New Imaging Applications in the Siemens Hybrid Theatre

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Disclosures

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  - Consultant & Research grants
- Atrium
  - Consultant
- Siemens
  - Consultant
- Medtronic
  - Consultant

Hybrid OR has become the Standard of care in EVAR

- Sterile environment
  - Open access
  - Hybrid Procedures
  - Conversion
- Safer environment team
- Logistics
- OR-lights

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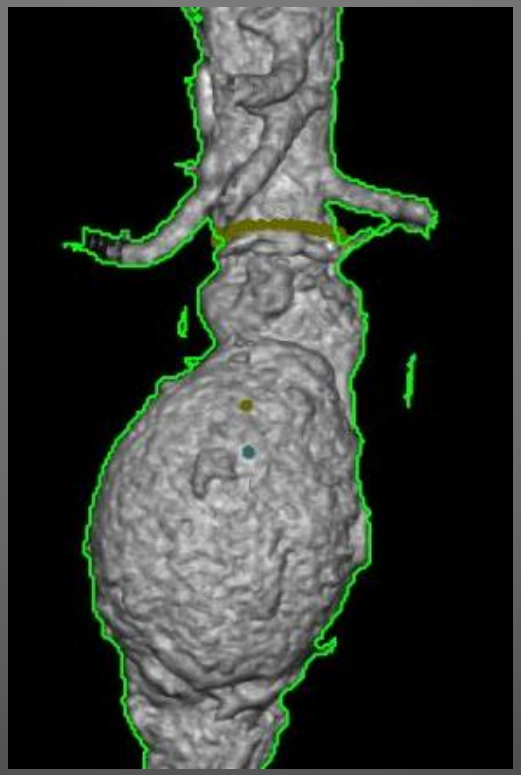
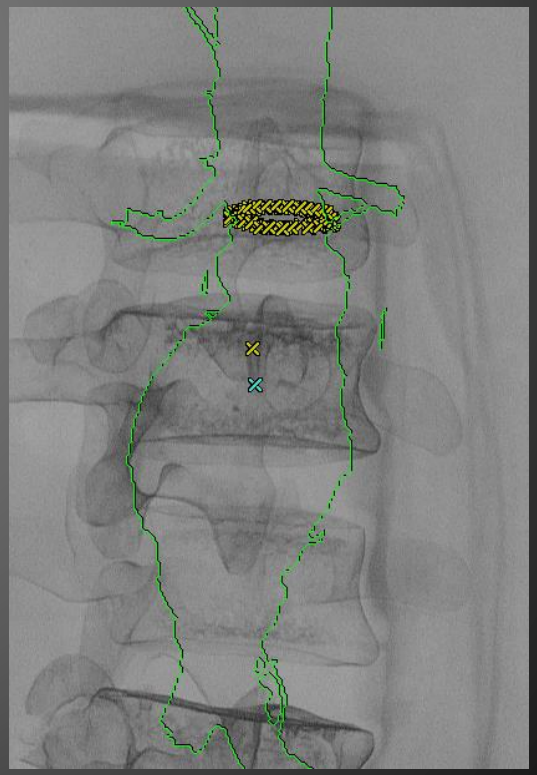
- Fusion Technology





Intraoperative C-arm cone-beam computed tomography in fenestrated/branched aortic endografting

Martijn L. Dijkstra, BA,[a] Matthew J. Eagleton, MD,[a,b] Roy K. Greenberg, MD,[a,b] Tara Mastracci, MD,[a] and Adrian Hernandez, MD, PhD,[c] *Cleveland, Ohio*

(J Vasc Surg 2011;53:583-90.)

- CBCT for FEVAR guidance
  - ↓ Contrast used (p=0.001)
  - Trend for ↓ OR & ↓fluoroscopy time
- CBCT for Intraoperative Endoleak Identification
  - Endoleaks identified & treated intraop
  - ↓ Contrast vs routine F/U with MDCT

Impact of Hybrid Rooms with Image Fusion on Radiation Exposure during Endovascular Aortic Repair

A. Hertault [a], B. Maurel [a], J. Sobocinski [a], T. Martin Gonzalez [a], M. Le Roux [a], R. Azzaoui [a], M. Midulla [b], S. Haulon [a,*]

[a] Vascular Surgery, Hôpital Cardiologique, CHRU de Lille, INSERM U1008, Université Lille Nord de France, 59037 Lille Cedex, France
[b] Radiology, Hôpital Cardiologique, CHRU Lille, INSERM U1008, Université Lille Nord de France, 59037 Lille Cedex, France

Table 1. Procedures performed in the hybrid room during the study period.

Procedure	Number of procedures (%)	BMI	DAP (Gy.cm^2)	Contrast medium volume (mL)	Fluoroscopy time (min)	Intervention time (min)
BIF	44 (43.1)	27.7 (24.2—29.9)	12.2 (8.7—19.9)	59 (50—75)	10.6 (9.1—14.7)	92.5 (75—120)
BR	20 (19.6)	24.5 (21.7—29.8)	47.4 (37.2—108.2)	120 (100—170)	39.5 (34.8—51.6)	205 (169—240)
FEN	18 (17.6)	28.4 (25.9—33.3)	43.7 (24.7—57.5)	105 (70—136)	30.7 (20.2—40.5)	150 (150—160)
THO	14 (13.7)	24.7 (22.0—28.7)	26.0 (11.9—34.9)	80 (50—100)	8.9 (6.0—10.5)	80 (60—105)
Bifurcated + Iliac branch endografts	6 (5.9)	29.7 (26.2—31.7)	41.2 (38.2—51.3)	85 (60—120)	27.3 (22.4—30.1)	140 (120—180)

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We worked on reduction of radiation with other available tools……

DAP 27,7 Gy.cm^2 Contrast use 120mL Fluoro time 29.9 min

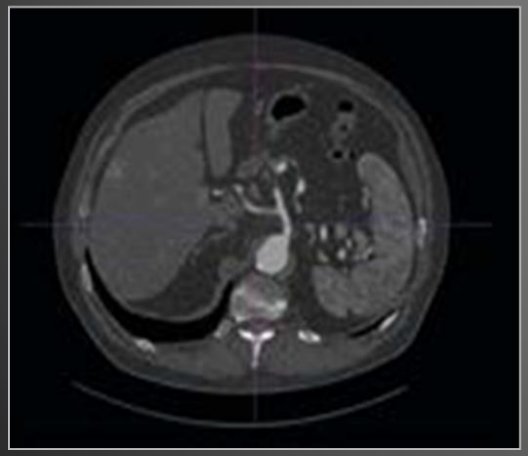
Hybrid OR with Modern Fixed Systems

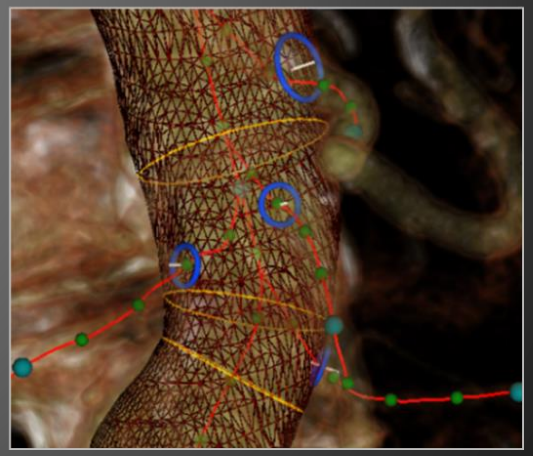
Risk: Potentially much higher Radiation!!!!

Message: use all tools to reduce Radiation

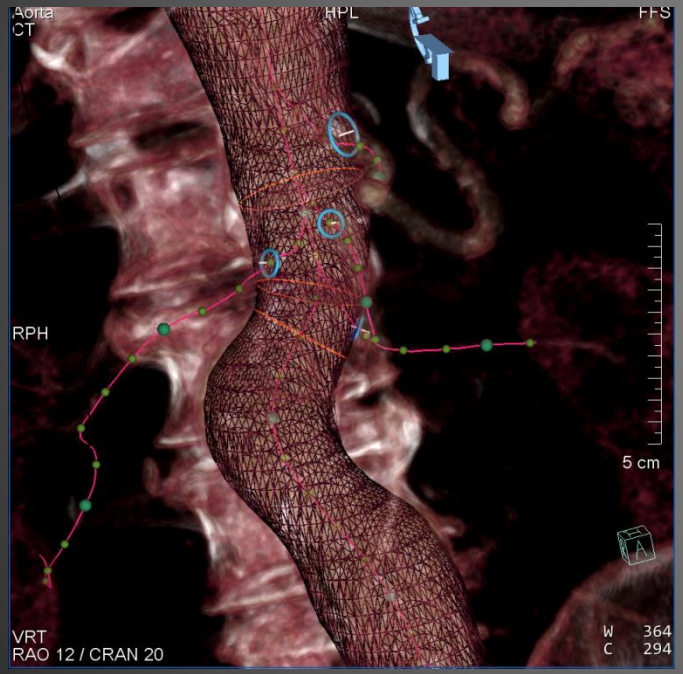
Evolution of Fusion Technology from manual…..

Manual segmentation → Manual marking of landmarks landing zones/ostia rings/centerline/contour → Manual evaluation of viewing angles





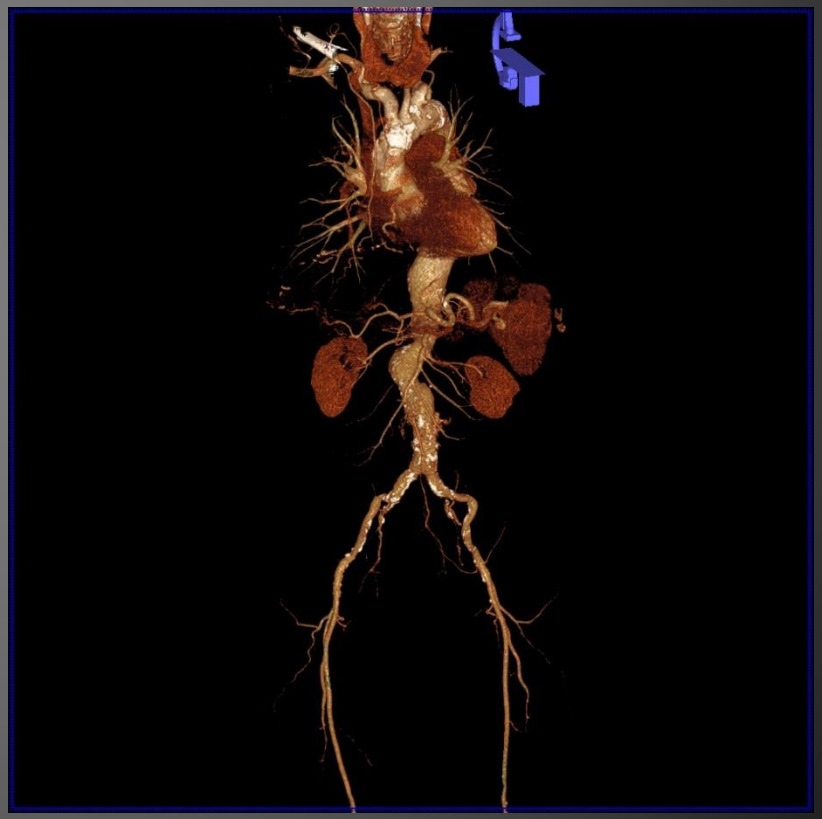
Evolution of Fusion Technology ….. to automated



Automated vessel wall detection

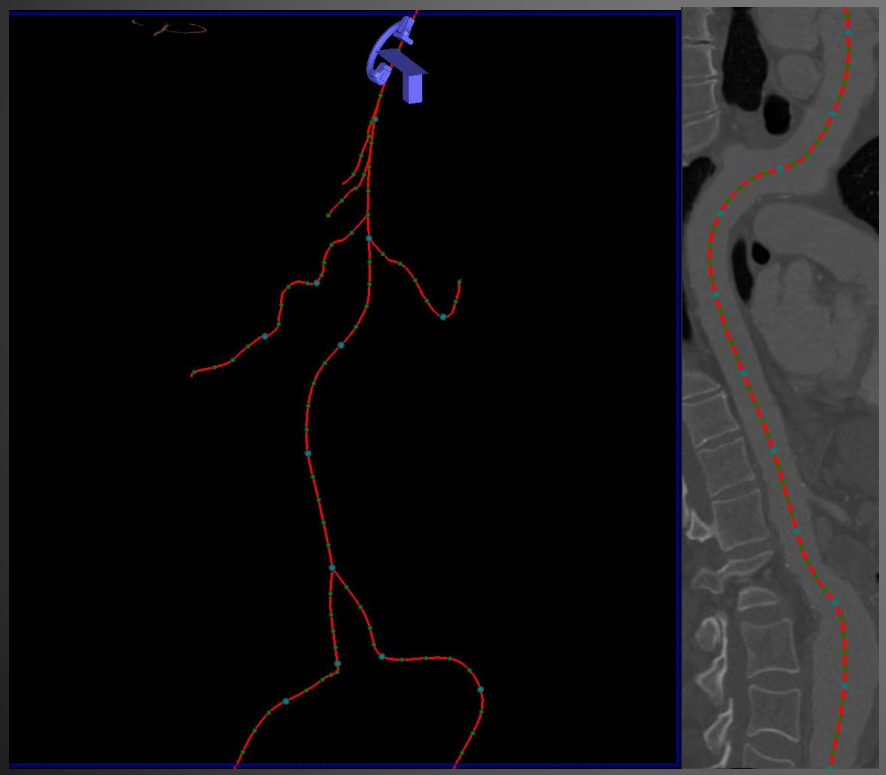
- **The software detects the vessel wall of the aorta and branched vessels**
- **A mesh model of the aortic wall is calculated**

Evolution of Fusion Technology ….. to automated



Automated bone removal

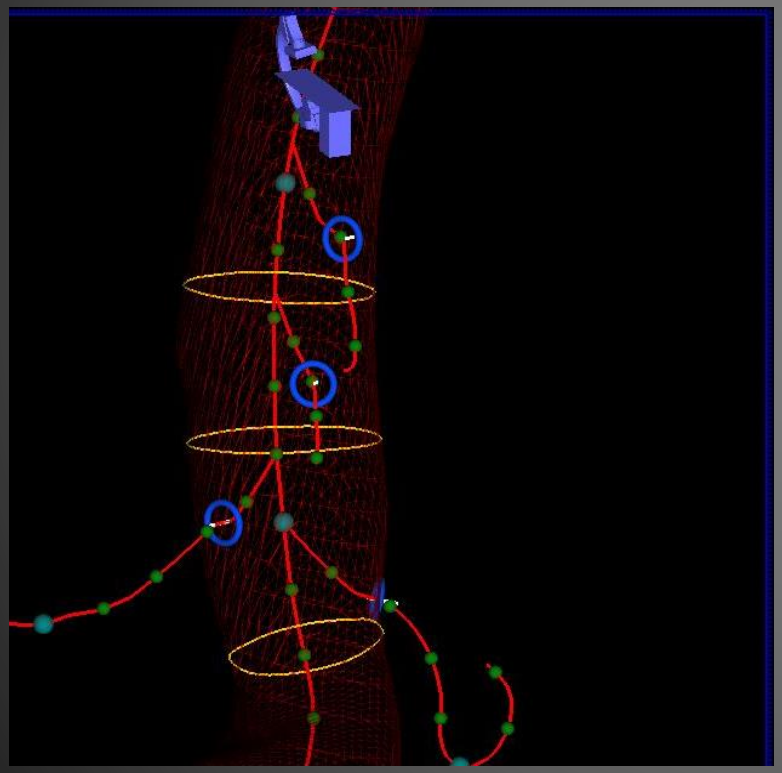
Evolution of Fusion Technology ….. to automated



<u>Automated calculation of centerlines</u>

- **The software automatically calculates the centerlines of the aorta and all main branching vessels**
- **All centerlines visualize ruler marks for comfortable sizing of the stent length**
- **No special sizing catheters are required**

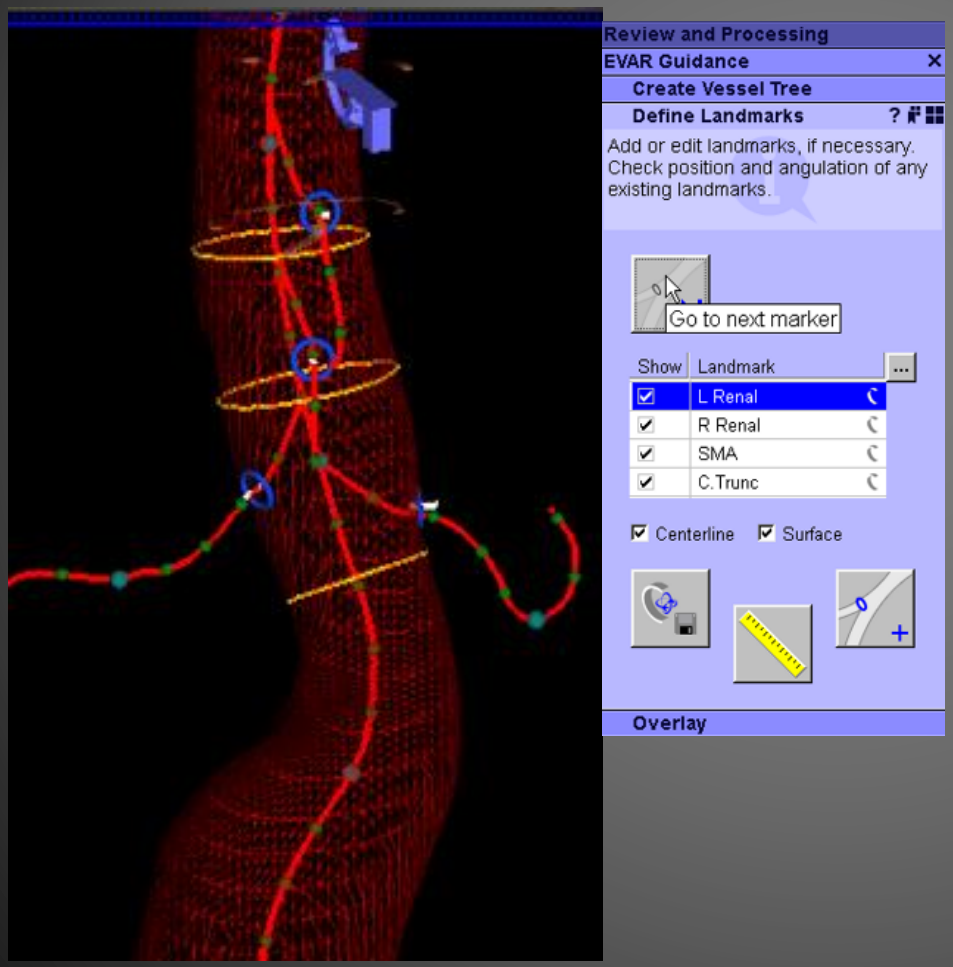
Evolution of Fusion Technology ….. to automated



Automated generation of landmarks

- **The software automatically generates the ostia rings of the main branching vessels**
- **The main vessels are automatically labeled**
- **The landing zones for the stent graft are automatically suggested**

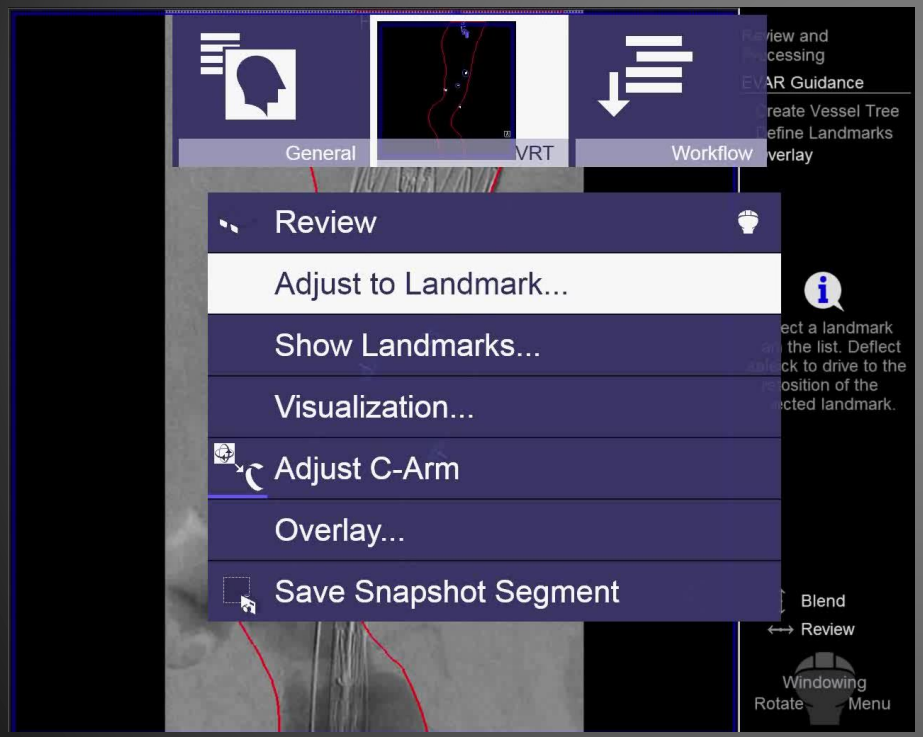
Evolution of Fusion Technology ….. to automated



Automated calculation of angulation

- **A perpendicular view of the vessel is important for a precise deployment**
- **For each landing zone and each branching vessel, the system calculates the optimal C-arm angulation for deployment**
- **The C-arm angulations are stored and can be selected in the OR for automated positioning**

Evolution of Fusion Technology ….. to automated

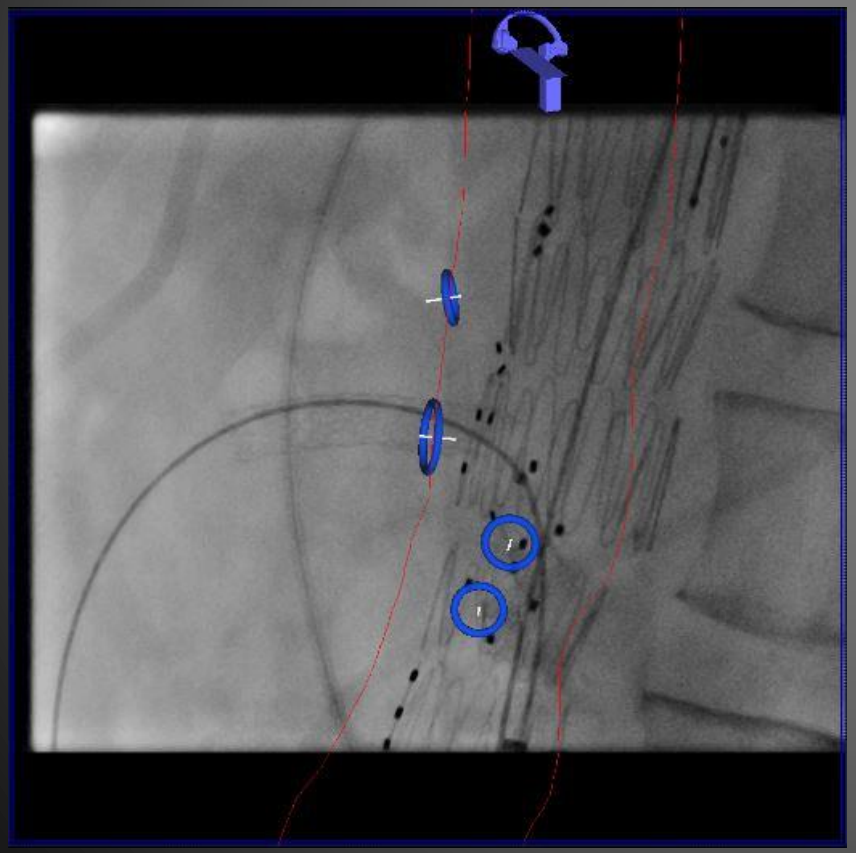


Automated C-arm positioning

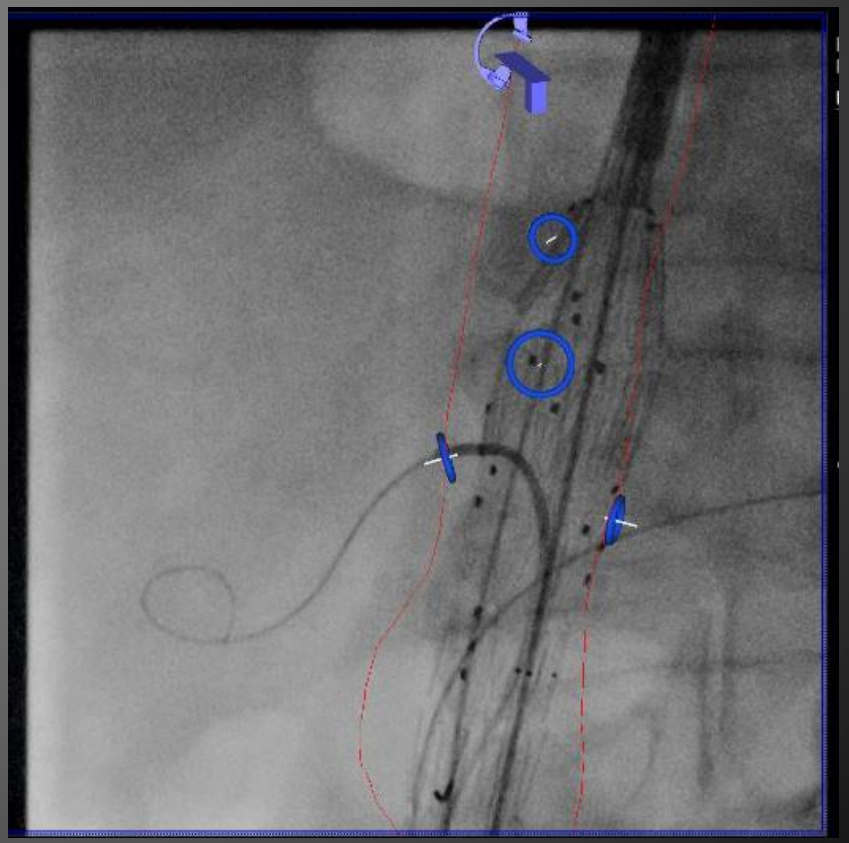
- **A precise stent deployment requires an optimal viewing angle**
- **The landmark can be selected at tableside from the heads-up display**
- **The C-arm will move automatically to the optimal viewing angle that has been calculated during the preparation phase**
- **This functionality saves time and radiation dose**

Evolution of Fusion Technology ….. to automated

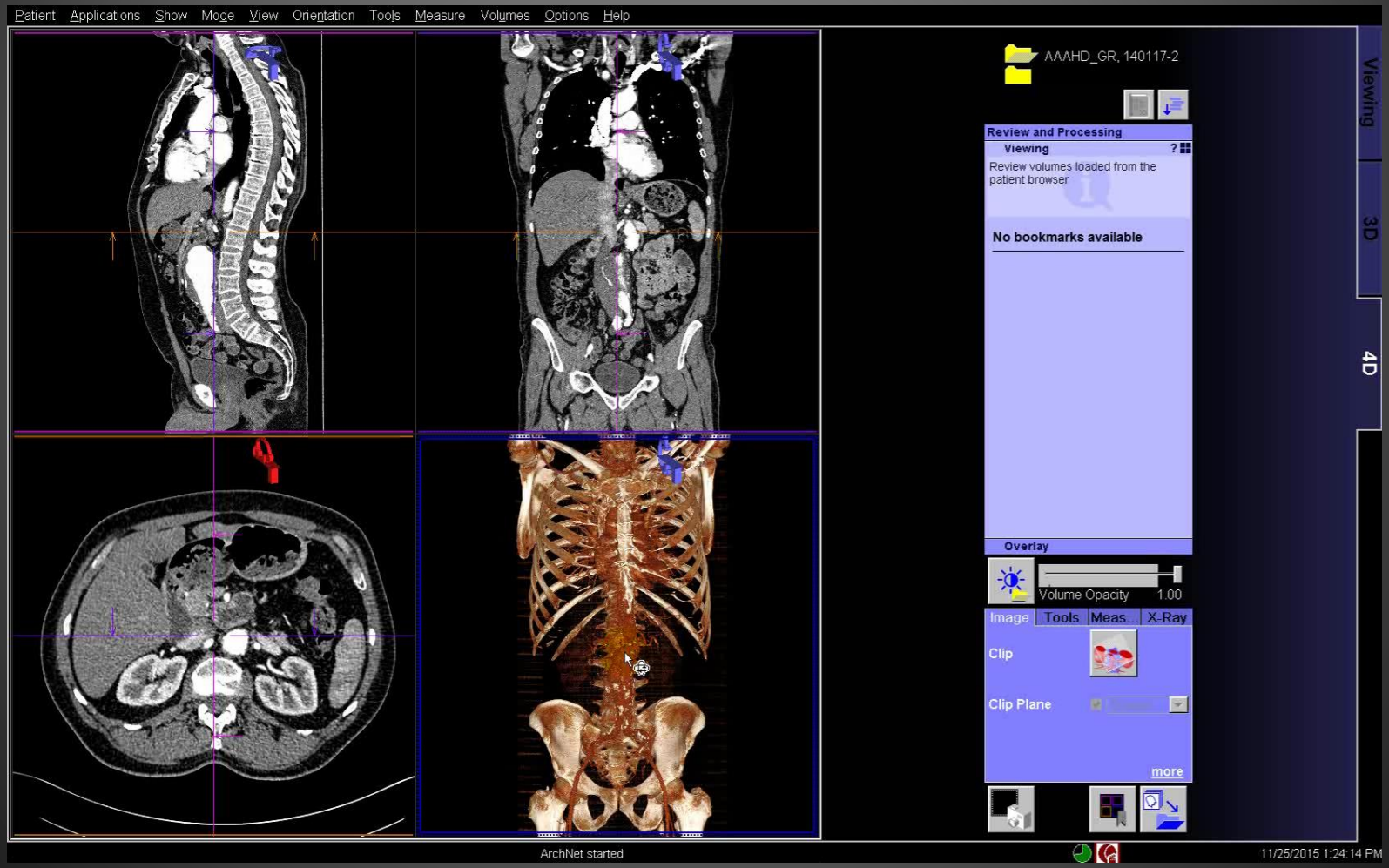
SMA



R renal

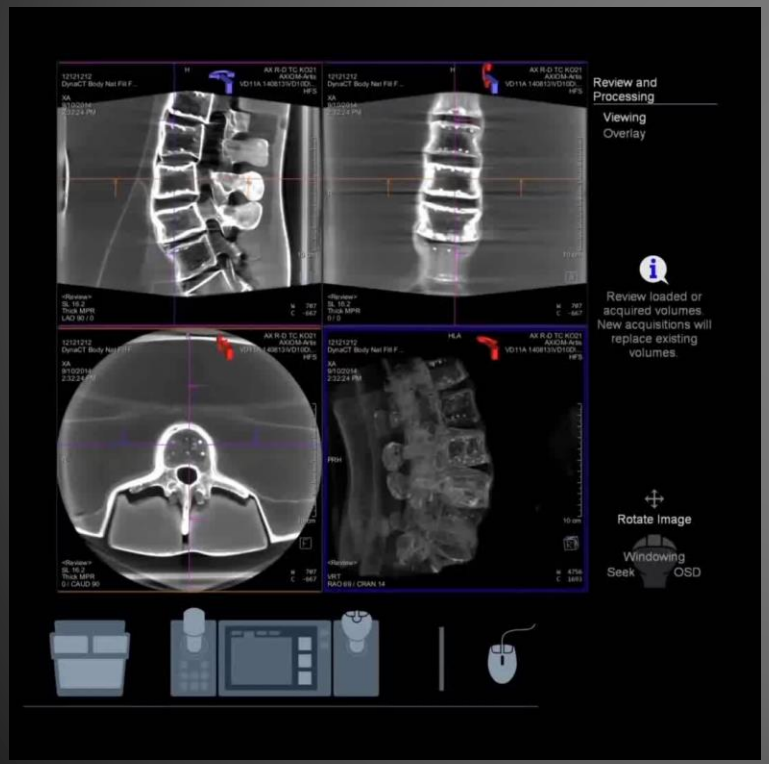


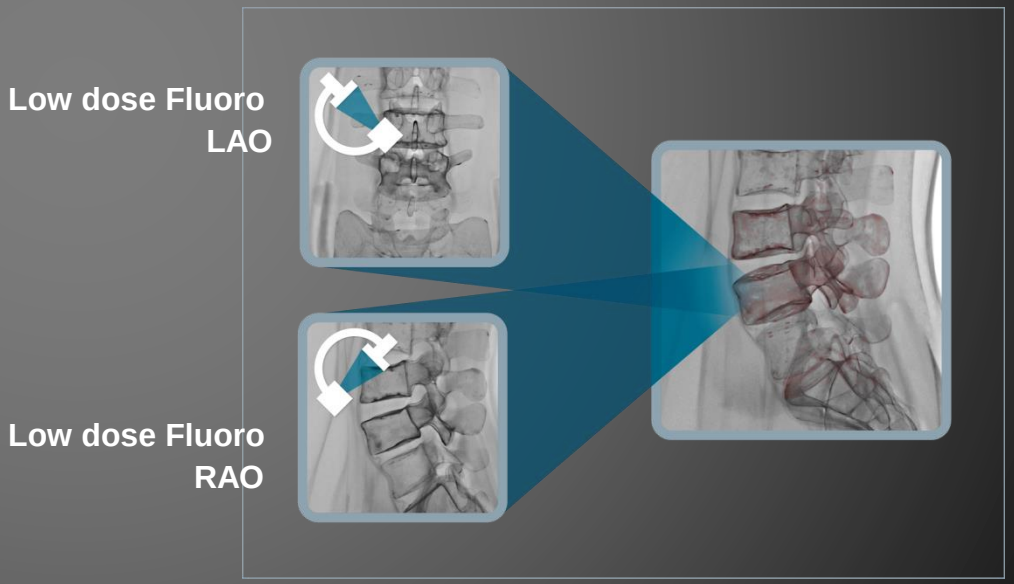
Evolution of Fusion Technology ….. to automated



Registration of CT to Zeego

2D / 3D Registration

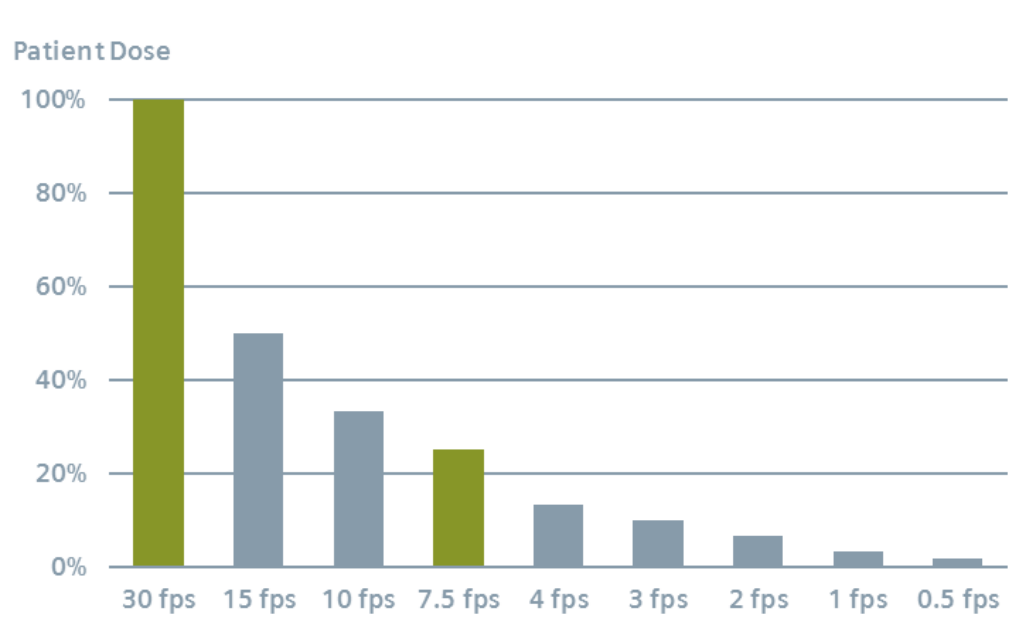




Fixed System
Do not forget Basic Rules….

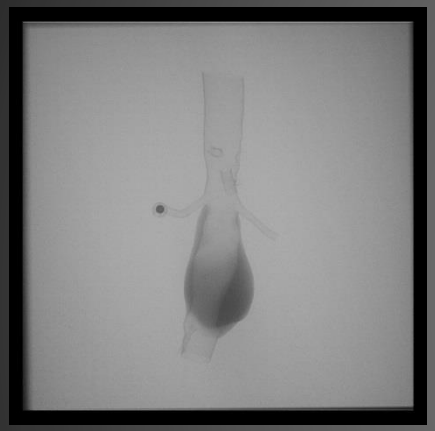
- ALARA
  - Collimation
  - ↓↓ DSA
  - ↓↓ angulation
  - Protection shields

Reduced pulse rate during Fluoroscopy

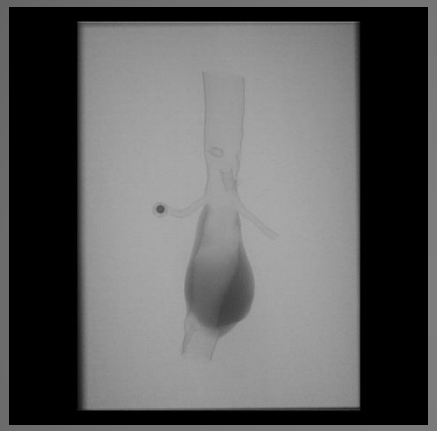


65 % less dose when reducing from 10 to 4 pulses per second fluoro

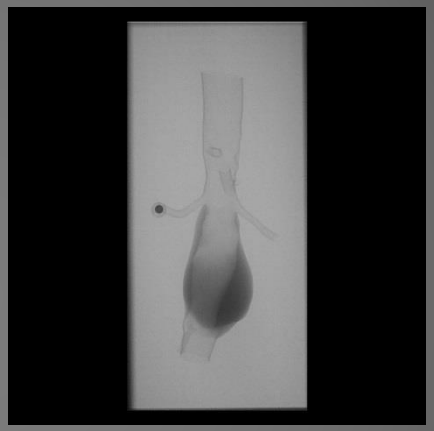
Collimation



100 %



75 %



53 %

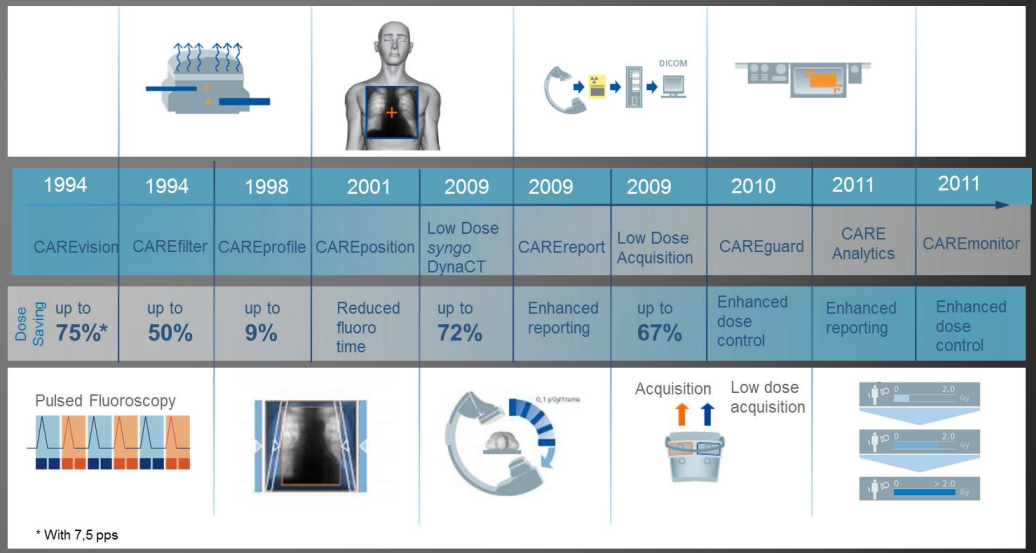
43 %

<u>Dose saving of 57%</u>

just by using collimation to the area of interest !

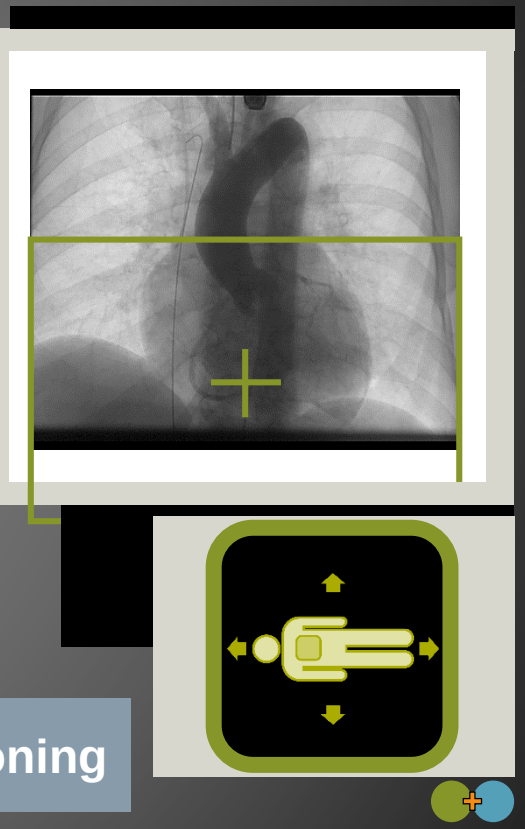
SIEMENS CARE Applications

- Low Dose Programs
- CAREposition
- Automap
- Fluorostore



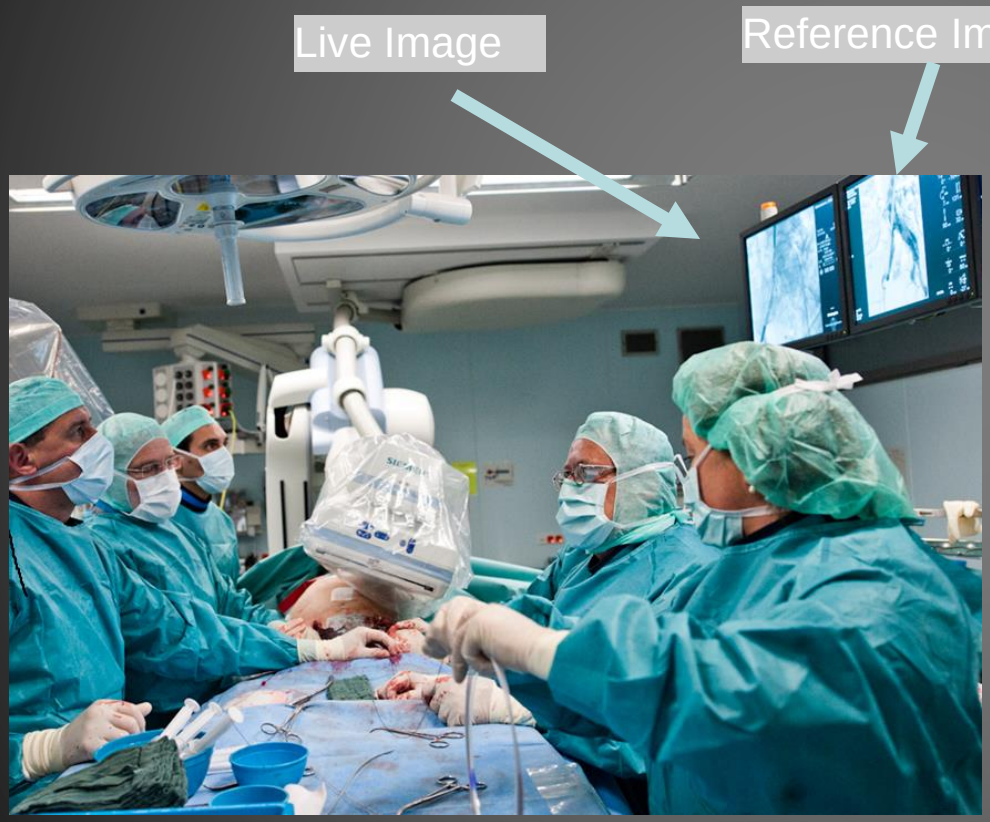
CAREposition

CAREposition allows patient positioning without fluoroscopy while moving
the table or C-arm.



CAREposition provides radiation-free patient positioning

CARE 2D Automap



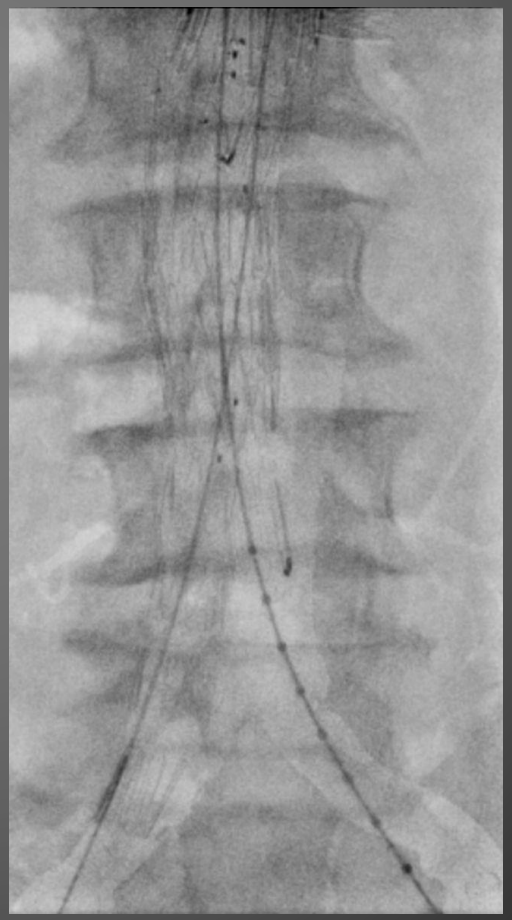
The c-arm can be moved to exactly the angulation of a reference Image.

This workflow is faster and reduces the need for additional radiation and contrast use.

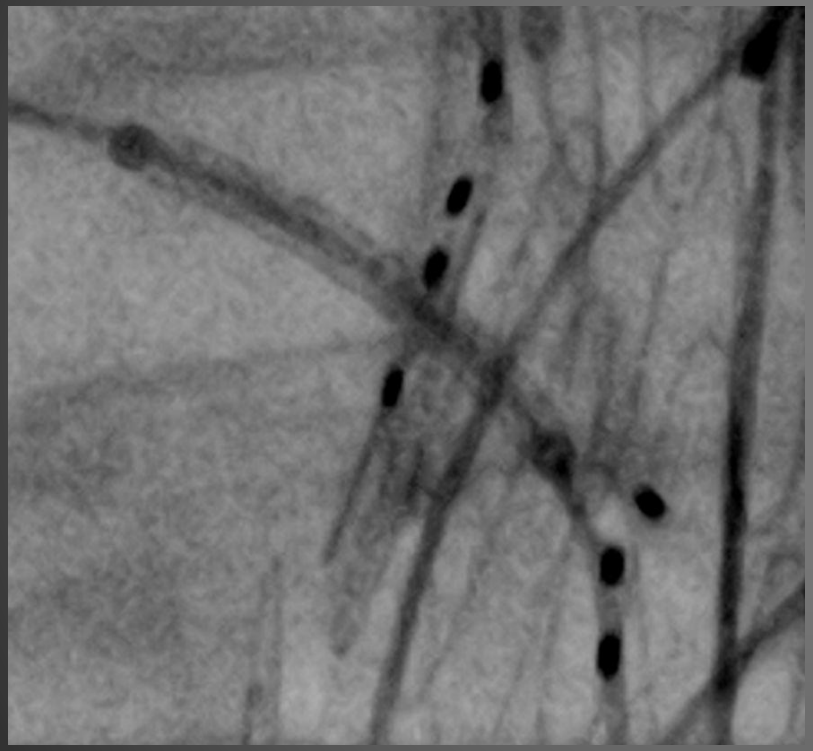
CARE 2D Automap

Reference Image

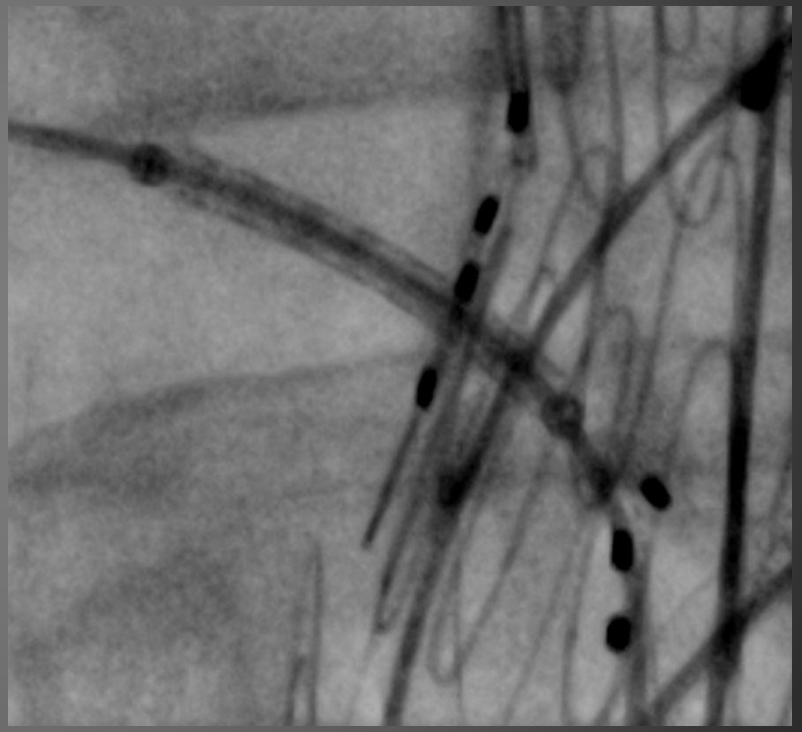
C_arm moves automatically
to the angulation of the reference image



High quality Fluoro only when really needed



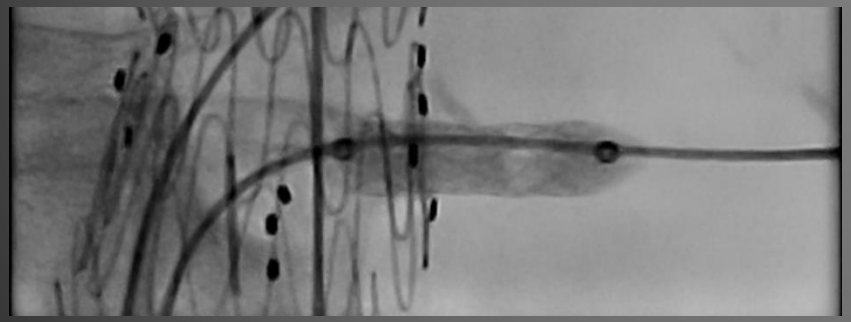
4 pulses/sec



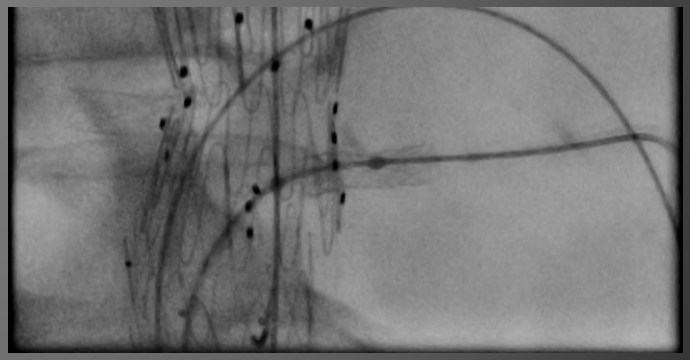
7.5 pulses/sec

High quality Fluoro only when really needed

High contrast Fluoro
32 mGy/min*



Low dose fluoro
2 mGy/min **



- 55 nGy/pulse, 10 Pulse / sec

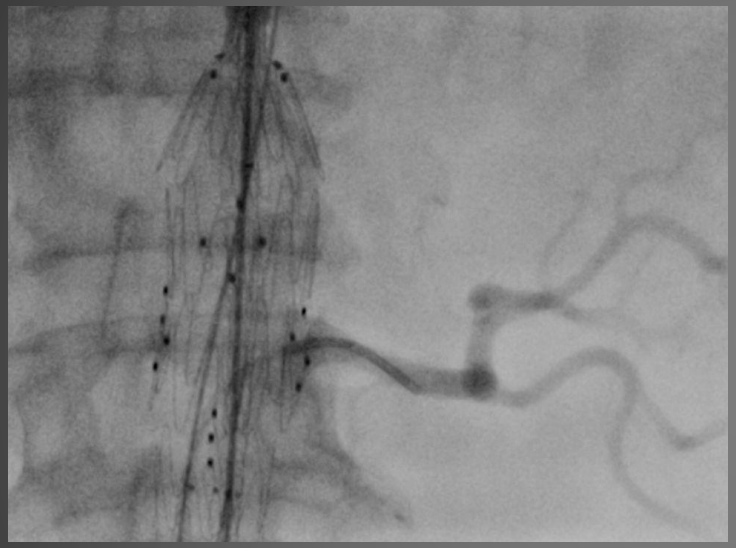
** 23 nGy/pulse , 4 Pulse /sec

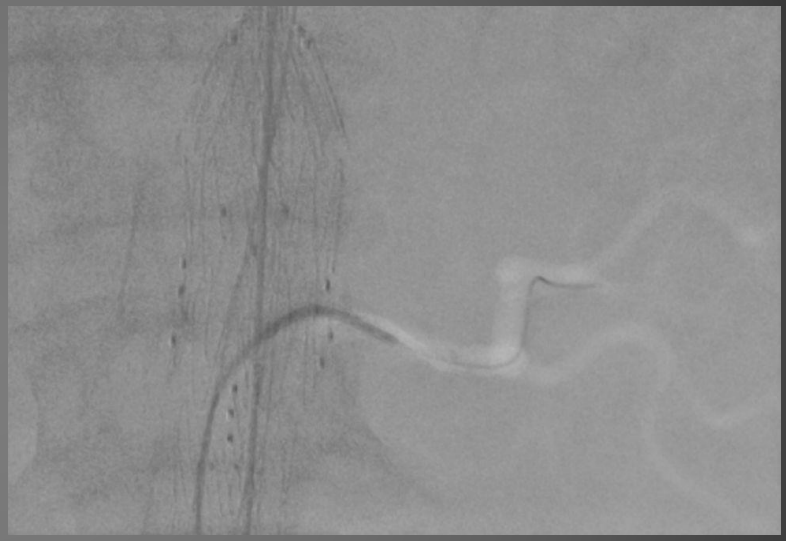
DSA only when really needed

Low dose DSA
321mGy/min

Fluoro w. contrast
12 mGy/min

2D Guidance with Fluorostore

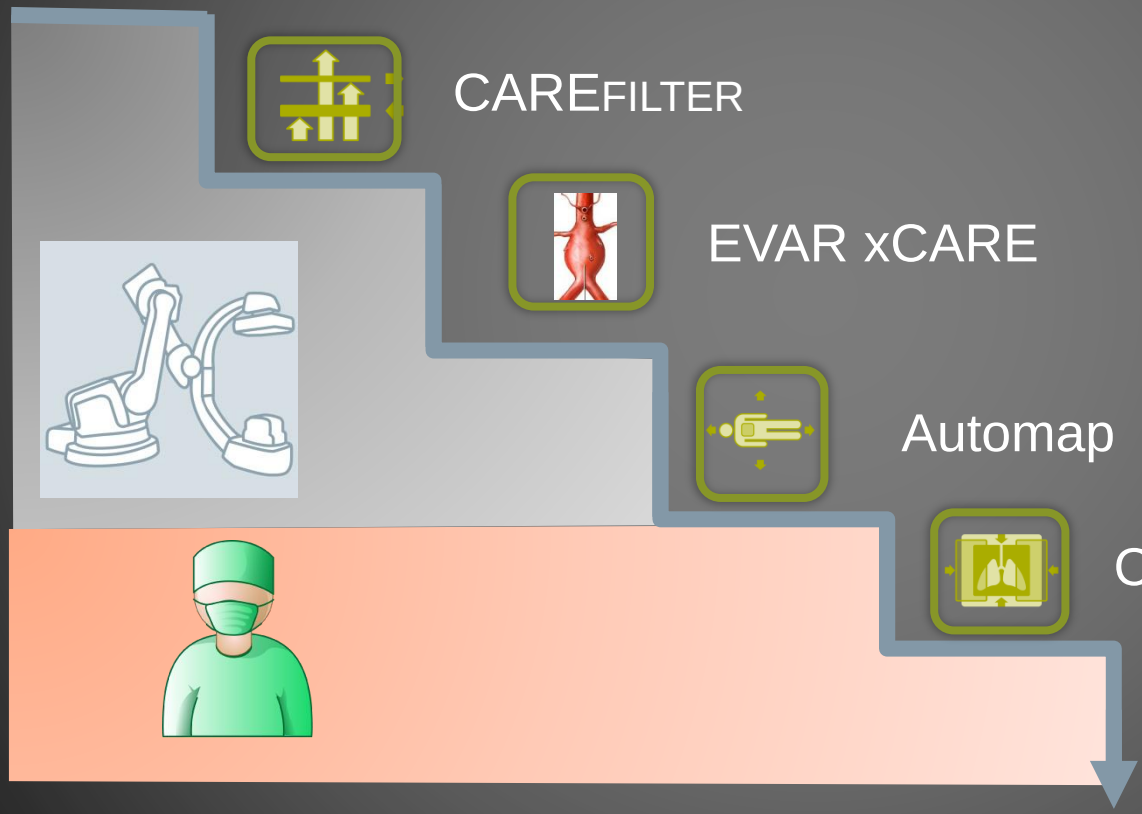




Fluoroscopy + contrast instead of DSA

Use as Overlay

Using this pathway during a triple fenestrated case with a bifurcated component, the dose area product was 27,719Gy.cm2



Reduce fluoro time
Reduce number of DSA runs
Avoid steep angulations
Short detector distance

* Compared to standa

Conclusions

- Fusion imaging
  - Development towards automated
  - To be included in Standard of Care
- Do not forget
  - General ALARA principles
  - Use of SIEMENS CARE/CLEAR Programs
  - 2D Automap
  - Fluoro w. contrast instead of DSA

21ST INTERNATIONAL EXPERTS SYMPOSIUM

CRITICAL ISSUES

in aortic endografting 2017

Save the date!

Critical Issues 2017 will take place on May 19 and 20, 2017 in Nuremberg, Germany

Visit our website: www.critical-issues-congress.com