



MRA uden Gadolinium

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Disposition

- Hvad har NSF betydet?
- Sundhedsstyrelsens retningslinjer
- MRA - Gd.
- Hvad kan vi uden Gd.?
- De forskellige skanner – firmaer
- Billedeksempler

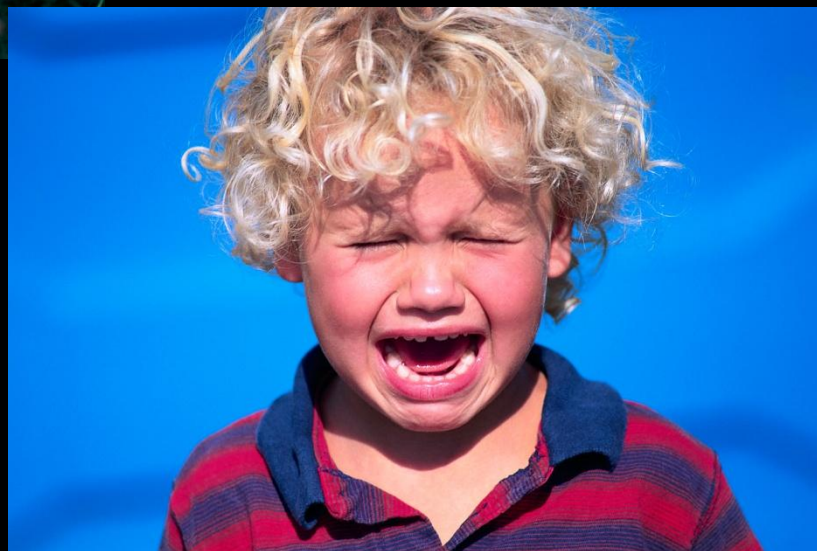
MRA – Gd.

- Back to basics
 - Har vi ikke bare de samme problemer som dengang?
- Hvad har ændret sig siden slut 90'erne?
 - Bedre spoler
 - Nye (hurtigere) sekvenser
 - Parallel imaging
 - Navigator teknik




Du kan gøre nogle glade
engang imellem...

Men du kan ikke gøre alle
glade hele tiden.



Hvor er udfordringerne?

- De nyresyge patienter! $eGFR \leq 30$ (*ml/min/1,73 m²*)
- Ikke i cerebrum – Det ka' vi godt
- Dem der skal nyretransplanteres = Bækkenkar
- Dem med DM; AOAbd, Under ekstremiteter
- Børn; ex. 

Alle firmaerne har løsningsforslag



- GE
- TOF
- PC
- FIESTA
- INHANCE
- TRICKS
- LAVA
- FAME



- Philips
- TOF
- PC
- B-FFE/TFE
- TRANCE
- B-TRANCE
- THRIVE

SIEMENS

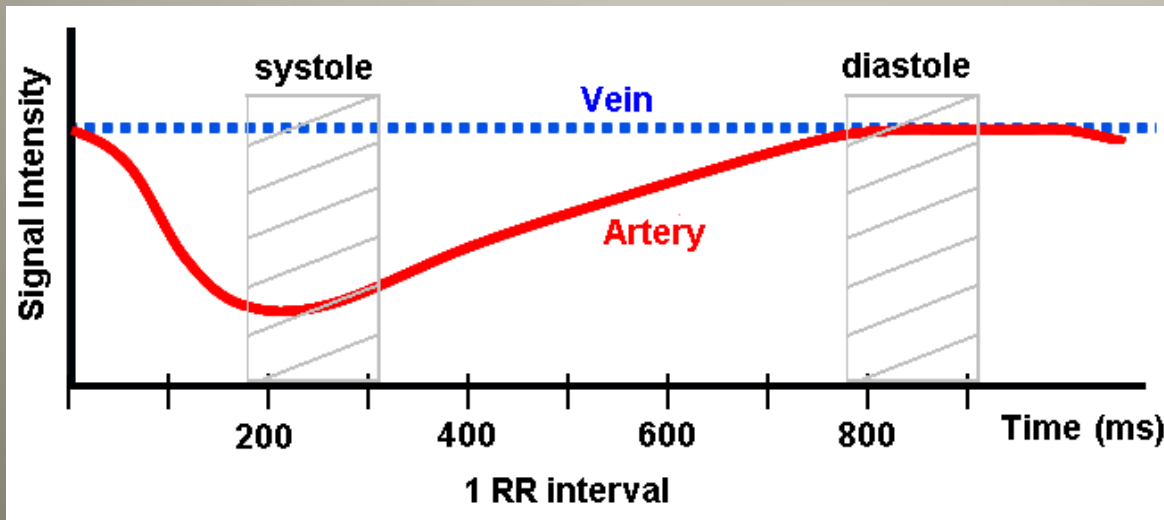
- Siemens
- TOF
- PC
- True FISP
- NATIVE
- TWIST
- VIBE

Teknikker og anvendelsesområder

- TOF - hjerne, carotider, fod (overalt)
- PC - Hjerne (a+v og AVM), nyrer (overalt)
- B-TFE/FIESTA/True Fisp – Nyrer, Abd, Thorax, Hjerter, Vena porta,
- TRANCE/INHANCE/NATIVE – UE, fod
- B-TRANCE – Nyrer, hjerte

TRANCE

- TRANCE 3D teknik med cardiac triggering
- Baseret på varierende signal intensitet i karrene gennem hjerte cyklus
 - systole: sorte arterier, hvide vener
 - diastole: hvide arterier, hvide vener
- Automatisk subtraktion – kun arterierne ses
- Primær anvendelse: perifere kar



TRANCE – Principles (II): Subtraction angiography



Diastole image
High signal arteries
High signal veins



Systole image
Low signal arteries
High signal veins

=



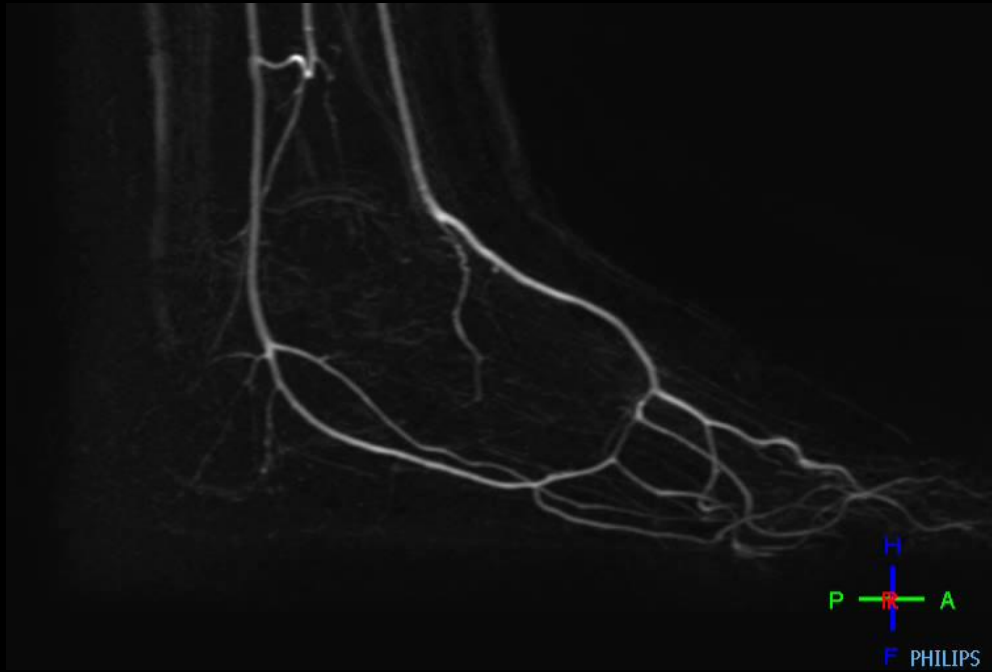
Subtraction image
High signal arteries
No signal veins

Lower Extremities – TRANCE

Arteriogram

Foot

MobiFlex lower
extremities



TRANCE - Benchmarks

Arteriogram comparisons

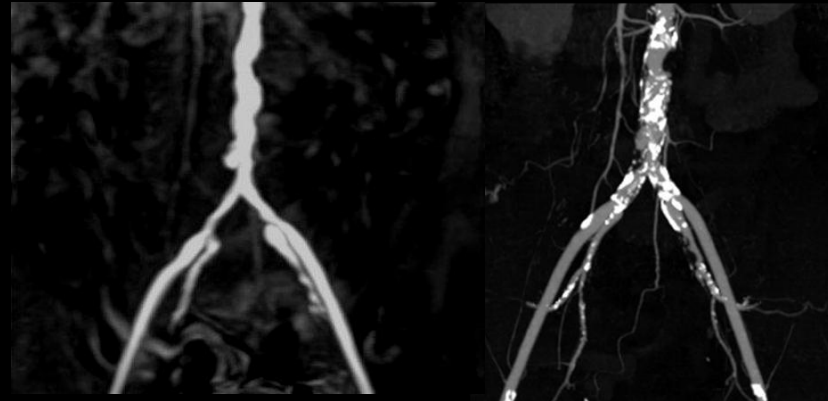
3D-TSE

ECG triggered

TR/TE/FA 1RR/80/90°
40 slice 5.0/-2.5mm

Scan Time
1:55 x 2

Achieva 1.5T

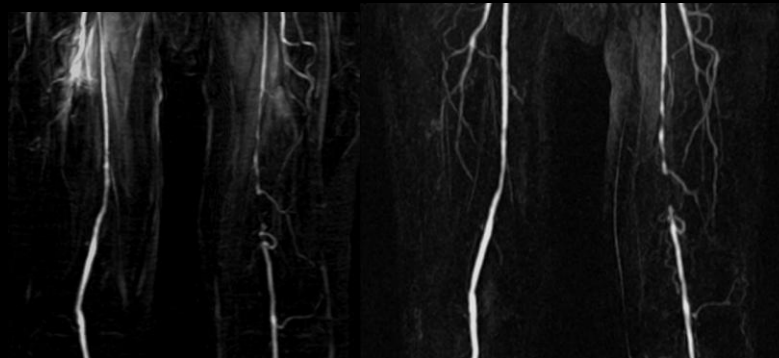


TRANCE

3D-CTA

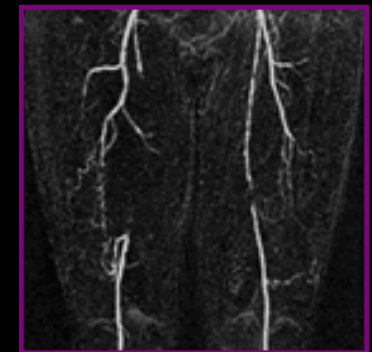


X-ray



TRANCE

CE-MRA



For comparison Toshiba, FBI

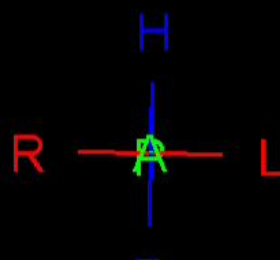
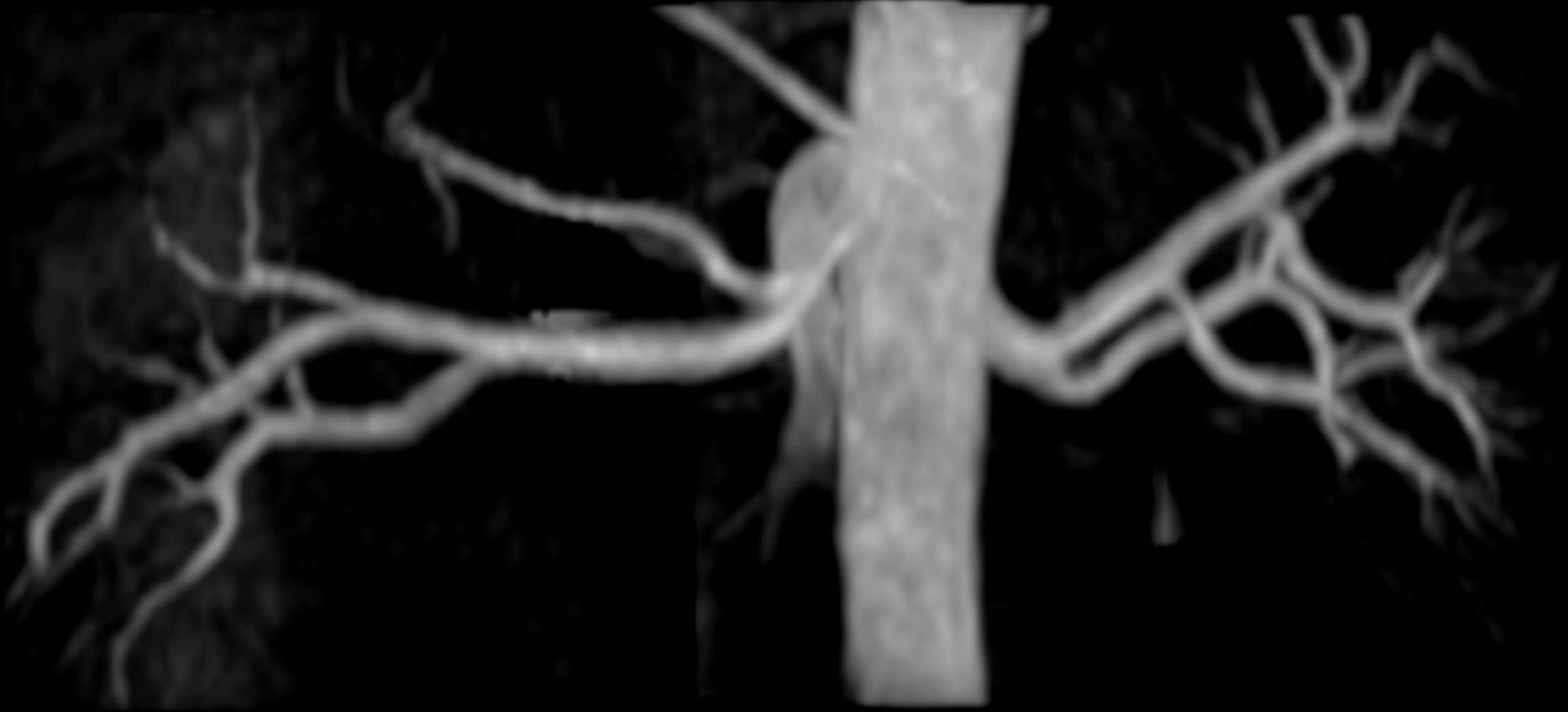
Excellent correlation to
CTA, X-ray and CE-MRA

B-TRANCE

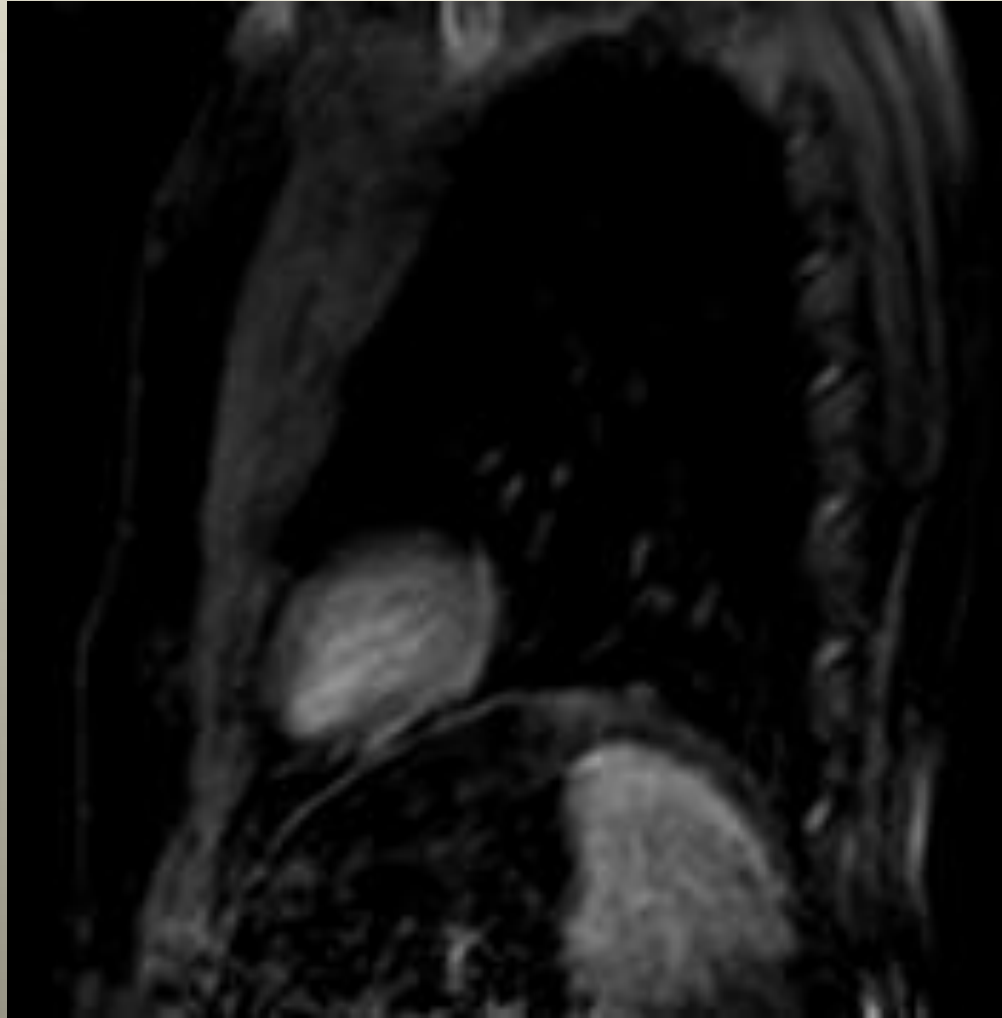
Balanced TRiggered Angiography Non Contrast Enhanced

- B-TRANCE = 3D B-TFE med cardiac triggering
- Pt. kan frit trække vejret
- Fedt undertrykkelse med ProSet eller Fat SAT/SPIR
- Ekstra inversions puls for at minimere signal fra baggrunden
- Fleksibel placering af saturerings bånd for minimering af signal fra vener eller parenkym/baggrund
- Primært til nyrearterier



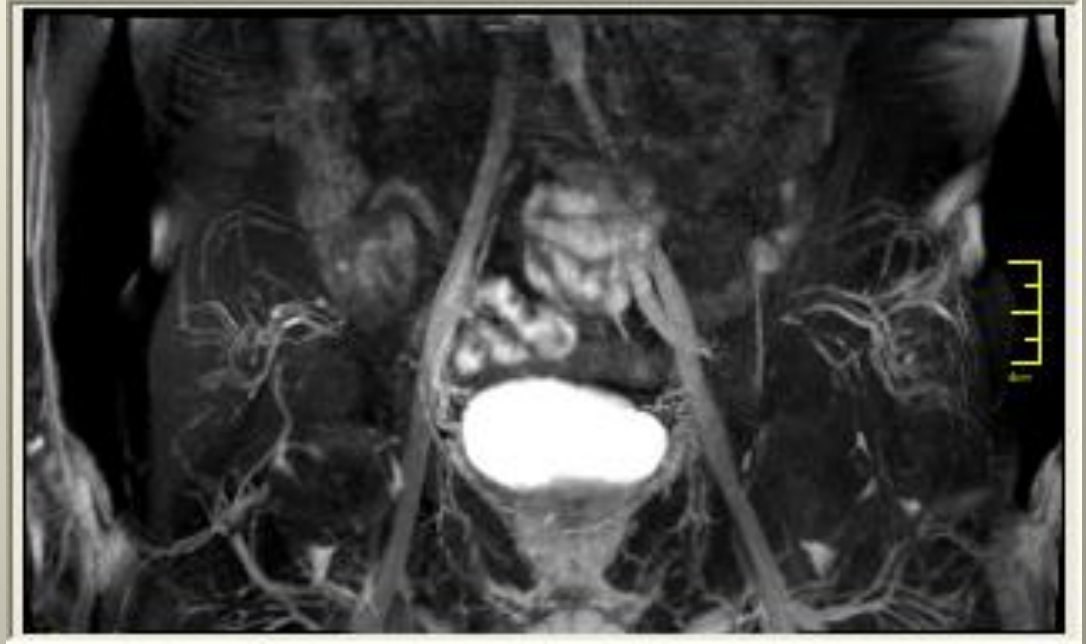
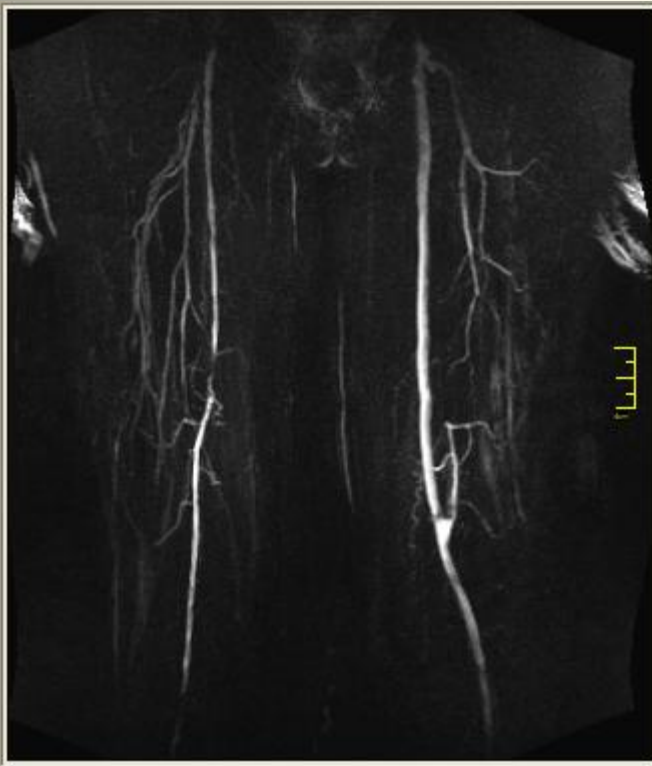


3D B-TFE Nav



Lidt eksempler fra de forskellige
firmaer med forskellige sekvenser

Siemens

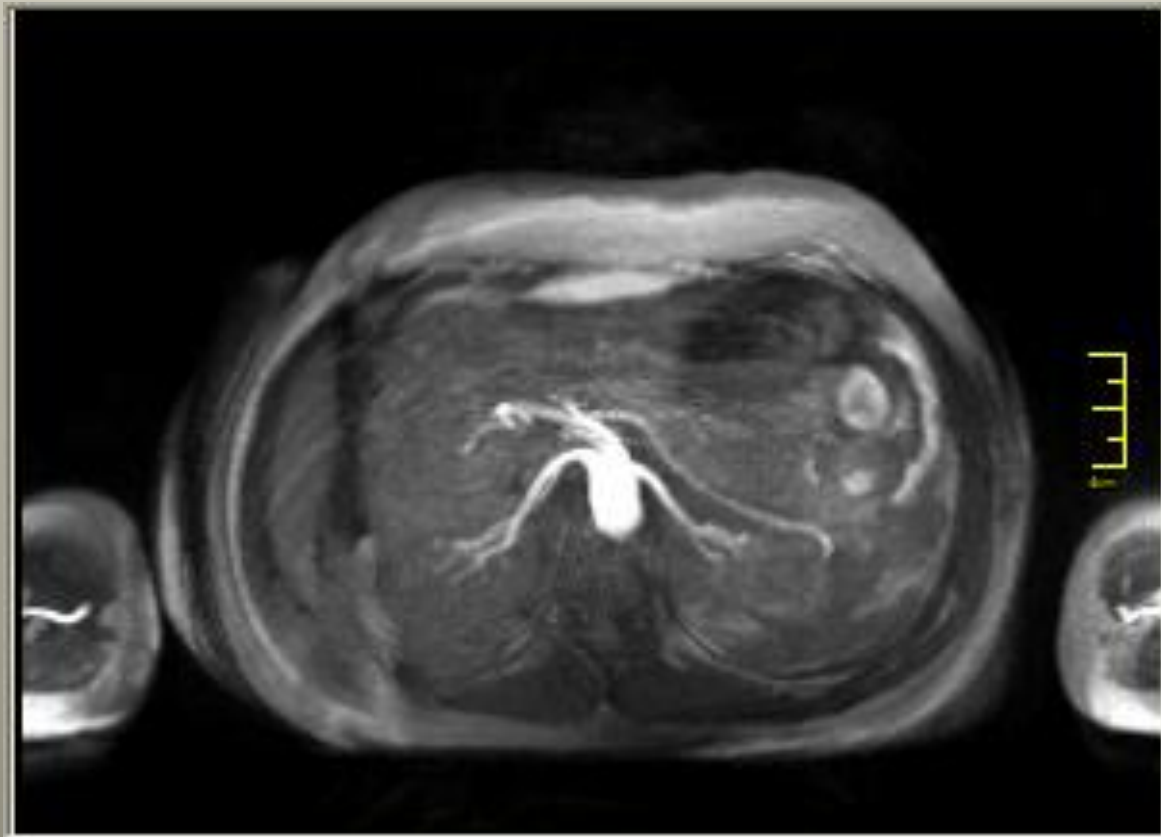


NATIVE Space på femur og crus
NATIVE True Fisp på Pelvis

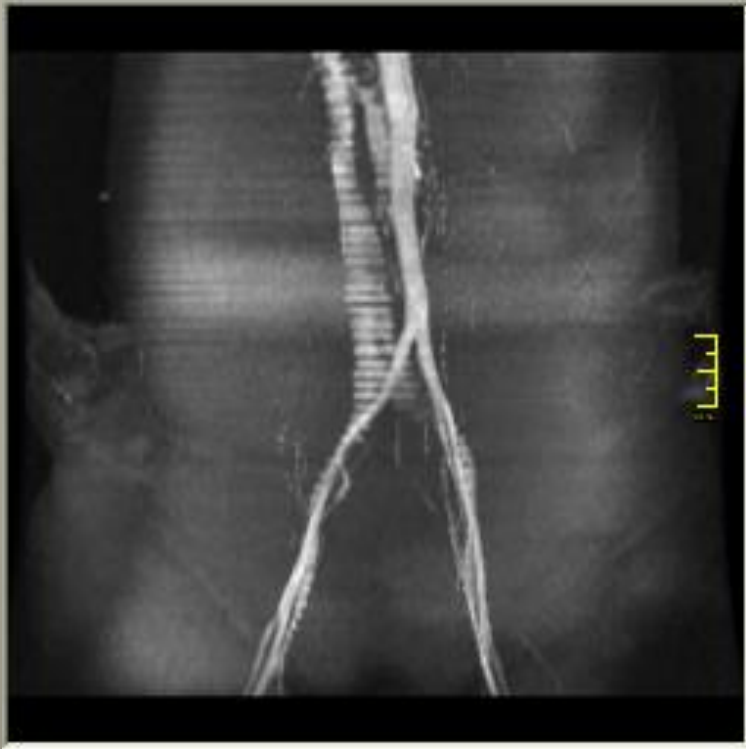


Siemens

NATIVE True Fisp



GE

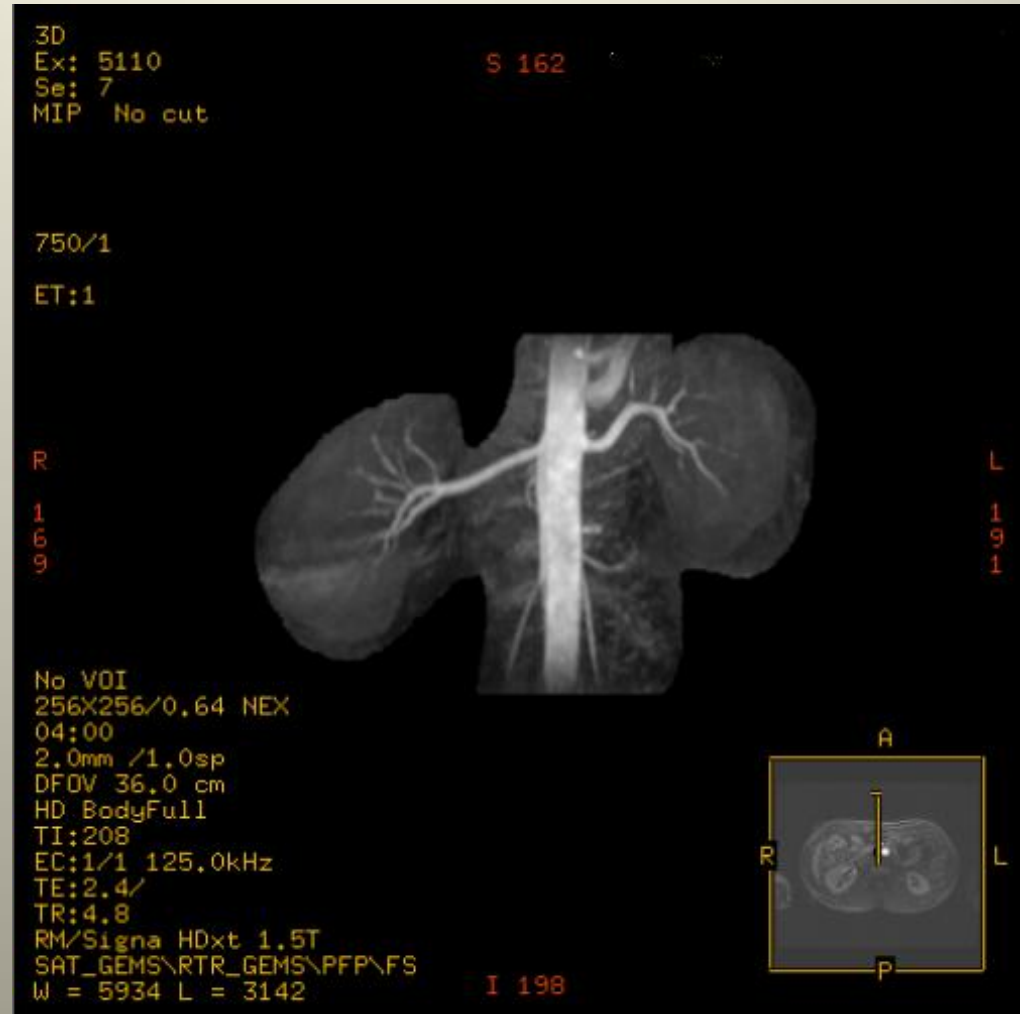


2D TOF

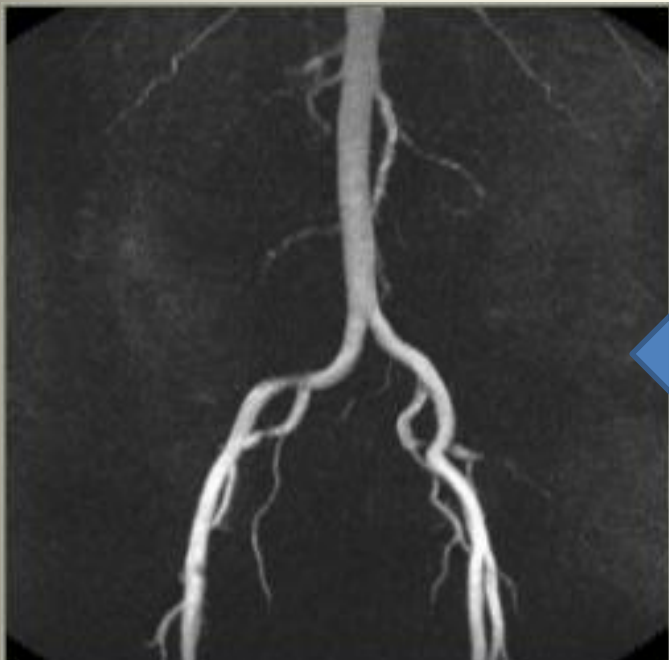


GE

MIP Inhance

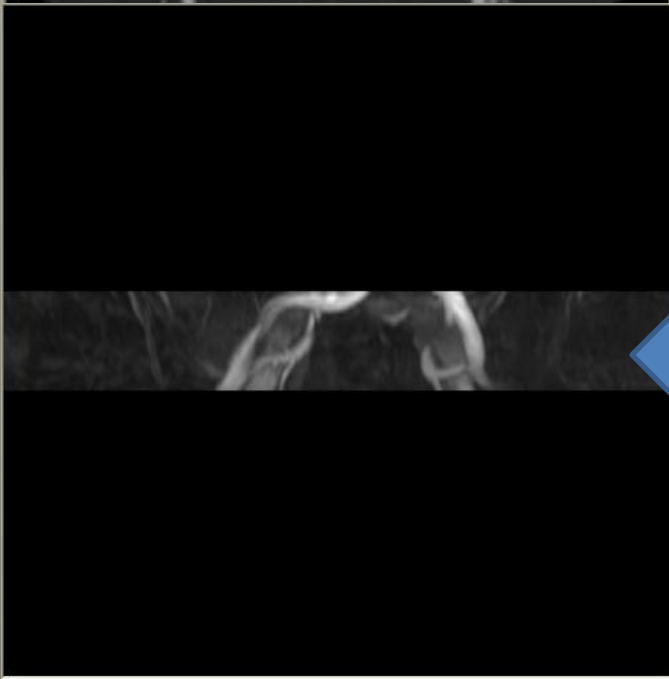


Philips



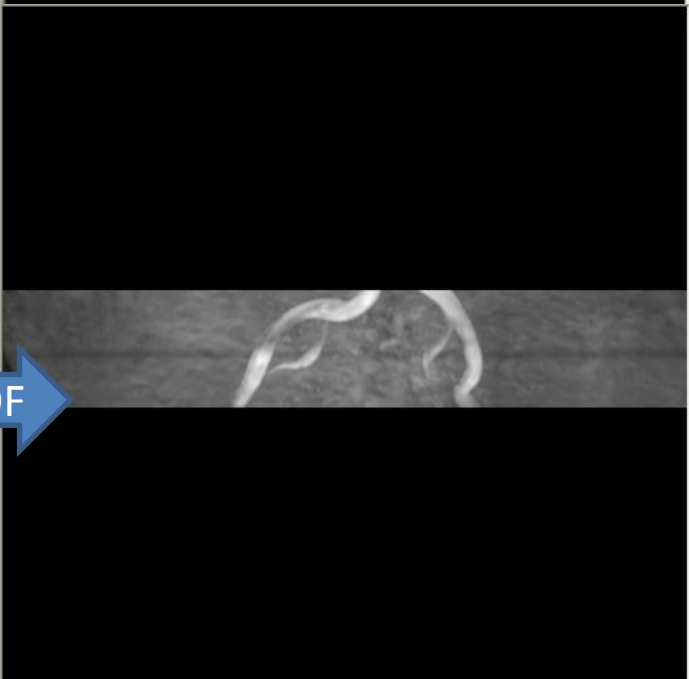
← 2D TOF

3D PC →

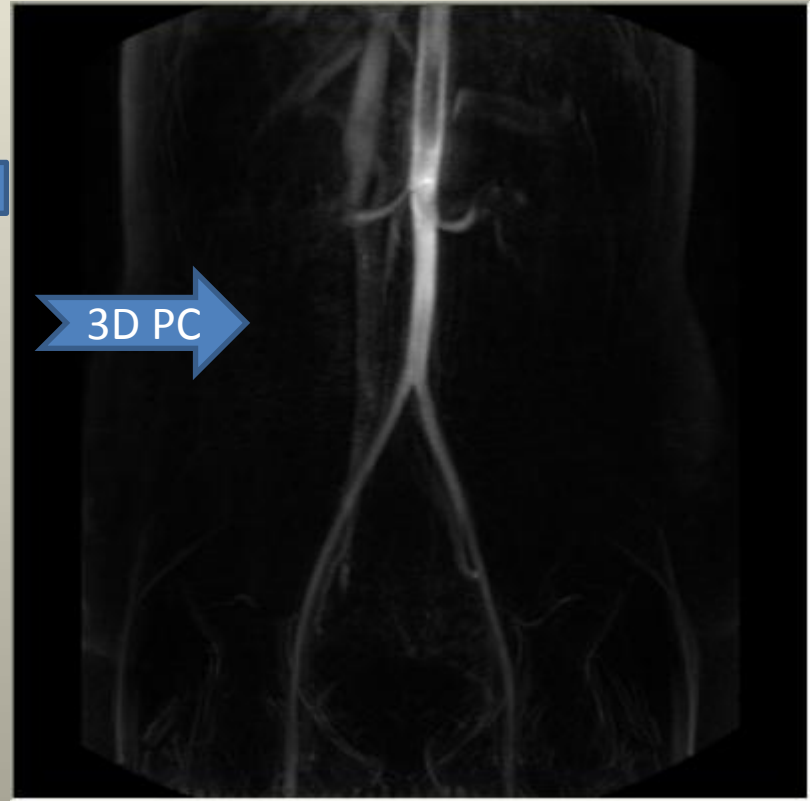
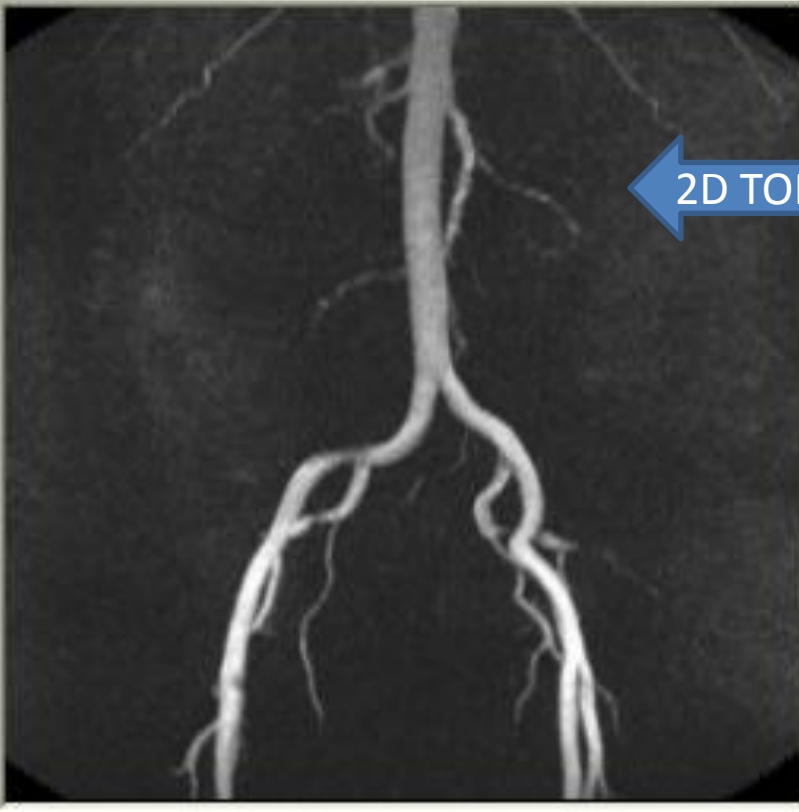


← 3D B-TFE

3D TOF →

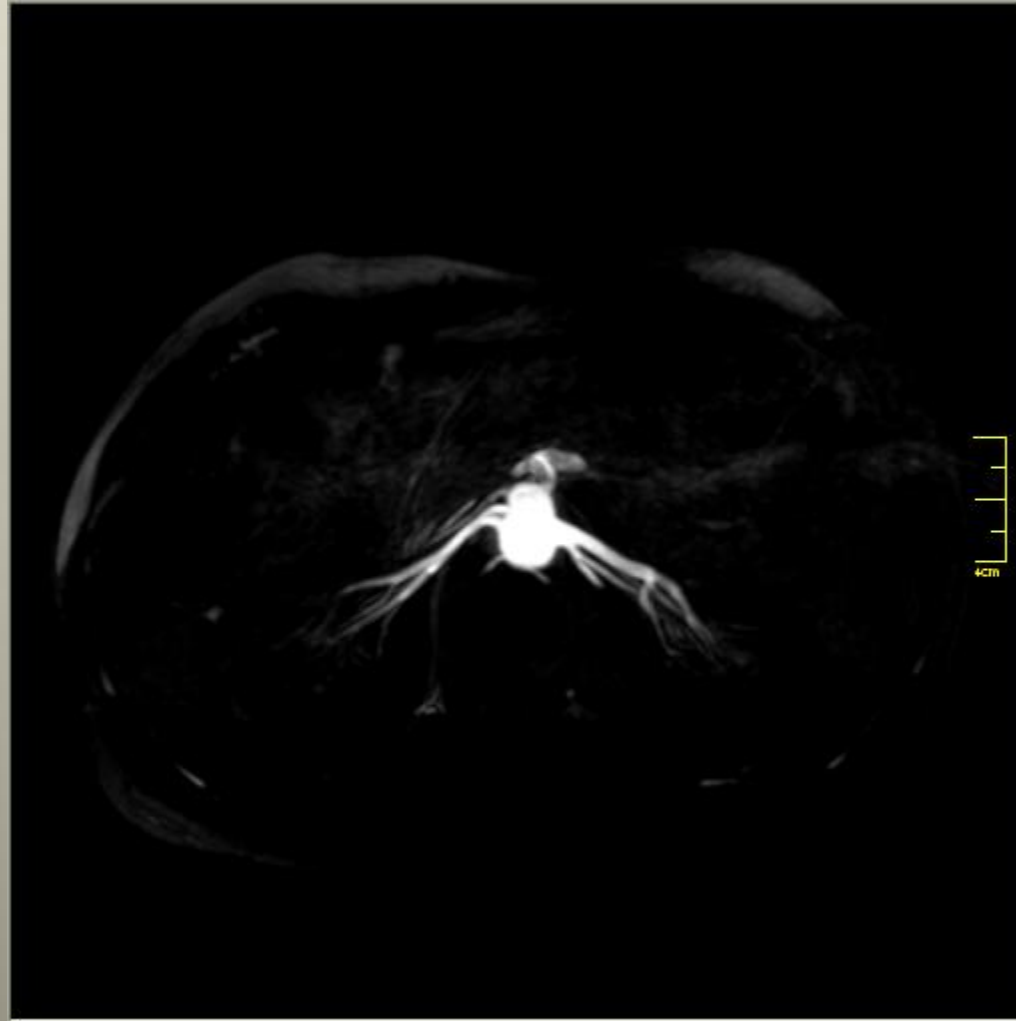


Philips

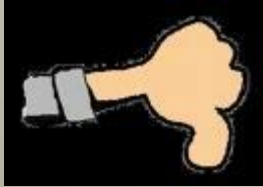


Philips

3D B-TFE
uden
beskæring

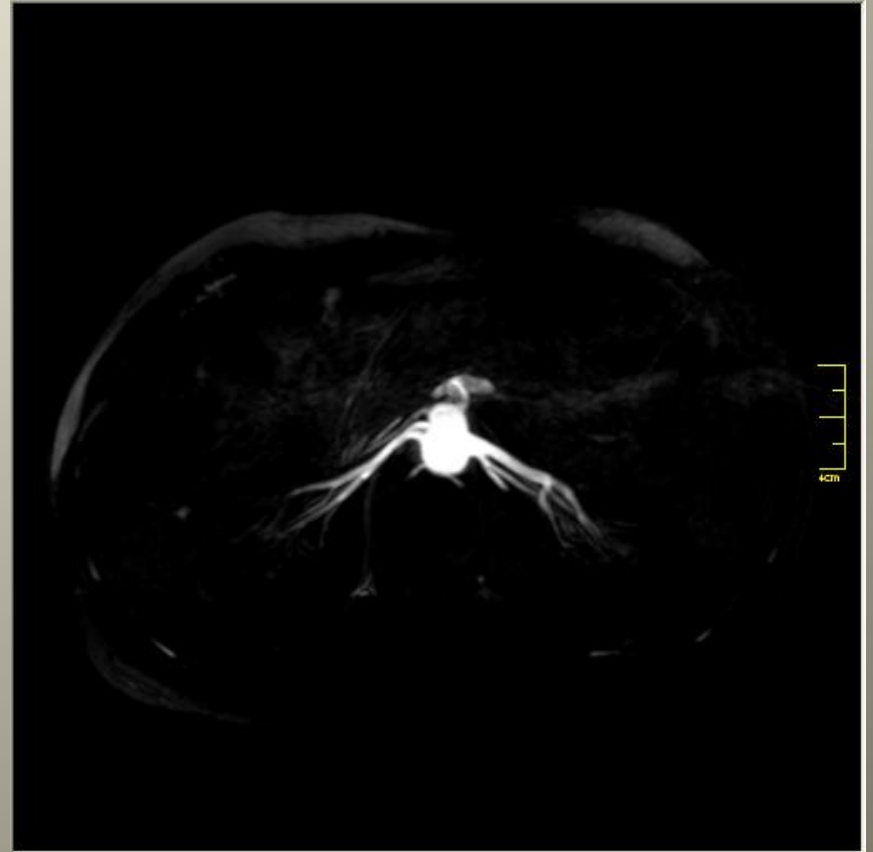


Tilfredsstillelse?



Take home message

- Fortvivl ikke!
- Bliv ved med at udvikle
- Det kan lade sig gøre



Tak til

- Kollegerne på MR-Centret
- Philips