**Principles of Fusion Techniques And Dyna-CT: Advantages and Limitations during EVAR AND TEVAR**

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**Disclosures**

- Consultant
  - Endologix, Gore, Medtronic
- Research grant / research support
  - Endologix, Gore, Medtronic, Siemens
- Advisory Board
  - Endologix, Gore, Medtronic, Siemens
- Major Stakeholder
  - None

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### Principle of Fusion imaging

- **Preoperative CTA**
- **Fluoroscopy**
- **Fusion Imaging**

**2D-3D Registration**
- DynaCT / Fluoroscopy

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### Potential of Fusion Imaging

**Reduction of:**
- Radiation
- Contrast
- Fluoroscopy time and DAP
- Procedure time

**Improvement of technicals and clinical results:**
- Lower endoleaks
- Less reintervention

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### Reduction of Dose Area Product

- **X-ray Filtration and short pulses**
- **CARE Programs Fluoro and CARE Position**
- **Collimation and detector distance**
- **Fluoro Time, Angulation**
- **DSA runs, Roadmap**
Advantage>Device Length Measurements

Limitations of Fusion Imaging

Deviation during EVAR

Mean deviation 5.8 mm

Deviation during TEVAR

Feasibility and accuracy of fusion imaging during thoracic endovascular aortic repair


Schulz, Schmidt, Böckler, Geisbüsch, J Endovasc Ther 2016.

Schulz, Schmidt, Böckler, Geisbüsch, J Endovasc Ther 2016.

Schulz, Schmidt, Böckler, Geisbüsch, J Endovasc Ther 2016.
Simulation of device deployment
Automatic vessel distortion and alignment

Dyna CT Acquisition
5s Protocol; 90 LAO - 110 RAO

Heidelberg Experience
EVAR Patients: n=98, prospective patient cohort

Detection of endoleaks

Endograft limb stenosis

**Table:**

<table>
<thead>
<tr>
<th>Endoleak Type</th>
<th>DSA</th>
<th>DynaCT</th>
<th>CTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
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**Sensitivity:**
- I: 100%
- II: 76.8%
- Total: 82.9%

**Specificity:**
- I: 16.3%
- II: 35.7%
- Total: 22.4%

**Intervention:**
- DSA
- DynaCT
- CTA
- PTA
- Stentgraft Implantation
- Reintervention
### Reintervention After EVAR based on CTA

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Patients</th>
<th>Protocol</th>
<th>Radiation Dose</th>
<th>Intraoperative cDSA</th>
<th>Intervention DynaCT</th>
<th>Postoperative Control Method</th>
<th>Reinterventions after CTA / CEUS</th>
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<tbody>
<tr>
<td>Heidelberg</td>
<td>n=98</td>
<td>5s, 200°</td>
<td>43.7 ± 10.8 Gycm²</td>
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<td>7/98 (7.1%)</td>
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<td>Hertault et al. (2015) Lille</td>
<td>n=54</td>
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### Radiation Dose Dyna CT

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### Reduction of Reinterventions

- **Completion DSA** - Secondary Reintervention
- **Completion Dyna CT**
- **Immediate Revision**
- **Duplex / CEUS**
- **Standard Follow-Up**

### Reduction of „in hospital use of contrast“

- **DSA & CTA**
  - 192.5 ± 38.5 mL
- **DSA & DynaCT & CEUS**
  - 145.5 ± 38.8 mL -24.4%
- **DynaCT & CEUS**
  - 118.6 ± 38.6 mL -38.8%

### Conclusions

- **Fusion imaging** can be standardized and routinely used in EVAR, TEVAR and FEVAR/BEVAR (plus 10 min)
- **Fusion imaging** is more demanding in TEVAR than EVAR
- Deviation is a recent limitation
- **Fusion Imaging** = assisting tool for angulation and navigation but iop. angiography is still necessary
Conclusions

- Fusion imaging can be standardized and routinely used in EVAR, TEVAR and FEVAR/BEVAR (plus 10 min)
- Fusion imaging is more demanding in TEVAR than EVAR
- Deviation is a recent limitation
- Fusion Imaging is an assisting tool for angulation and navigation but iop. angiography is still necessary
- **Dyna CT** is reliable to detect iop. SG related complications
- Immediate correction of intraoperative complications in 7%
- Potential to further reduce reintervention rates
- Reduces in hospital use of contrast and radiation exposure
- Optimal protocol needs to be defined