VASCUPEDIA

Differences between 2D-3D and 3D-3D fusion imaging – why it matters

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Case Example

Why Fusion Imaging

First Author	Year	Fusion vs. Standard guidance	Method	Radiation dose	Fluoro time	2D3D / 3D3D
Dijkstra	2011	40 vs 49	R	n.s.	n.s.	3D3D
Hertault	2014	96 vs 301	P	Significantly lower	n.s.	2D3D
Sailer	2014	31 vs 31	P	n.s.	n.s.	3D3D
McNally	2015	31 vs 41	R	Significantly lower	Significantly lower	3D3D
Stangenberg	2015	16 vs 16	R	Significantly lower	Significantly lower	2D3D
Dias	2015	103 vs 123	R	Significantly lower	n.s.	3D3D

→ Fusion Imaging reduces radiation exposure to patient and personnel

When to use fusion imaging

Monastiriotis S, Comito M, Labropoulos N.

Radiation exposure in endovascular repair of abdominal and aortic aneurysms.

J Vasc Surg 2015

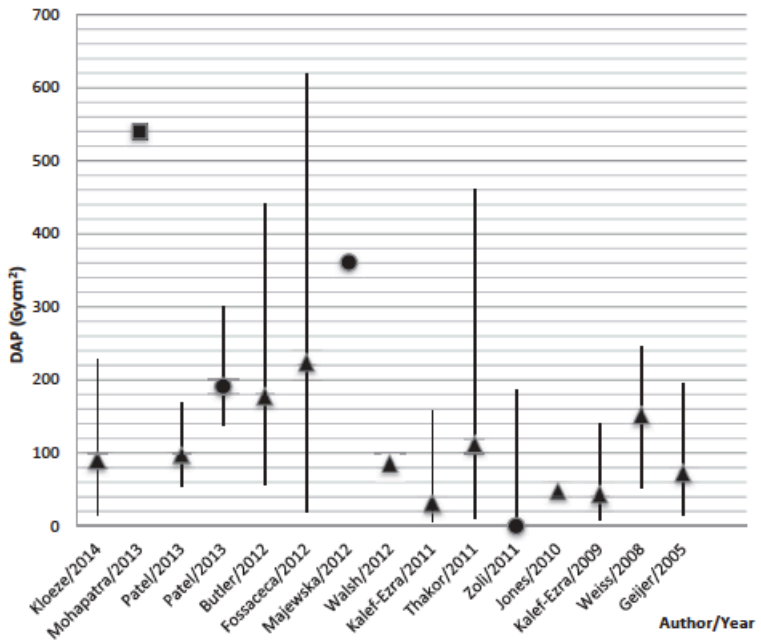
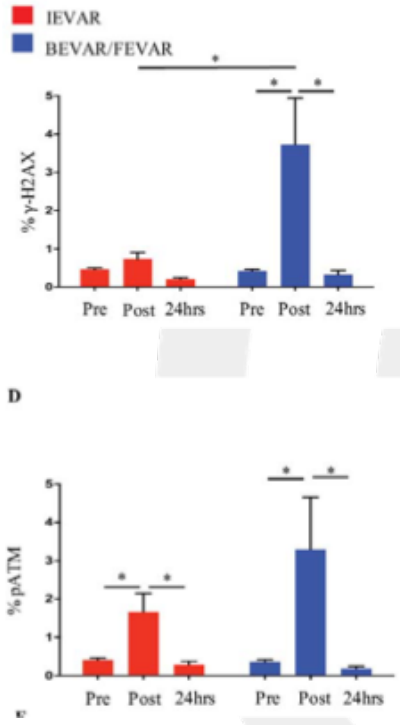


Fig 2. Mean radiation exposure. *DAP*, Dose area product. *Black triangle*, mean DAP for standard endovascular repair (EVAR); *black circle*, mean DAP for thoracic endovascular repair (TEVAR); *black square*, mean DAP for fenestrated endovascular repair (FEVAR); *vertical line*, range of values (if available).

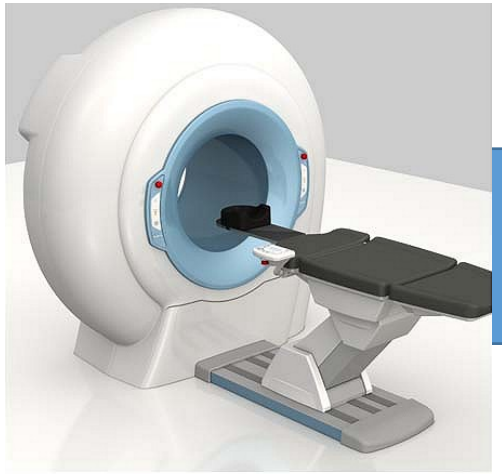


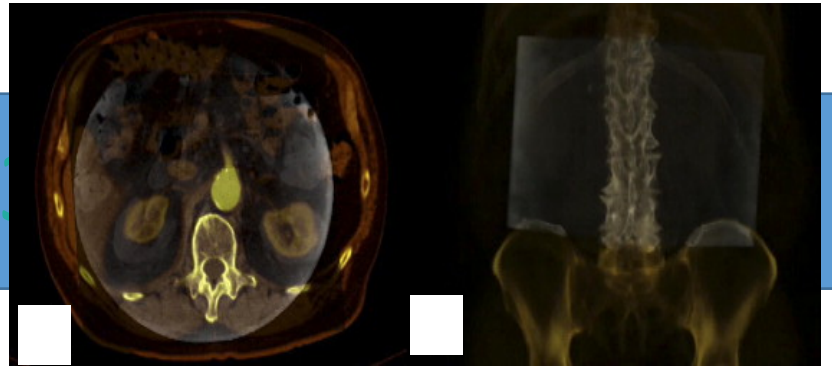
El-Sayed T et al.

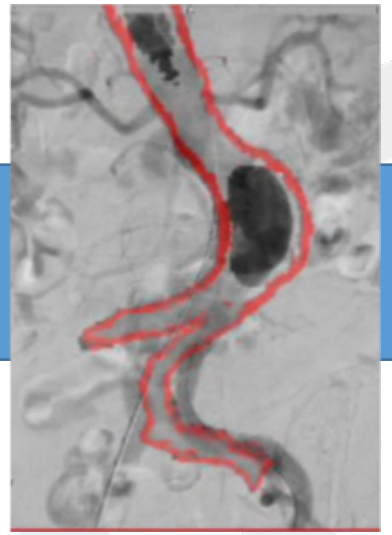
Radiation Induced DNA Damage in Operators Performing Endovascular Aortic Repair.

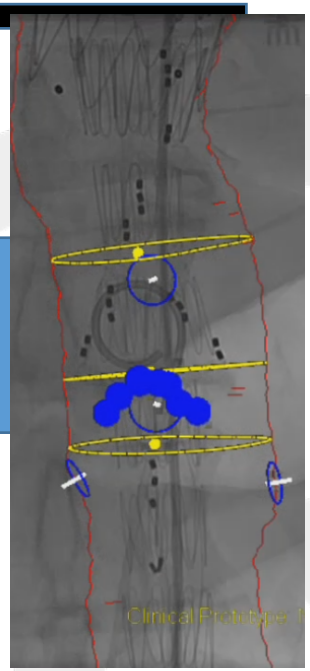
Circulation 2017

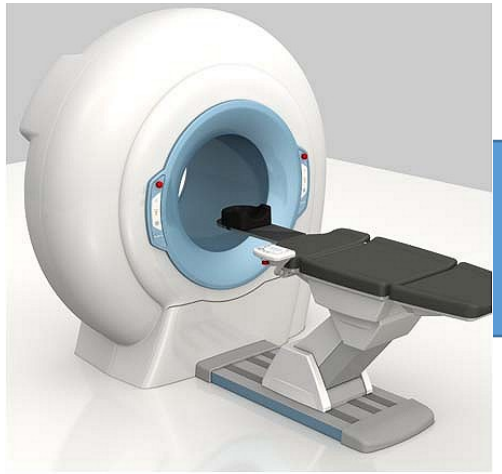
→ Complex EVAR is connected to higher radiation exposure and thus have the highest need/potential for radiation reduction

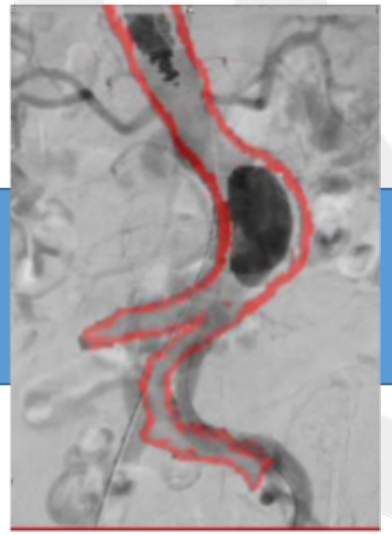


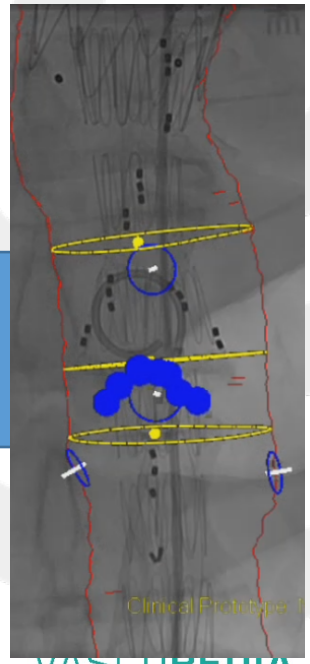






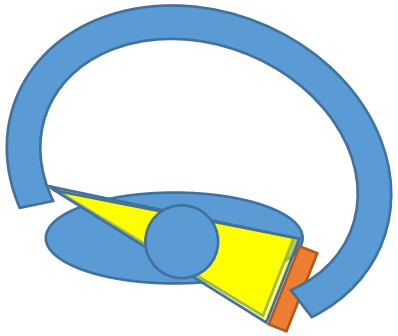






3D3D Fusion Imaging

Patient is brought to hybrid OR



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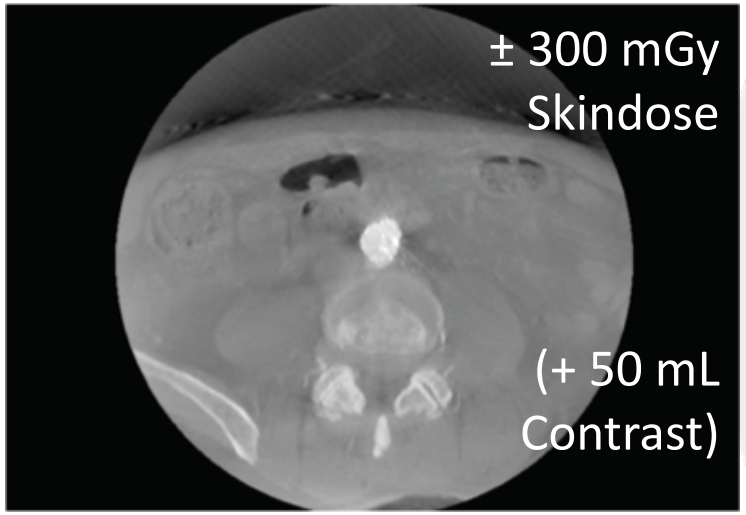
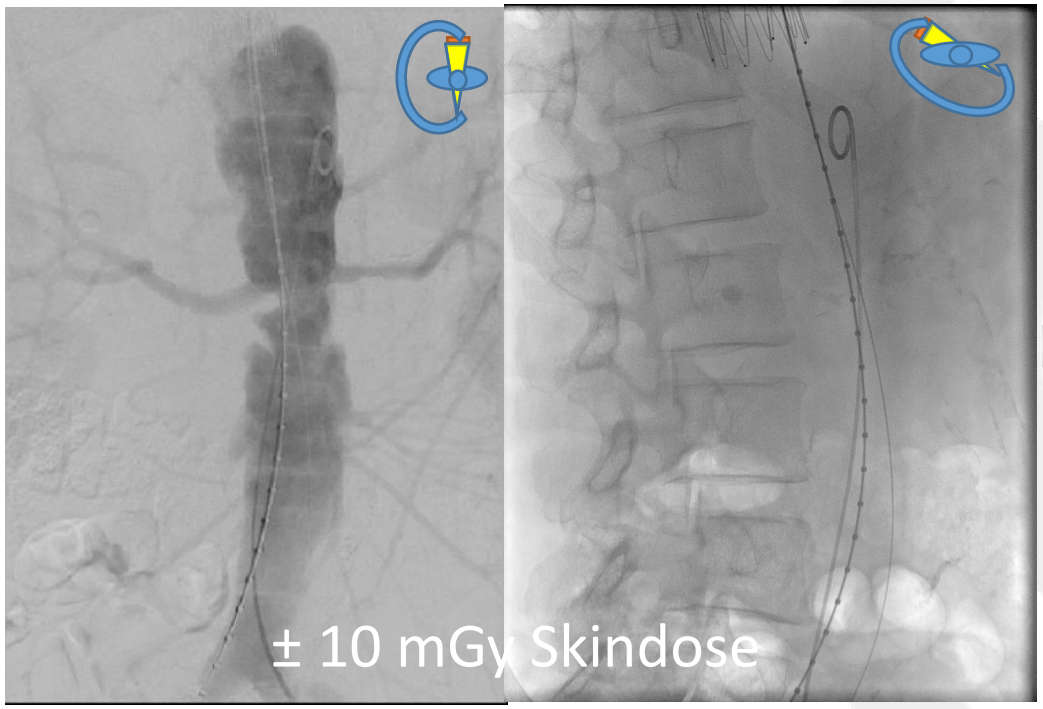


- Altered workflow, necessitating additional time, radiation and contrast (OR personnel?)
- Patient is positioned after obtaining the 3D dataset (arms)

2D3D Fusion Imaging



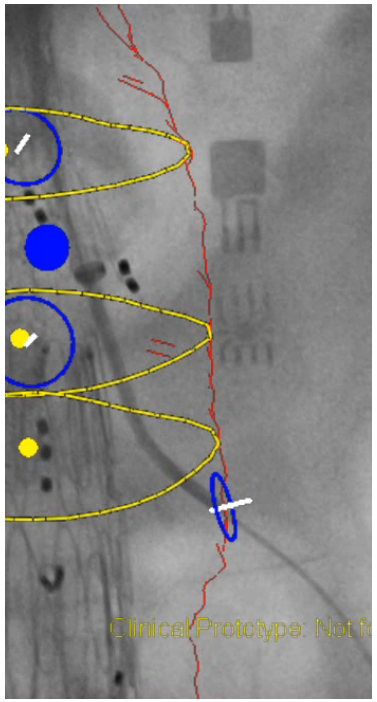
- Similar workflow, no additional time, very little extra radiation
- Fusion „on the fly“

Accuracy

First Author	Year	N	2D3D / 3D3D	Accuracy
Carell	2010	11 fEVAR, EVAR	2D3D	2.5 ± 1.2 mm deviation
Fukuda	2013	18 TEVAR	2D3D	2.0 ± 2.5 mm deviation
Kauffmann	2015	16 f/bEVAR, EVAR	3D3D	10.6 ± 11.1 mm deviation
Schulz	2015	18 TEVAR	both	11.7 mm deviation
Schulz	2016	101 EVAR	3D3D	6.3 ± 4.6 mm deviation
Panuccio	2016	25 f/bEVAR, EVAR	2D3D	0.4 (IQR 0-5) mm deviation

→ Accuracy rates are converging

Conclusion



- Fusion Imaging reduces radiation and contrast medium exposure
- 2D3D Fusion Imaging is faster, needs less radiation and with the additional angiography will probably become as accurate as 3D3D Fusion imaging