How to use MRI imaging for planning and fusion of a complex F/BEVAR procedure

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Disclosure

Speaker name: Michel Bosiers

I have the following potential conflicts of interest to report:

☐ Consulting
☐ Employment in industry
☐ Stockholder of a healthcare company
☐ Owner of a healthcare company
☐ Other(s)

X I do not have any potential conflict of interest
Background:

Basis for the treatment of komplex thoracoabdominal aneurysms: **Thin-layer (1mm) angio-CT-scan-thorax and abdomen**

**Radiation dose:**
CT thorax and abdomen: $10 - 20 \text{ mSv}$
(5 fold of the yearly natural radiation exposure)

**Contrast medium:** $60 - 120 \text{ ml}$
GOAL:
Reduction of the radiation dose and CM

Is the MRA Imaging suitable for the planning of complex fenestrated and branched endografts?
Choosing the right MRI-sequence:

Renal artery sequence T1 Flash 3d Sequence
in-plane resolution 0,99x0,99 mm, layer thickness 1,1 mm
layers 104, in 12 sec.
FOV (Field of view) craniocaudal 38 cm, width 33 cm
MRI And MRA For Planning & Fusion In The Treatment Of TAAAs

Endograft-planning: 3d Reconstruction

CT-Angio

MR-Angio
MRI And MRA For Planning & Fusion In The Treatment Of TAAAs

Endograft-planning: Centerline
Endograft-planning: Measurement of the distances of the target vessels in relation to the SMA (Base-line)
Endograft-planning: Measurement of the distances of the target vessels in relation to the SMA (Base-line)

CT-Angio

MR-Angio
Endograft-planning: Determination of the clock position of the target vessels

CT-Angio

MR-Angio

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MRI And MRA For Planning & Fusion In The Treatment Of TAAAs

Endograft-Planning: Drawing, Endograftdesign
GOAL:
Reduction of the radiation dose and CM

Is the MRA Imaging suitable for fusion during complex endovascular repair?
Segmentation for Fusion: 2D/3D Reconstruction

(1) Planning on MR

**Iodine-Free Planning on MR**

- Segmentation of MR Iliacs and Aorta (Prototype MIT)
- Marking of SMA, Coeliac Trunk and Renal Arteries
(2) Registration

**Iodine-Free Registration with CO2**
- Initial registration on inserted devices.
- Detailed registration on first CO2 Angio
(3) Catheterization of Branches

Iodine-Free Catheterization of Visceral Branches

- Placement of wires based on Overlay (No Roadmaps)
- Order: SMA, Right Renal, Left Renal, C.Trunk

Comments Dr Austermann:
Fusion is very correct, 3D Model of MRI is as good as with CT
Fusion model is very helpful in this kind of navigation
Male 82 Y, renal impairment Crea 1.8 mg/dl: Result by CO2 Angio
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No bone structures -> adapt to wire(s)
Adapt MESH in 2 planes

Deliver endograft
MRI And MRA For Planning & Fusion In The Treatment Of TAAAs
In 5 patients with complex TAAAs in addition to the CT scan a MRA scan was performed:

- In all 5 patients we were able to use the **Fusion technique** on the basis of the MRA. (Siemens™-Prototyp)

- **Graftplanning** with Terarecon iNtuition™ was successful if the renal artery sequence was used with the disadvantage of the small FOV 38x33 cm.
Conclusion:

MRA as the basis for planning and fusion in the treatment of TAAAs is **feasible** and has the potential to **reduce radiation exposure** and the **amount of contrast medium**.

- **Renal artery sequence** T1 Flash 3d Sequence
- in-plane resolution 0.99x0.99 mm, layer thickness 1.1 mm
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