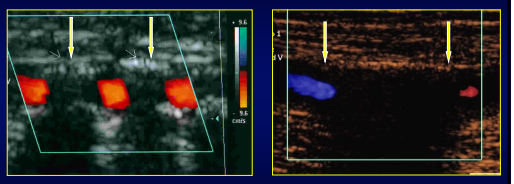
Duplex Arteriography : Limitations

- Operator Dependent
- Limited Field of View
- Patient Cooperation
- Technical Limitations



A Visit to the Spider Ultrasound Clinic

Arterial Wall Calcification



PT Mid - Calf SFA Mid - Thigh

Patient Population (960 Patients – 1000 cases)

Preoperative Evaluation	
DUAM	928 (93%)
DUAM + CA	72 (7%)

Indication	
Tissue loss	50%
Rest Pain	23%
Claudication	19%
Aneurysm	4%
Failing graft	4%

Mean age	72 ± 12 y
Male	66%
HTN	45%
DM	45%
Tobacco	44%
CAD	44%
CRF	13%
Previous bypass	25%

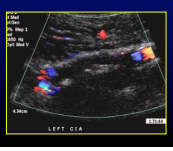
Duplex Arteriography
Protocols

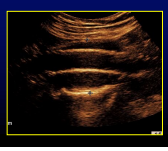
- L 7 – 4 MHz
  - Femorals
  - Popliteal
  - Tibials
- CL 10-15 / 5-7 MHz
  - Dorsalis pedis / branches
  - Common plantar / branches
- C 5 – 2 MHz, P 3 - 2 MHz
  - Aorto – iliac
  - Subclavian / axillary
  - Proximal calf
- L 12 – 5 MHz
  - Superficial veins

- 50 % stenosis = PSV ratio >2, ≥ 70 % stenosis = PSV ratio > 3

Duplex Arteriography
Contralateral Ilio – Femoral Exam

- Ipsilateral iliac disease
- Ipsilateral iliac occlusion

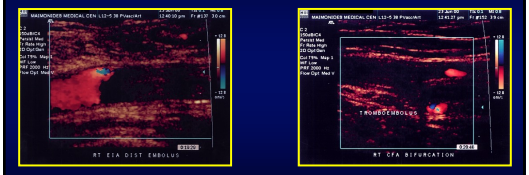




Duplex Arteriography
Subclavian / Axillary Exam

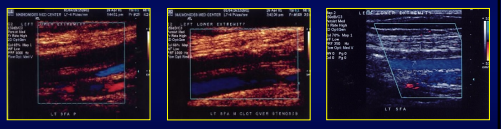
- Aortic disease / occlusion
- Bilateral extensive iliac disease
- Bilateral iliac occlusion
- Periligament lesions
- Critical iliac stenoses

Acute Embolus



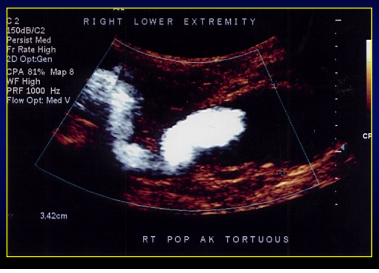
EIA CFA

Acute vs chronic SFA Thrombosis



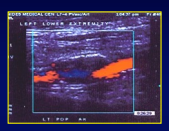
Mild + acute Severe + acute Chronic

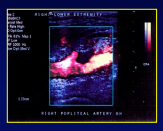
Thrombosed Popliteal Aneurysm



Duplex Arteriography
Small Popliteal Aneurysms

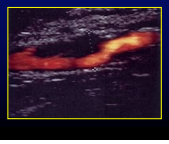
1.4 cm

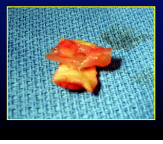




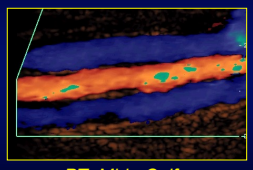
1.3 cm

1.16 cm

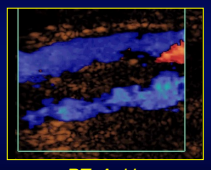




Infrapopliteal DA
Posterior Tibial Artery

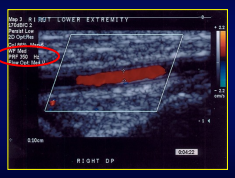


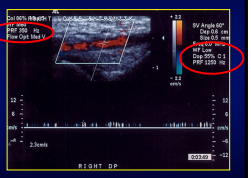
PT Mid - Calf



PT Ankle
(Occluded)

Duplex Arteriography
Tibial Artery Choice

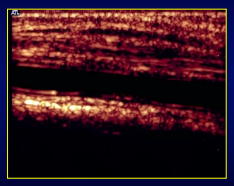




Dorsalis Pedis

PSV 2.3 cm/sec

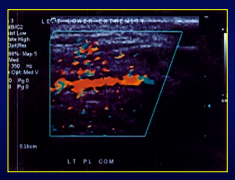
Duplex Arteriography
Tibial Artery Choice



PT soft

AT calcified

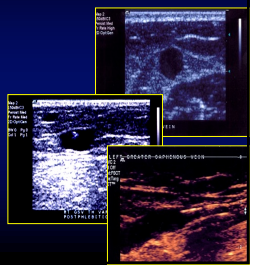
Duplex Arteriography
Tibial Artery Choice



Common Plantar Artery

Duplex Arteriography
Vein Conduit Choice

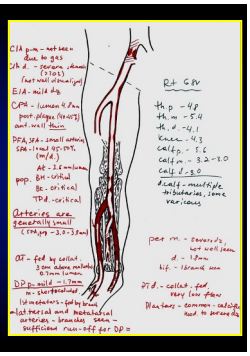
- Ipsilateral GSV
- Contralateral GSV
- Cephalic / basilic veins
- Tibial veins



Duplex Arteriography

Primary

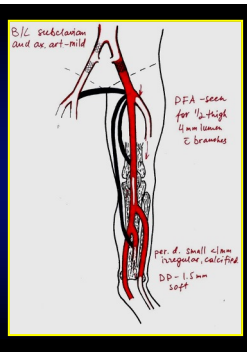
CIA Angioplasty + Stent



Duplex Arteriography

Secondary

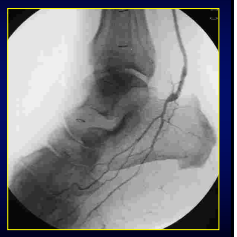
Multiple Failed Bypasses



Preoperative Skin Markings

- Limits incisions & dissections
- Distal anastomosis
  - Softer arterial segment

Fem – PT / Completion Angiogram



Arterial segments not visualized well

Iliacs (35)

Gas	12
Obesity	9
Uncooperative patient	8
Severe arterial wall calcification	4
Pain	1
Tortuous	1

Arterial segments not visualized well

SFA

Severe arterial wall calcification	4
Low flow	1

Popliteal

Severe arterial wall calcification	1

Arterial segments not visualized well

Tibials	*2.6%*
Severe arterial wall calcification	24
Edema	9
Open ulcer	6
Obesity	2
Uncooperative patient	2
Low flow	4
Pain	1
Tortuous	1

Duplex Arteriography

Average Time

55 ± 18 min

Conclusions

The majority (up to 93%) of lower extremity revascularization procedures can be safely planned based on DA alone.

When severe calcification is noted, DA is not reliable and other imaging modalities need to be used

Knowledge of surgical anatomy, operating team strategies, excellent technical skills and dedication are necessary qualities for the vascular ultrasonographer performing DA.