



Akuter arterieller Verschuß Diagnostik mit Ultraschall

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Kein Interessenskonflikt

Bitte beachten Sie das Urheberrecht

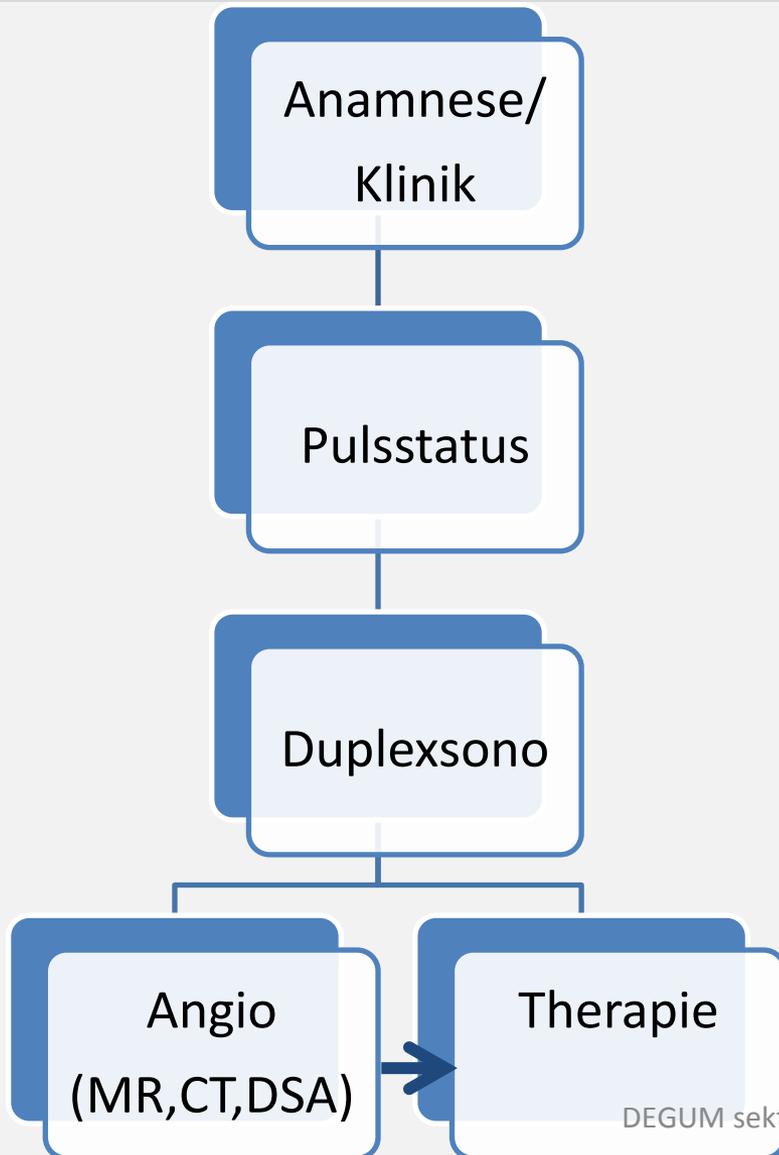
Einteilung

1. Einführung
2. Duplex Grundlagen
3. Subakute PAVK (III mit akuter Besserung in II b)
4. Beispiele Ursachen arterieller Verschuß

I. Problem

- Akuter arterieller Verschuß, Ruptur
- Klinik?
- Klinik: Stadium II – III, Schlaganfall, Bauchschmerz
- Anamnese?
- Anamnese: AVK? Aneurysma? VHF? MI? leer?

I Akuter Verschuß – diagnostischer Workflow



Arm, Bein,
Bauch Hals

I. Voraussetzungen?

- **Untersucher** Erfahrung
10 min.
- **Patient** Limits:
Kompliance
Adipositas
Echodichte Plaque
- **Scan**

Becken	curved	3,5-5 MHz
Bein	linear	7,5-10 MHz

I. Voraussetzungen: apparativ

B-Bild:

Plaque, Embolus

Stenosegrad im Querschnitt planimetrisch

Farbduplex:

Auffinden ,Stenose /Verschluß, Länge

Powermode:

echodichte Plaque, Low-Flow-Situation

Pw-Doppler !

- Stenosequantifizierung
- Kollateralfuß
- Zu- und Ausstrombahn

CEUS?



I. Diagnostik - Sonografie

- Untersucherabhängig
- zeitaufwändig
- + Wenig invasiv
- + Kein Kontrastmittel
- + Keine Strahlen
- + Herzschrittmacher
- + Beliebig wiederholbar

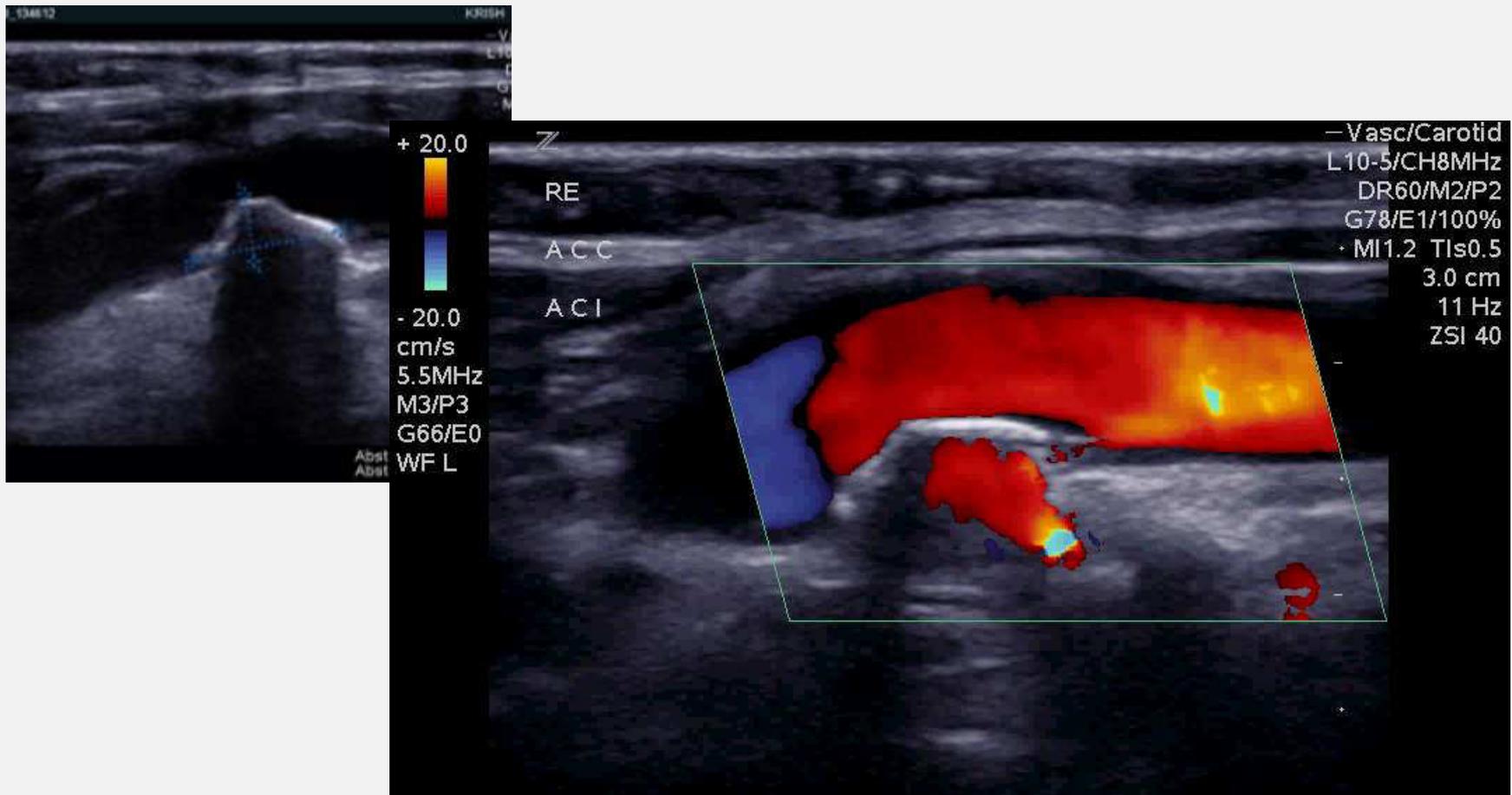
Gefäße

- Lumen
- Hämodynamik
- Gefäßwand

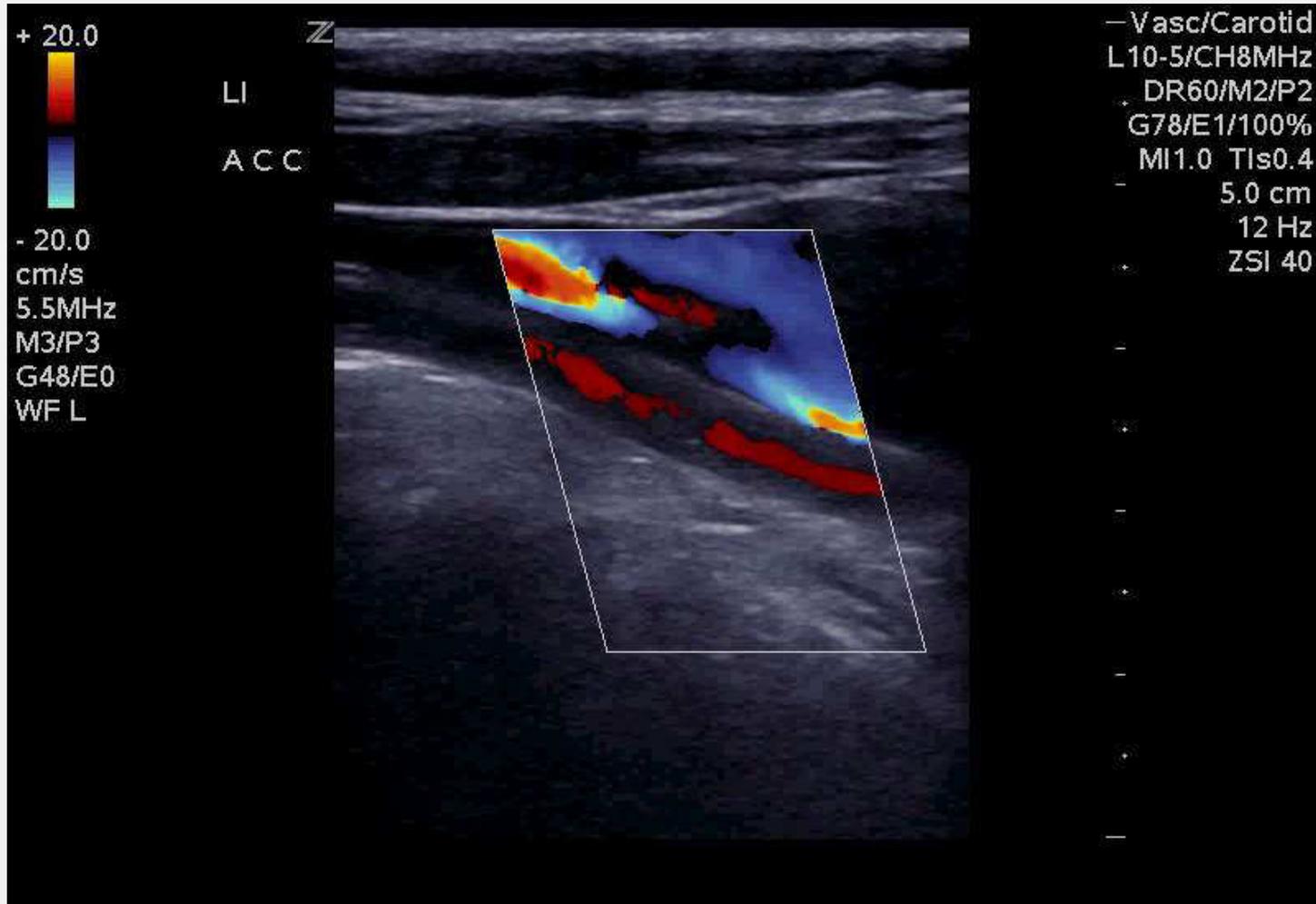
II. FKDS - Plaque



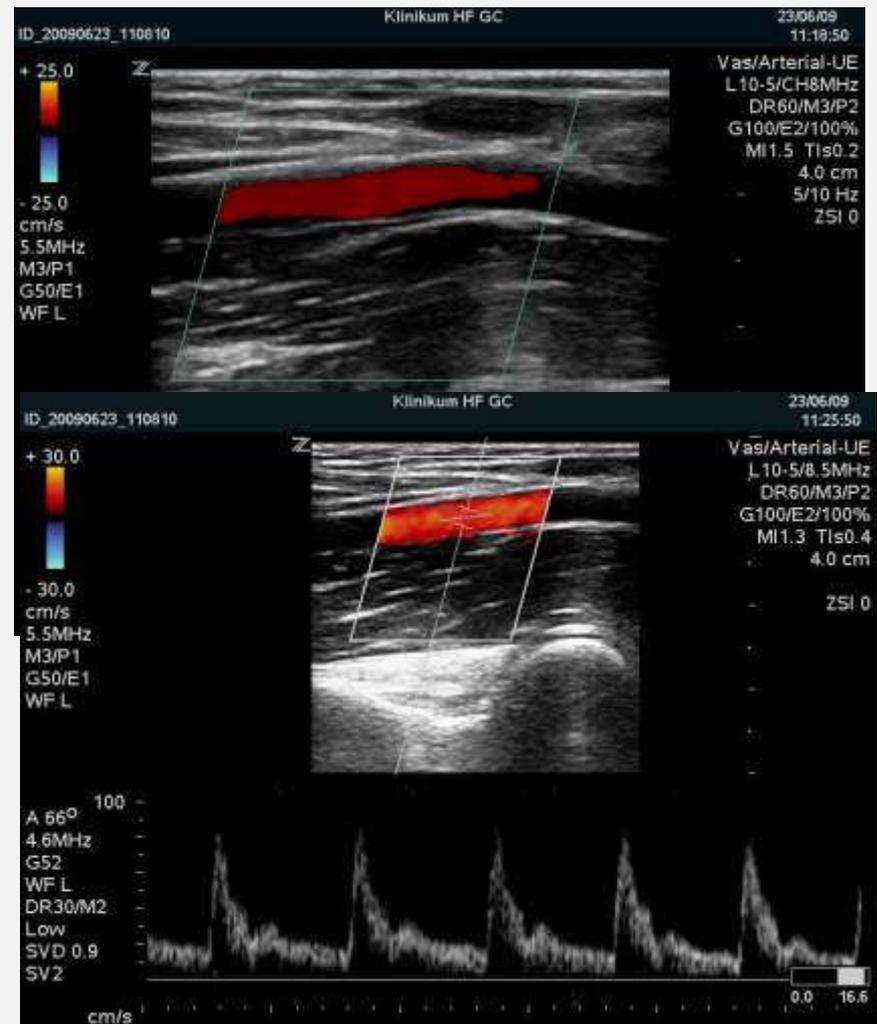
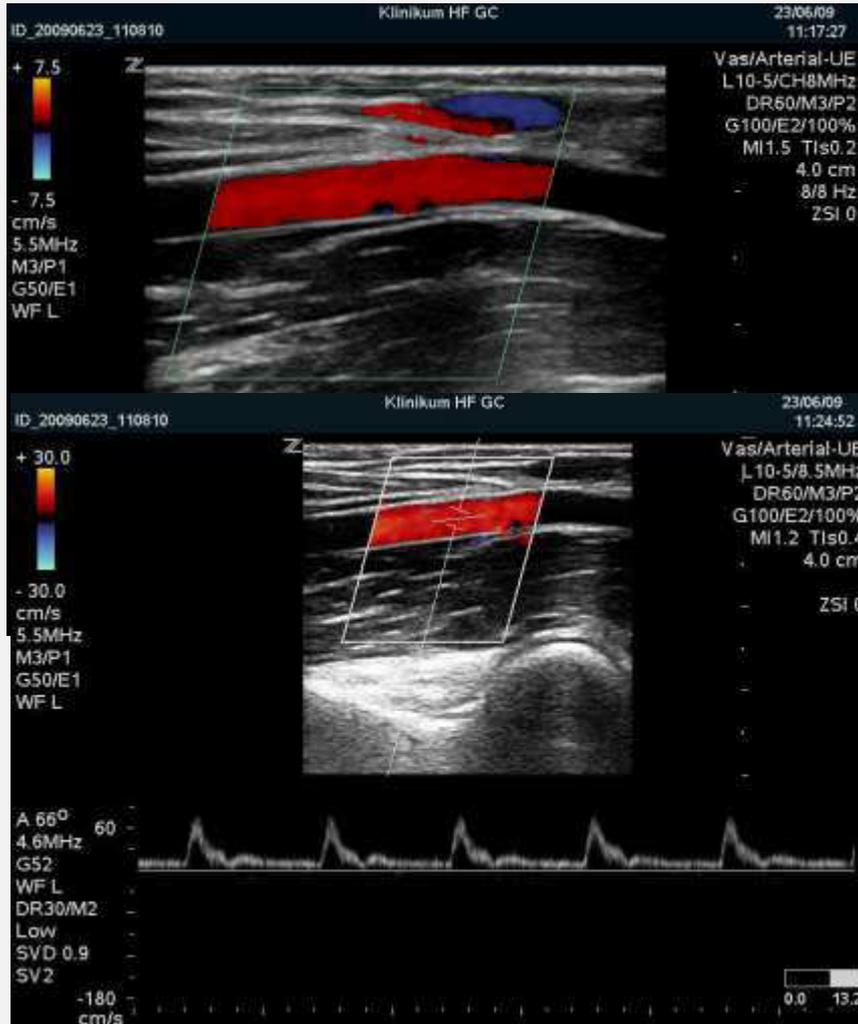
II. FKDS - Plaque



II. Arterie - Wand?



II. Farbduplex / pw-Doppler PRF



II. PW-Doppler – Signalspektrum

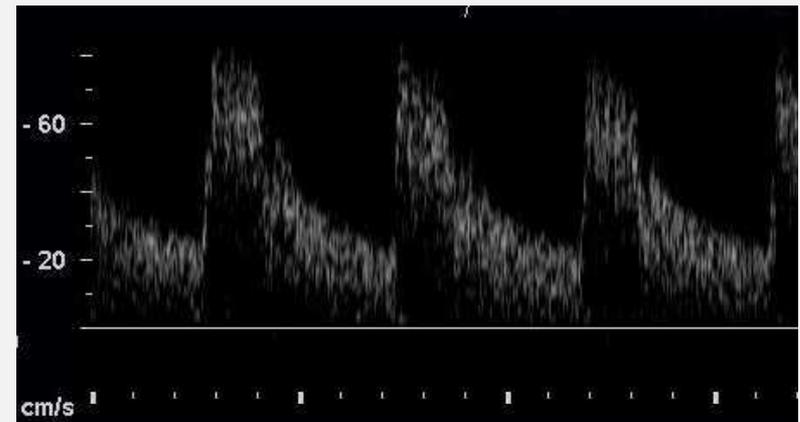
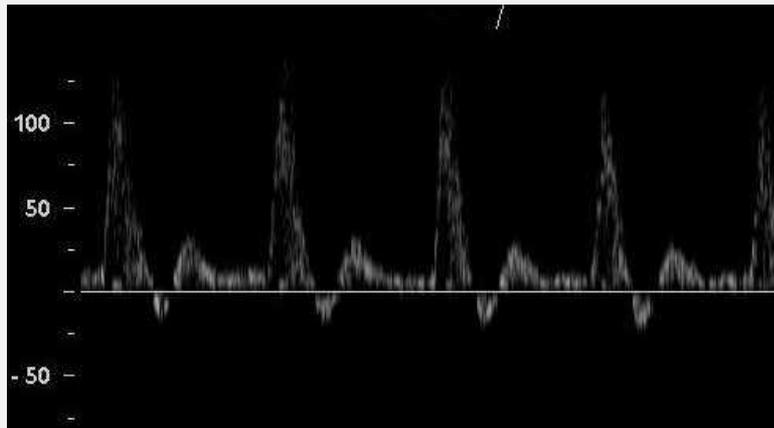
hoher

niedriger

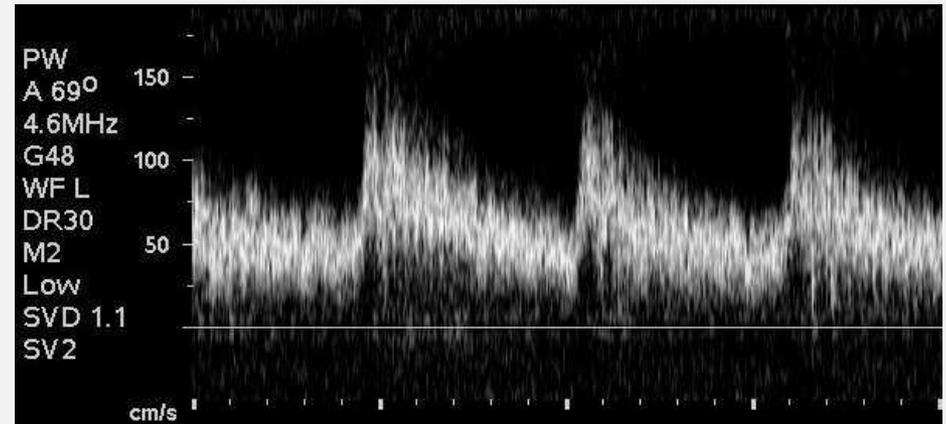
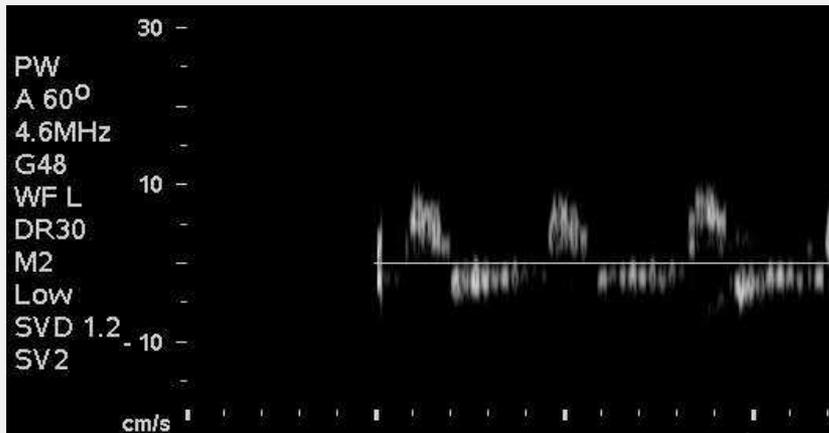
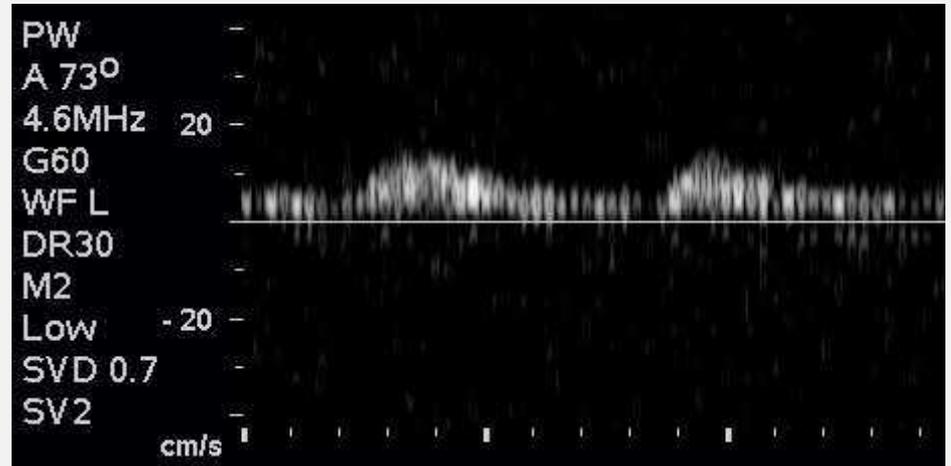
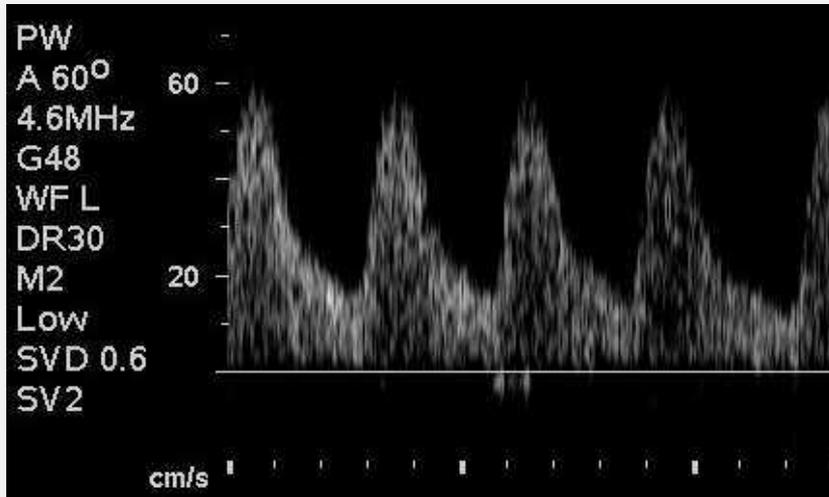
Widerstand

Muskel

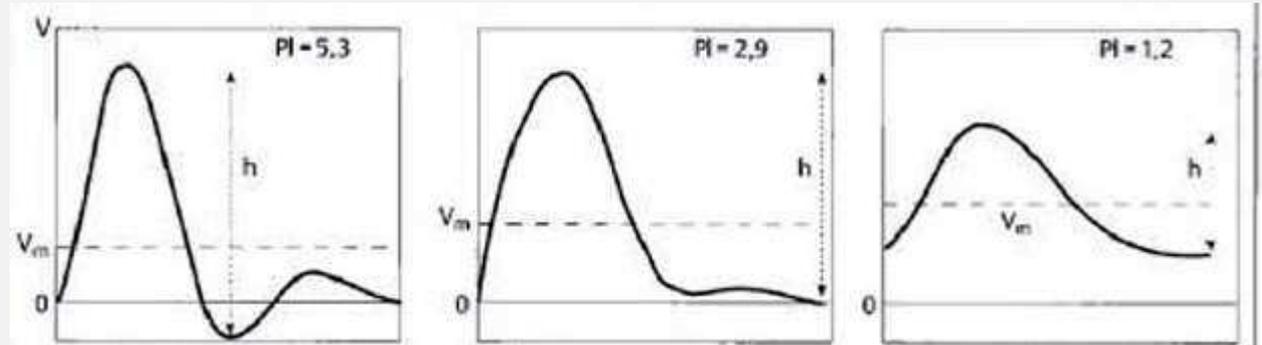
parench. Organe



II. Pw-Doppler Spektrum



II. Pw-Doppler Spektrum



Vorgeschaltete
Stenose (%)

0

50

100

$$\text{Pulsatilitätsindex (PI)} = \frac{h}{V_m}$$

III. Stenosegrad

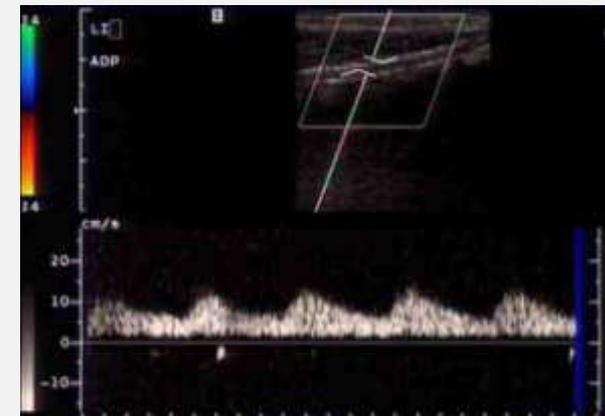
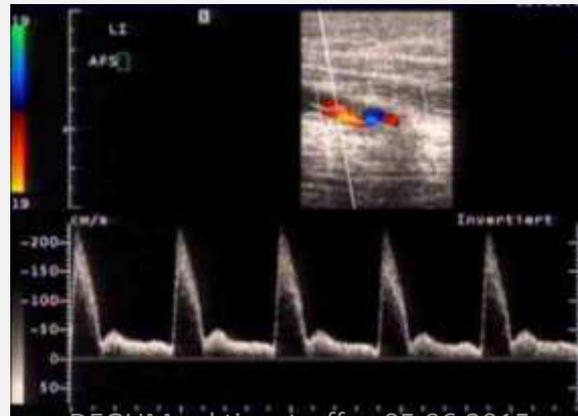
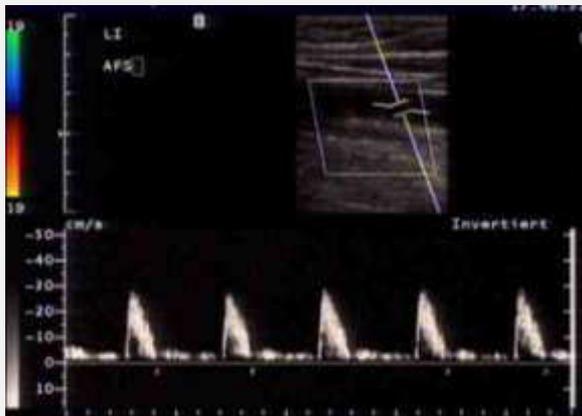
- Peak systolic velocity (PSV)
- Velocity ratio (PSV_{in}/PSV_{prae})
 - > 2 50 %
 - > 4 70 %
- Praestenot. Profil: Verbreiterung
- Poststenot.: Acceleration ↓ monophasisch



Prae

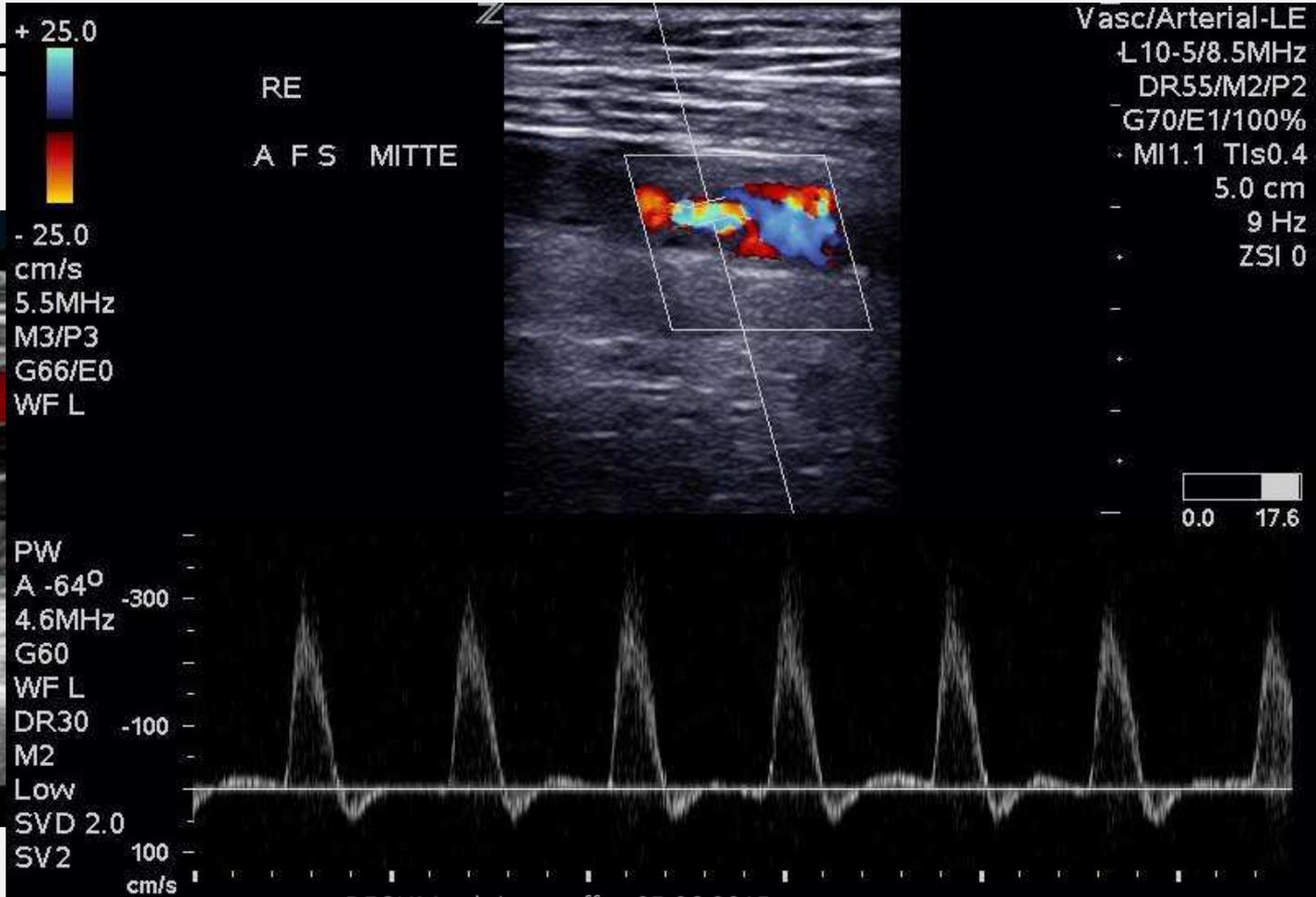
Stenose

Post



III. Stenose

No



III. PAVK Crural

- **Darstellbarkeit** bei Probanden (Lujan, 2005)

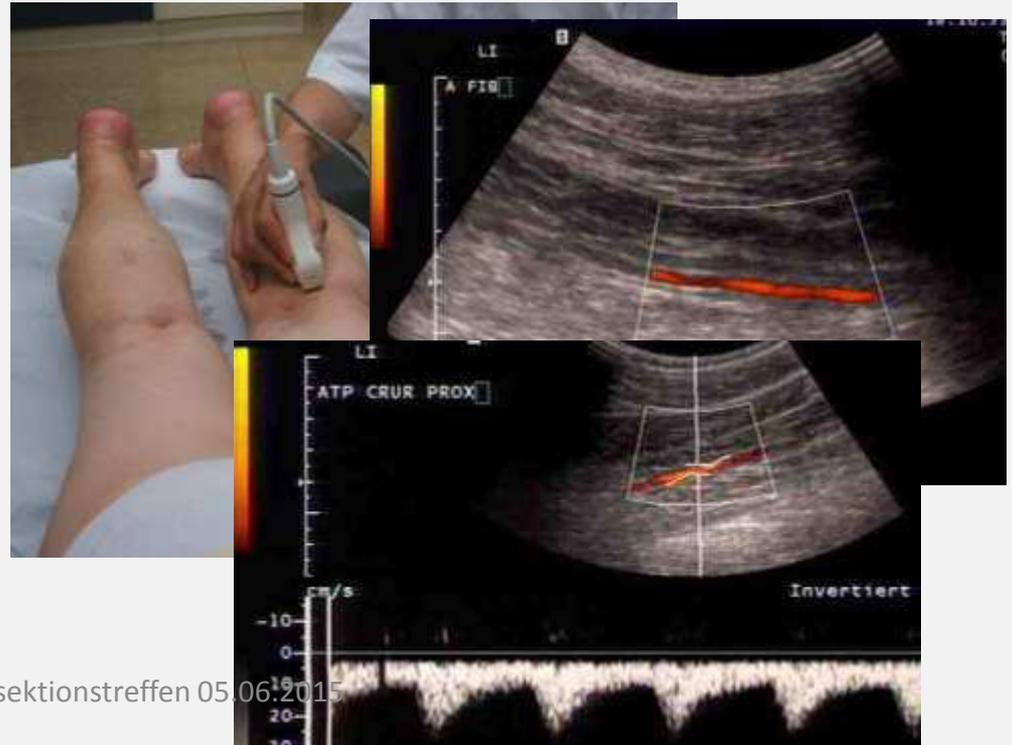
Sens. 100% , Spez. 100%

2 Begleitvenen

- postokklusive **Kollateralisation**

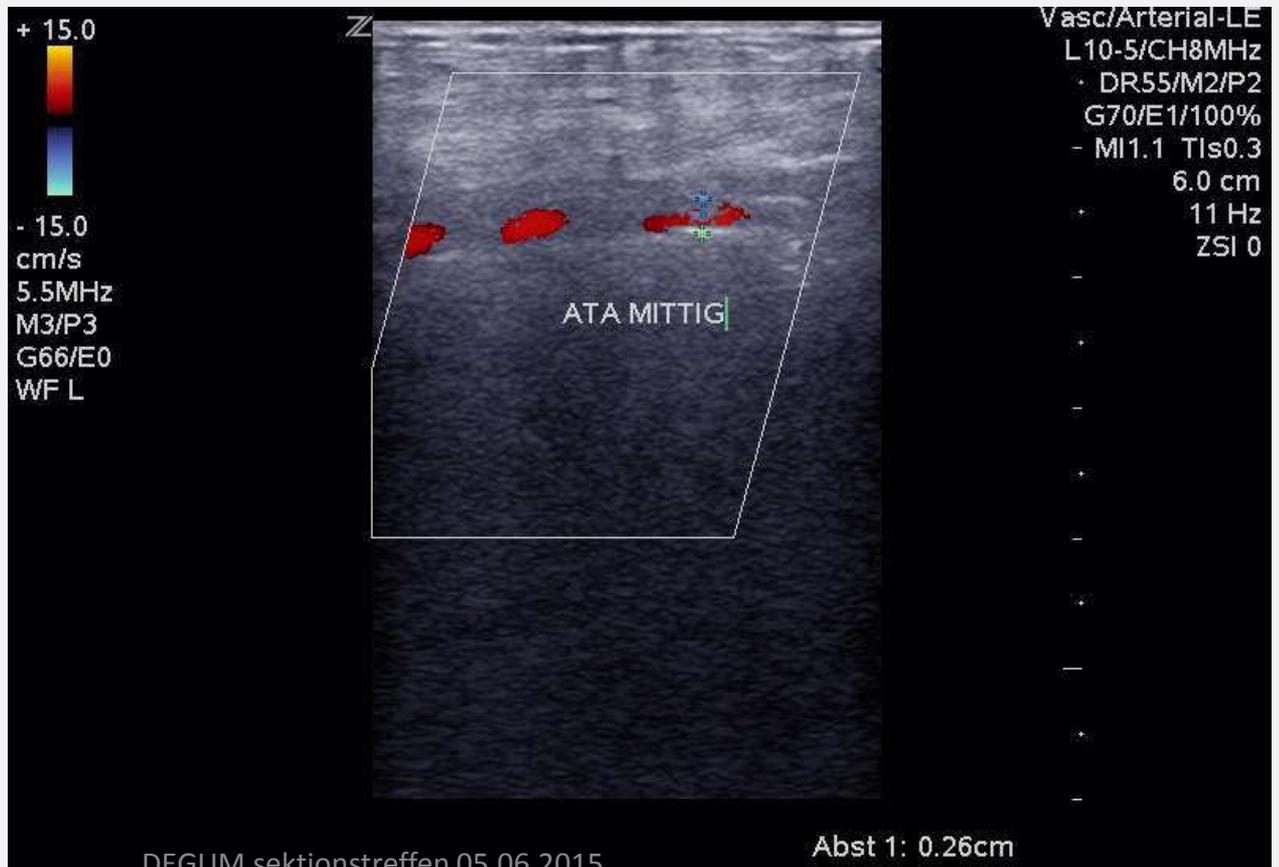
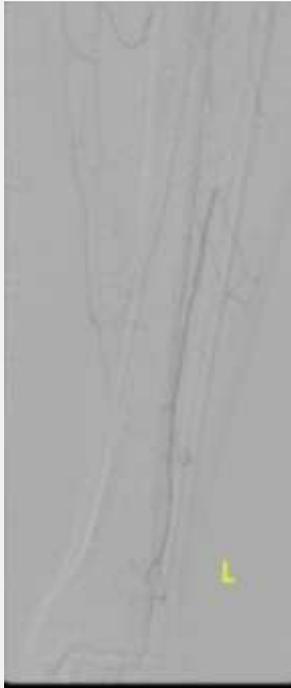
- **Tr. tibfib, A.fib. ?**

- Untersuchungstechnik!
- med., lat., dors., ventr.
- powermode



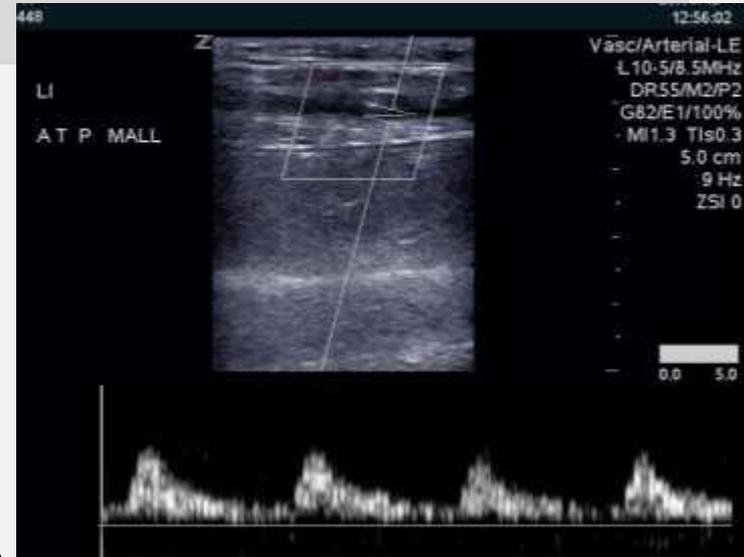
III. PAVK crural

- Sendefrequenz hoch
- PRF niedrig
- Evtl. Filter

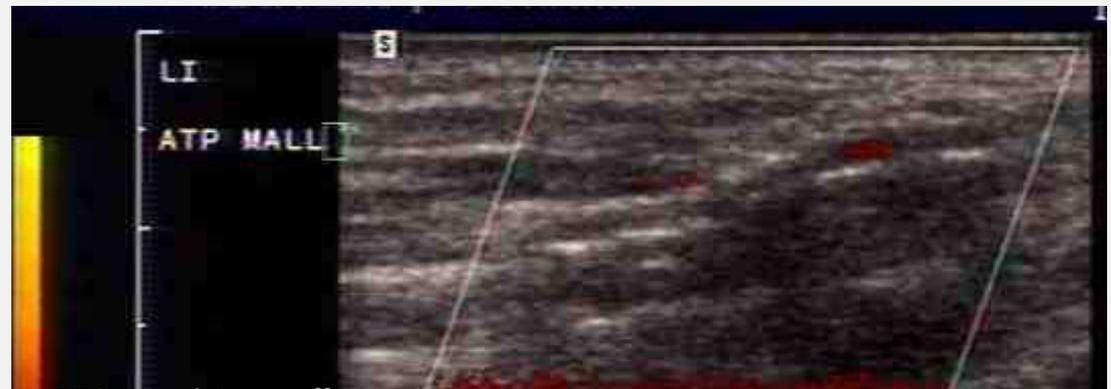


III. PAVK pedal

- Sonografie:
signifikant mehr
Anschlußsegmente
(Hofmann et.al., JVS, 2004)
ohne Duplex kein OP-Ausschluß!



- Powermode



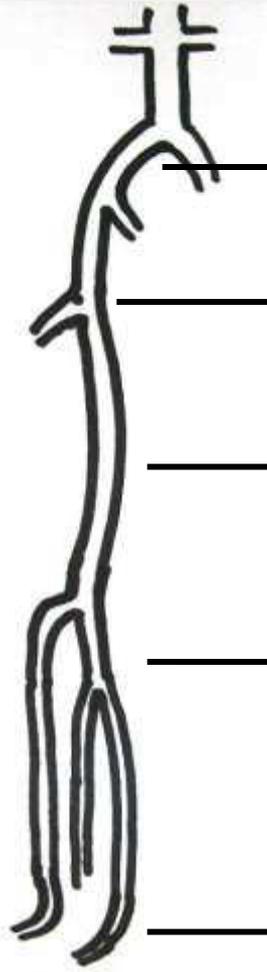
III. Sens./Spez. Bildgebung

Stenose > 50%, Verschluß untere Extremität

	CE-MRA	TOF	CTA	FKDS
Anzahl der Studien	7	5	6	7
mediane Sensitivität (Bereich)	95 (92 – 99,5)	92 (79 – 94)	91 (89 – 99)	88 (80 – 98)
mediane Spezifität (Bereich)	97 (64 – 99)	88 (74 – 92)	91 (83 – 97)	96 (89 – 99)

Collins et al., BMJ, 2007

III. Stenose/Verschuß



Sensitivität/Spezifität in %

89/98 (Moneta, 1992)

97/98 (Schäberle, 1998)

95/95 (Ota, 2005)

Crural > 85/90 (Grassbaugh 2003)

Pedal > Crural (Eiberg 2002)

III. Literatur: kontrovers

MRA vs. Duplex vs. DSA: MRA zuverlässiger

(Leiner et al., Radiology, 2005)

MRA vs. Duplex vs. DSA: MRA und Duplex gute Alternativen

(Gjonaess et al., EJVES, 2006)

MRA vs. Duplex vs. DSA: Duplex ist besser, aber untersucherabhängig

(Souk et al., EJVES, 2003)

DSA: sinnvoll nach Duplex bei kalzifizierten cruralen Arterien

(Avenarius et al., EJVES, 2002)

Duplex: für pAVK allein ausreichend

(Ascher et al., 2003)

MRA vs. DSA und CTA Metaanalyse: Sens. 95%, Spez. 96%

(Menke, Larsen, 2010)

MR/CT ohne KM?

KM bei radiolog. Diagnostik: guidelines AHA (2006)!

Duplex vs. DSA: duplex Femoral gleich, distal crural/pedal überlegen.

DSA überlegen: APF, prox. crural

(Eiberg et al., EJVES, 2010)

III. Duplex- AVK – Workflow

AVK?

AIE/AFC

A pop

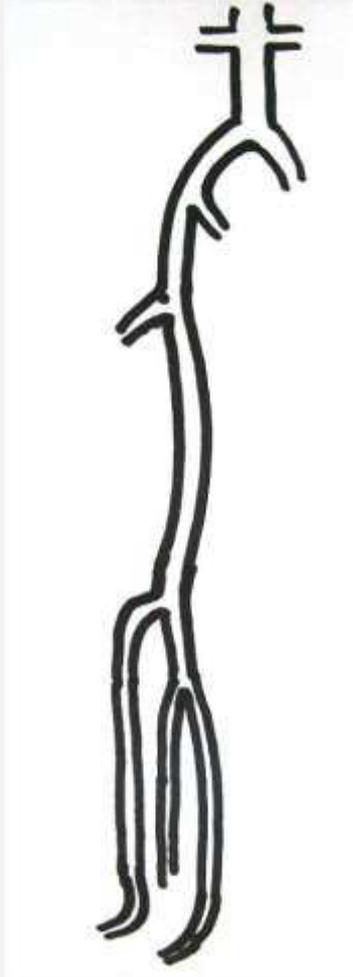
ATP/ADP

- Je nach Dopplerfrequenzspektrum
Stenose/Verschuß vor-/nachgeschaltet

- Scannen der Pathologie: Lokalisation, Länge
- Ausschluß Aneurysma (Ao → A. pop)

- Therapieentscheidung

III. Stufendiagnostik des Gefäßbaums



Aortoiliacal

AFC/Profunda

Fem-pop

Krural

Pedal

Klinisches Stadium

Pulse

ABI

Sonografie gezielt

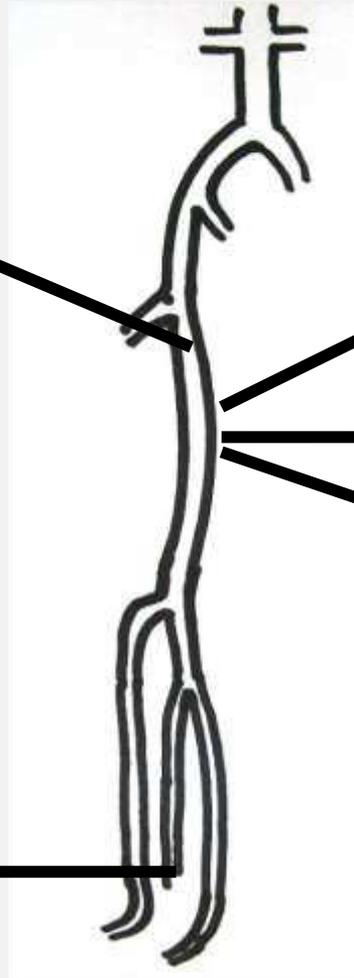
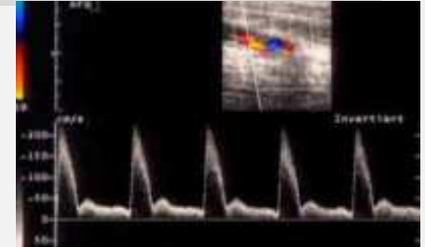
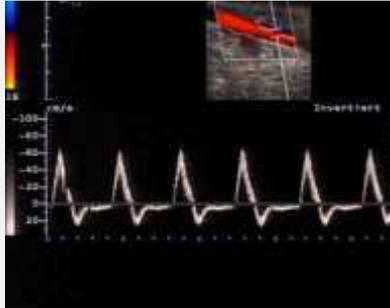
Welche Etage?

Klinisches Stadium?

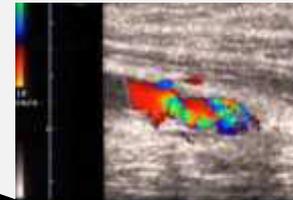
Venenmapping

III. AFS Stenose

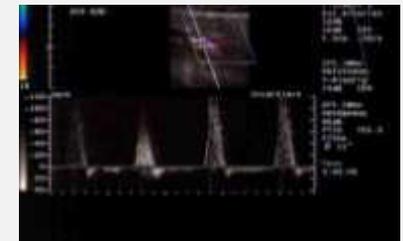
prä



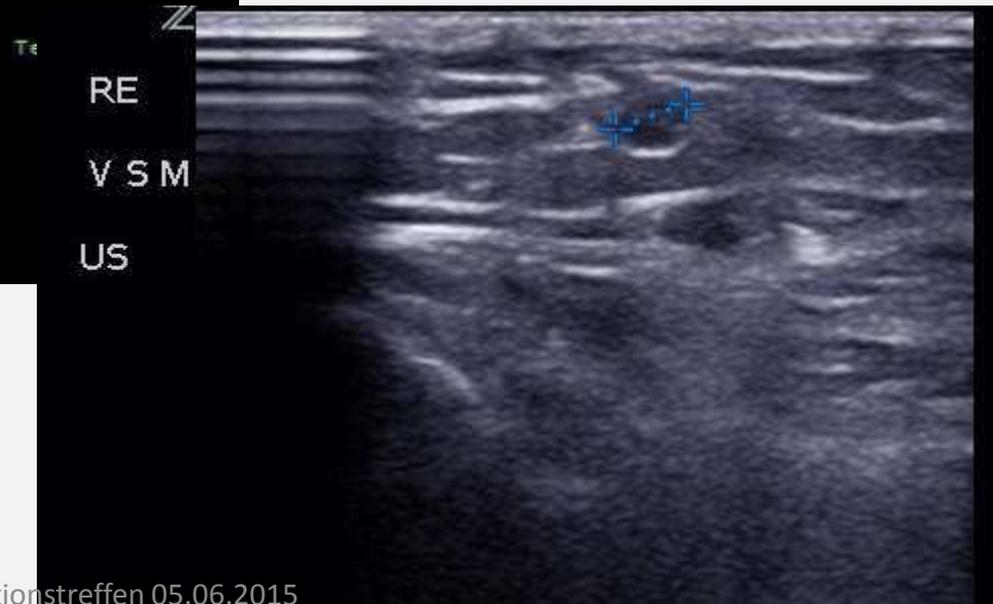
Stenose AFS Add



intra



III. Graftwahl



Bypass - Venen



?

350 m

Claudicatio Wade-OS-Gesäß
rechts

Keine trophischen Störungen

Klinisches Stadium

Pulse

ABI

Sonografie gezielt

Welche Etage?

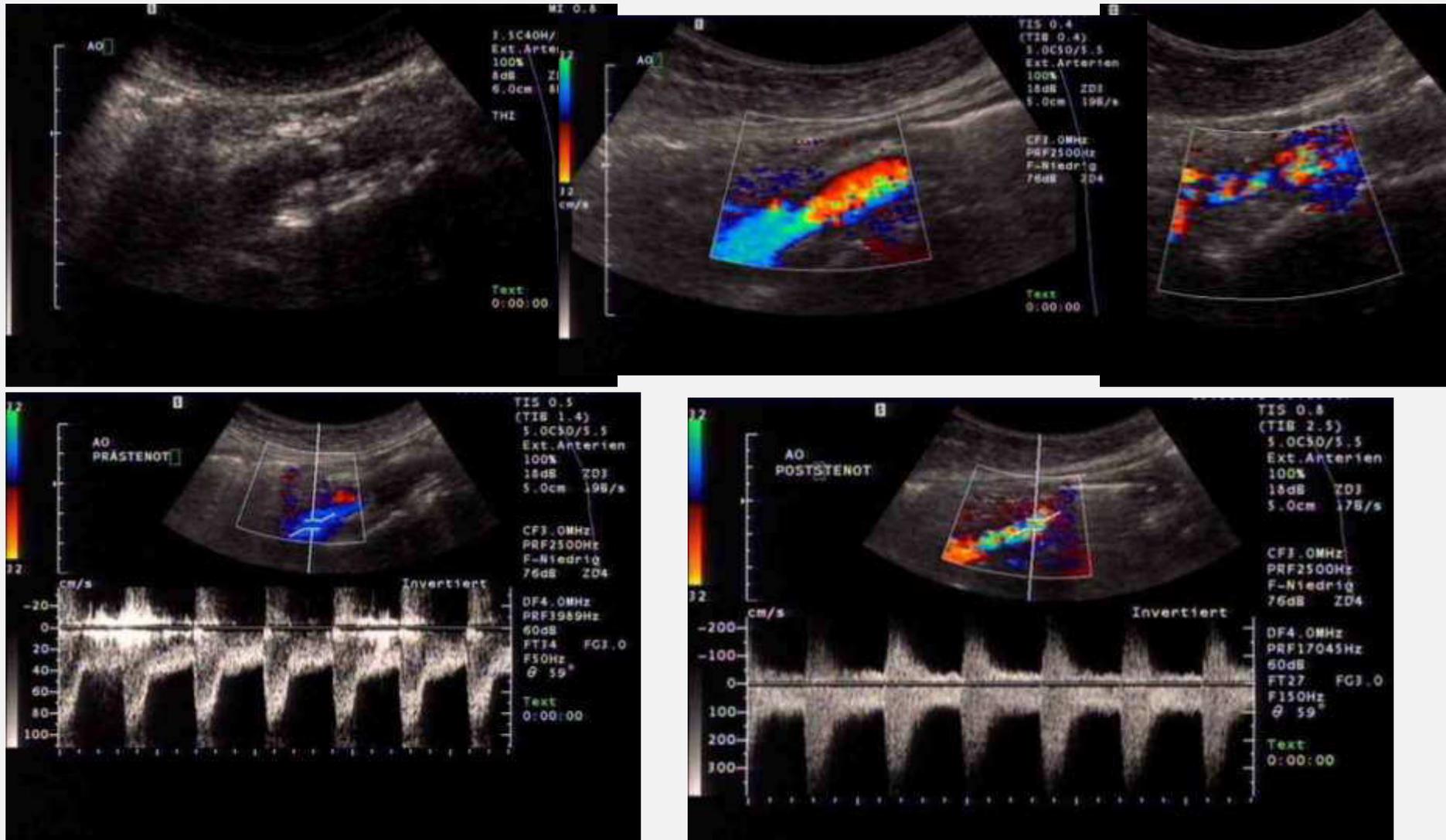
Klinisches Stadium?

Pulse



ABI
0,6

PAVK III in IIb: Aortenstenose



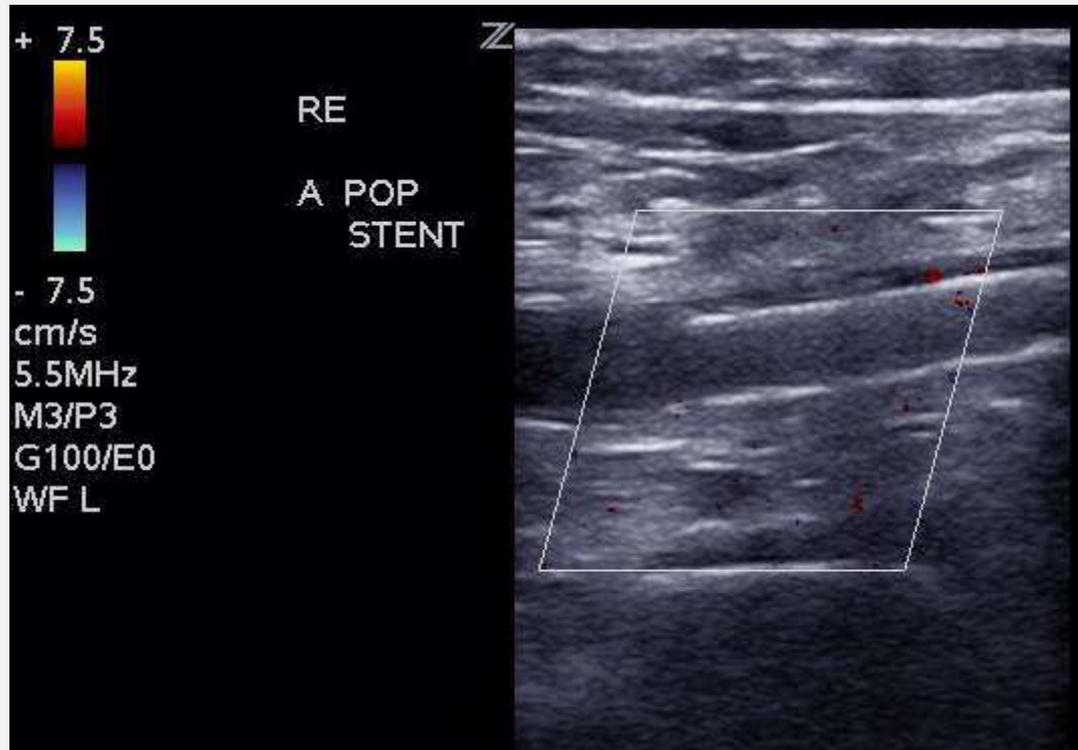
IV. postinvasiv

- Bypassverschluß



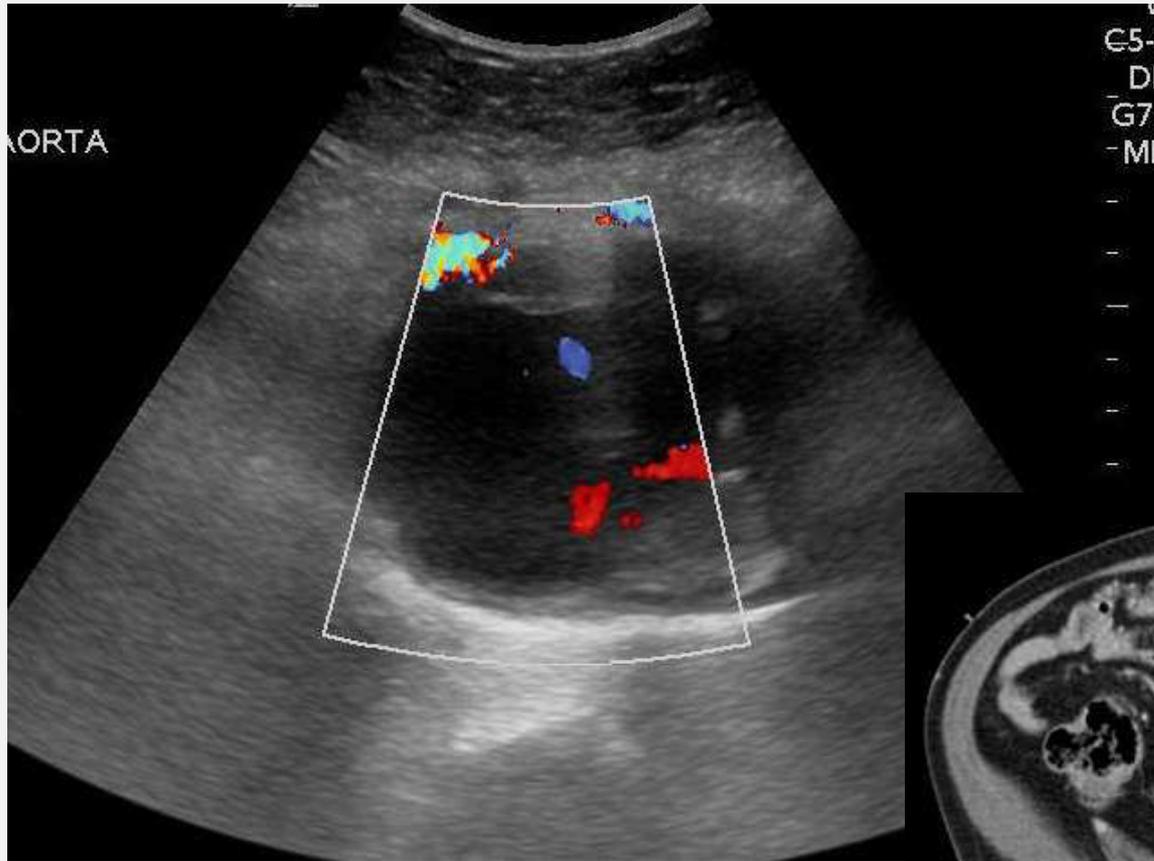
IV. Postinvasiv

- Stentverschluß

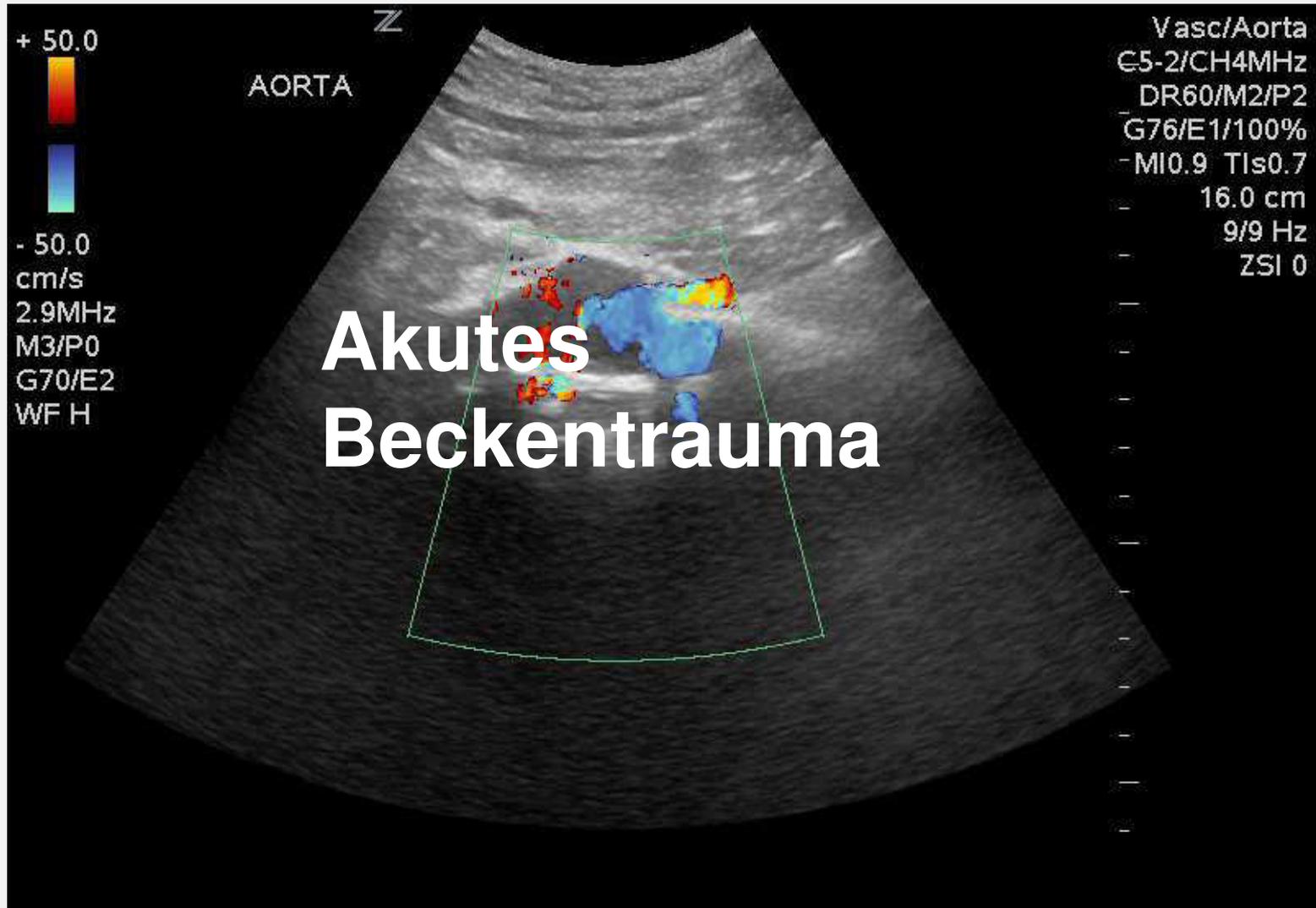


IV. Akute Thrombose / Embolie

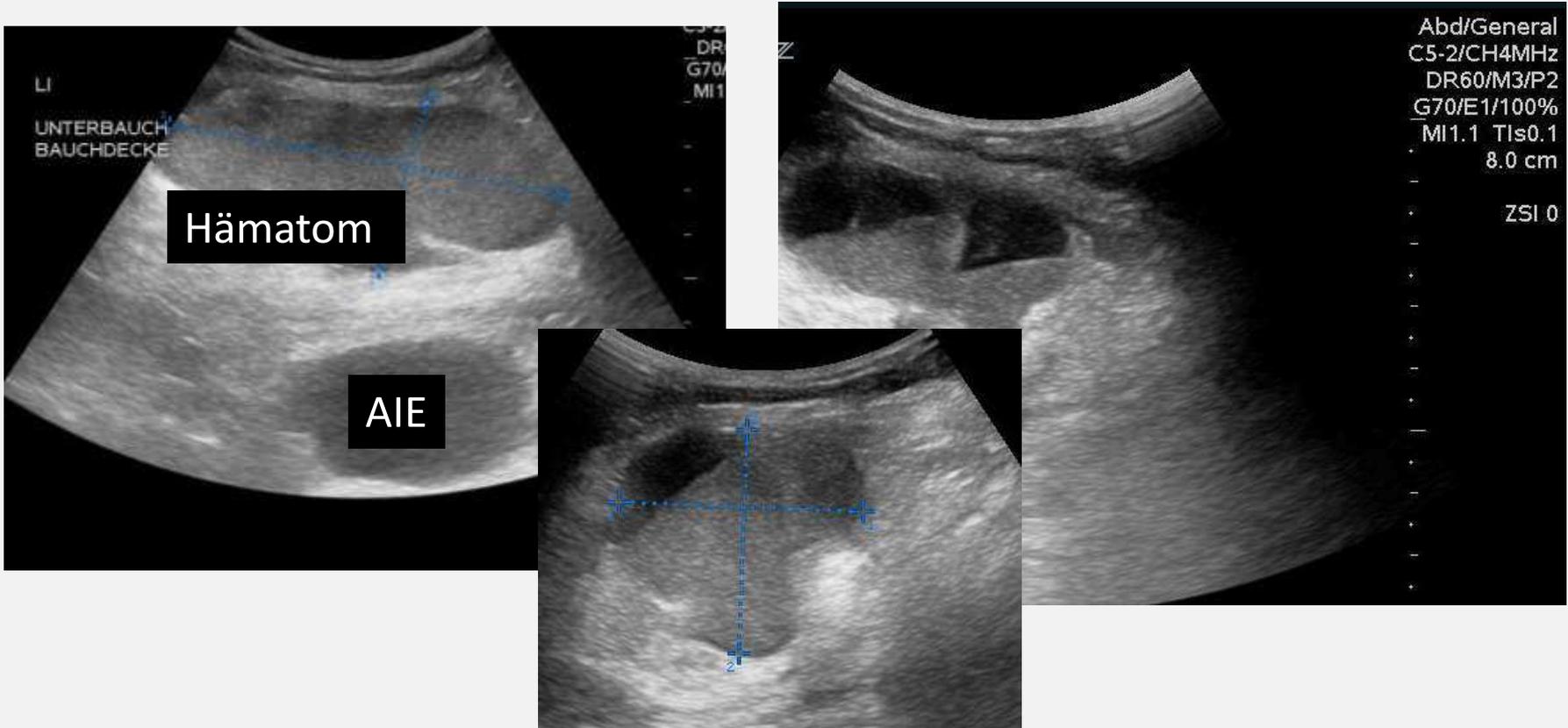
IV. Ruptur Aorta



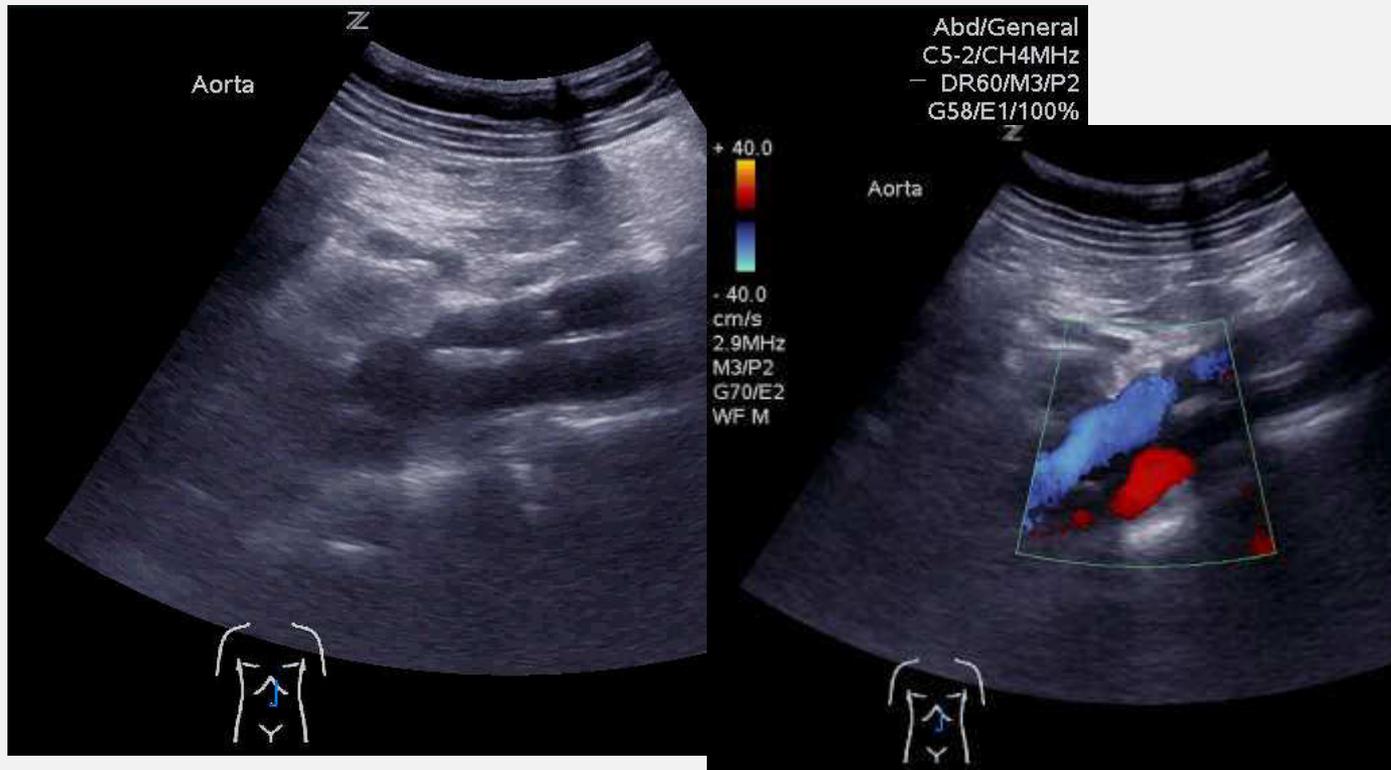
IV. Ruptur Trauma Aorta



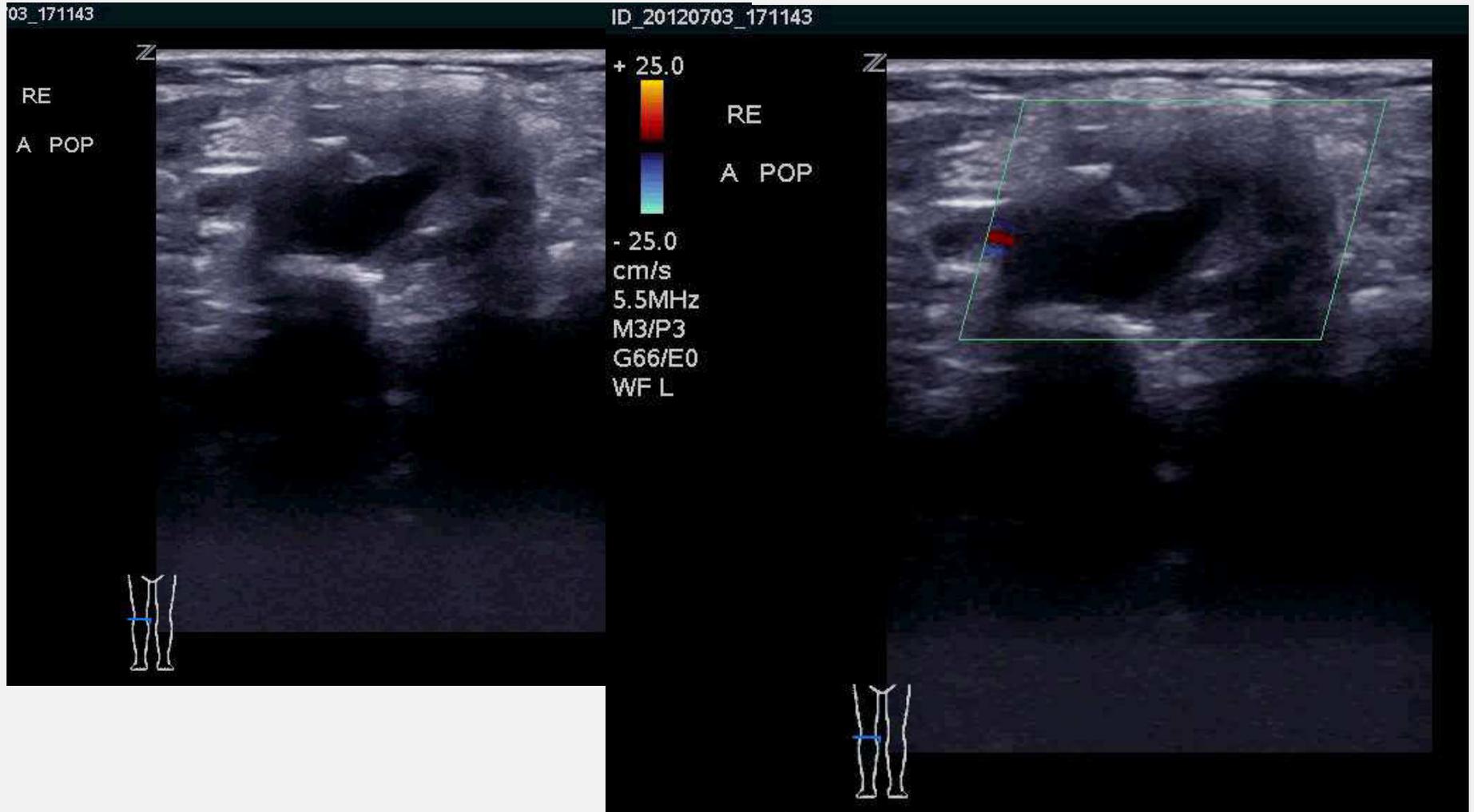
IV. Ruptur A. iliaca



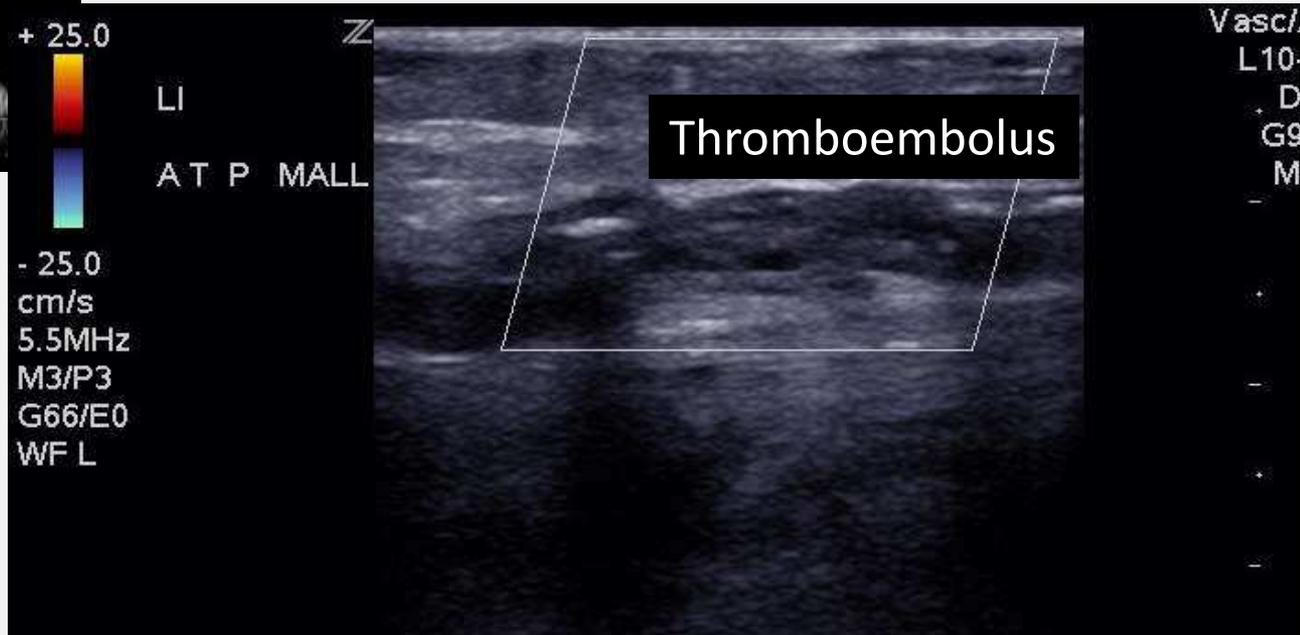
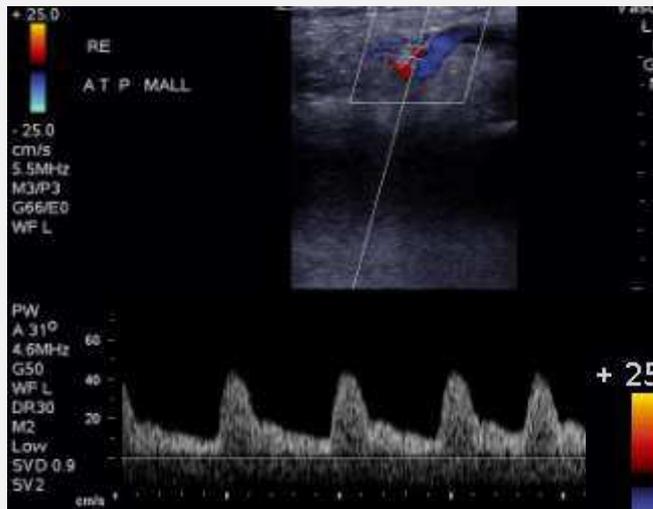
IV. Dissektion



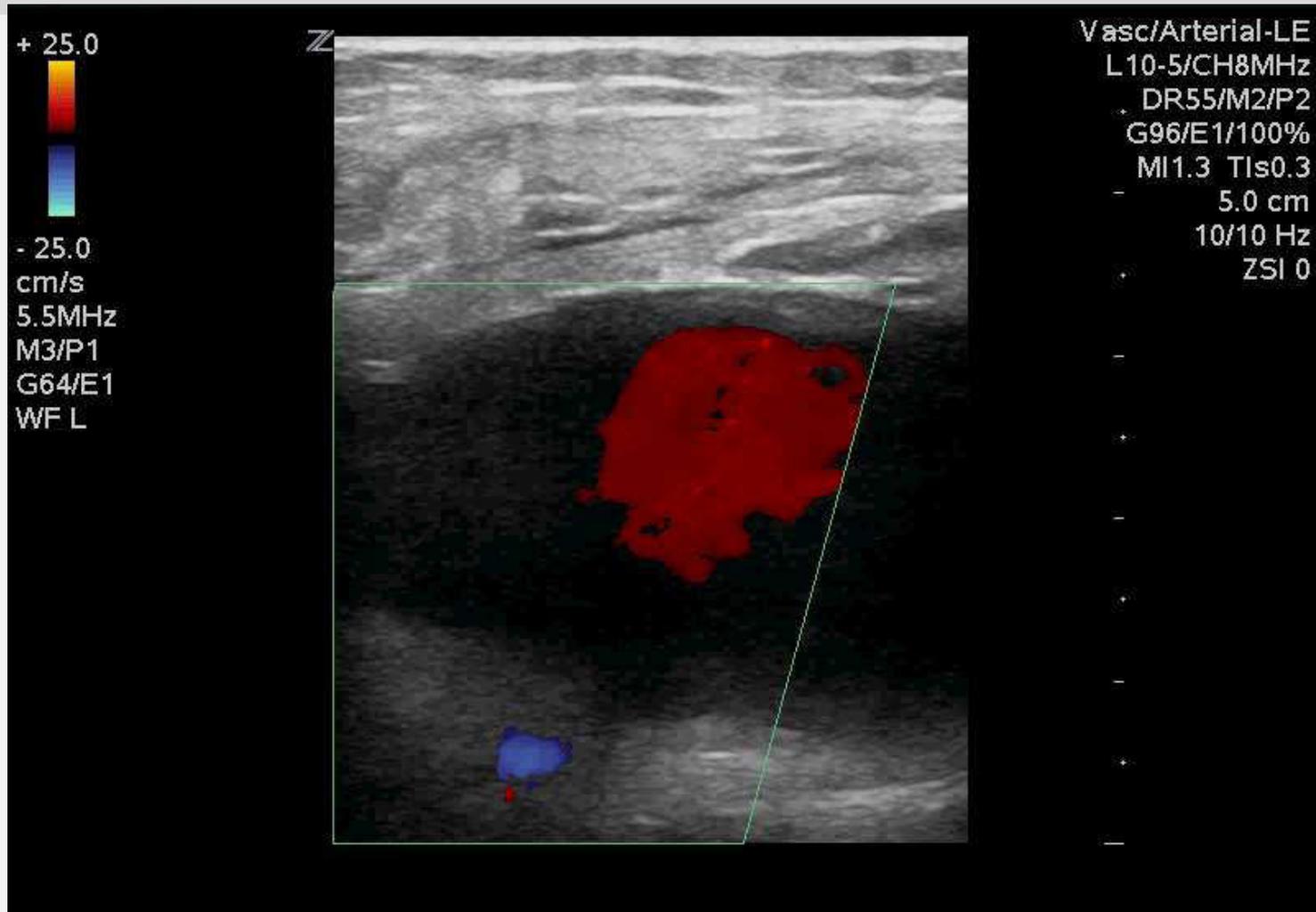
IV. Aneurysma popliteal



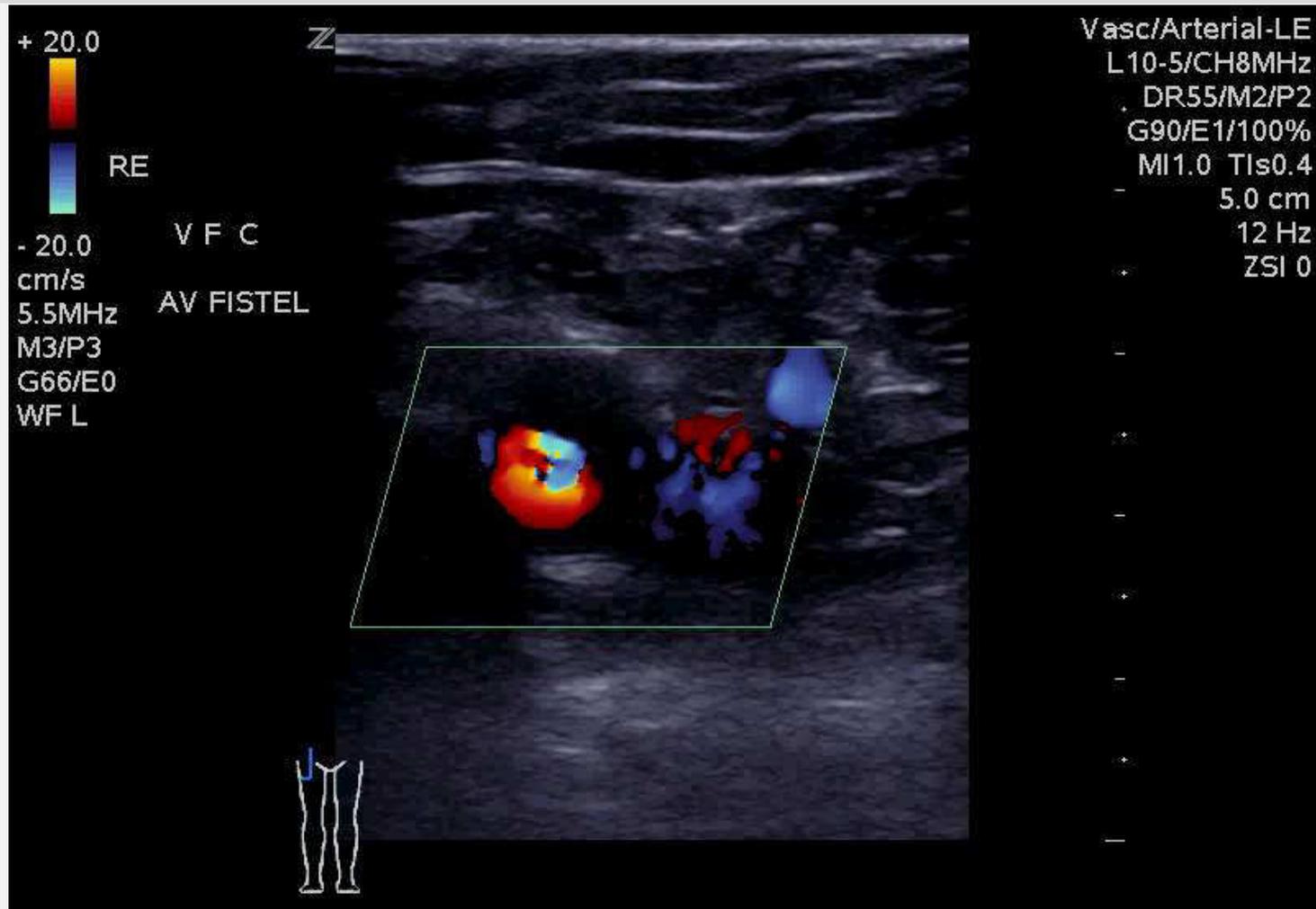
IV. Aneurysma popliteal Embolie peripher



Aneurysma Spurium

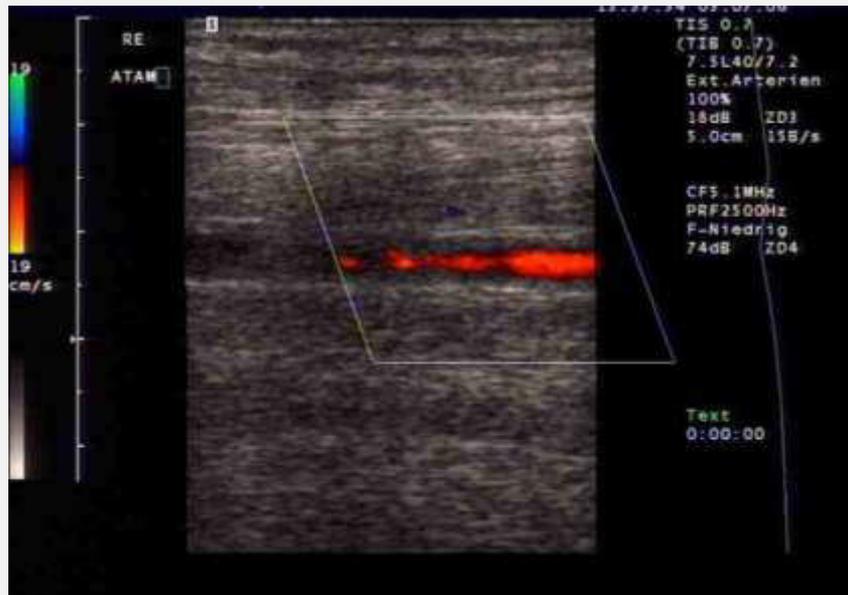


AV-Fistel



IV. Vasculitis

- Klinik: Schmerzen
- BSG-Beschleunigung
- Duplex: Wandverdickung, HALO-Zeichen

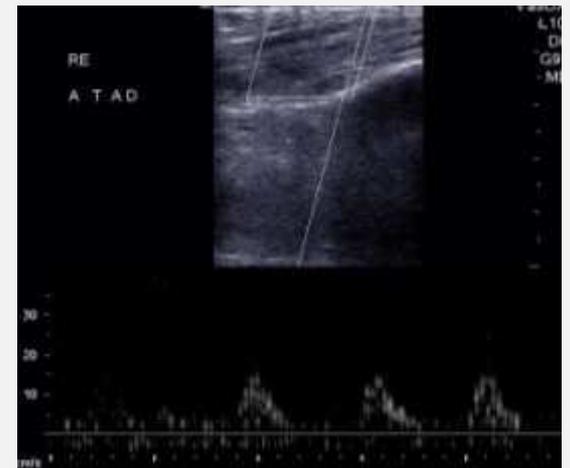
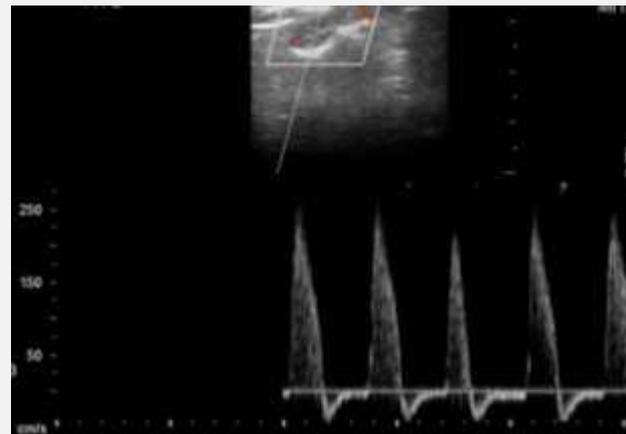
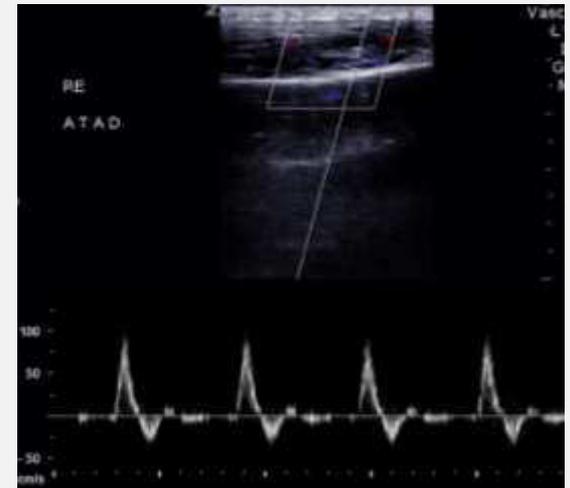
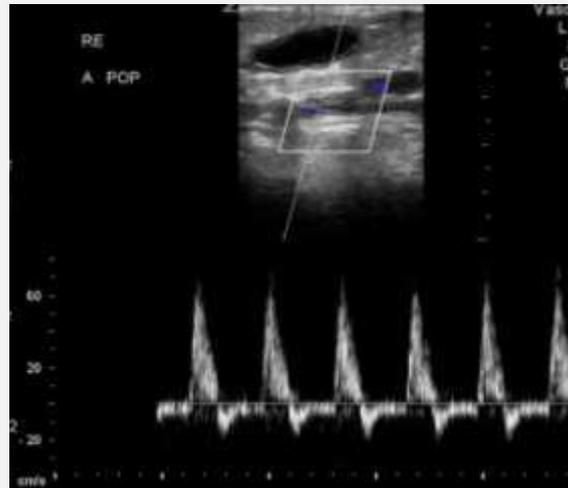


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IV. Popliteal Entrapment

- Ext. Einengung der A. pop.
- Plantarflexion:
Kompression der A poplitea



Zusammenfassung

- Sono kann i.a. DSA und MRA ersetzen
- Voraussetzungen:
 - Apparativ
 - Erfahrung des Untersuchers
- Stufendiagnostik /symptomorientiert
- Stenose/Verschuß entsprechend der Klinik zu bewerten.
- Duplex: Nicht arteriosklerotische Pathologien
- Angiografie: proximal crural, cerebral, thorakal
- Peripher: Graft? Venenmapping