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TIPS AND MODIFICATIONS IN RADIATION SAFETY CAN MAKE A HUGE IMPACT ON STAFF EXPOSURE: WHAT ARE THEY AND HOW CAN THEY BE ENFORCED

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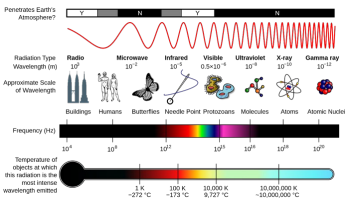
DISCLOSURES

No disclosures related to this talk

Fin-PI on Voyager trial (Bayer)
NovoNordisk (Grand review board)
Fin-PI in Anvance trial (Medtronic)
Lectures for Abbot, Cook. Gore



Eur J Vasc Endovasc Surg (2020) 59, 654–660

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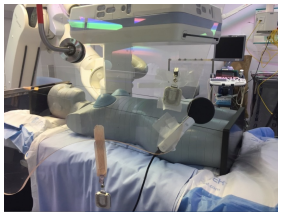
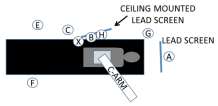
Radiation Doses to Staff in a Hybrid Operating Room: An Anthropomorphic Phantom Study with Active Electronic Dosimeters

Juan Serna Santos [a,*], Jouni Uusi-Simola [b], Touko Kaasalainen [b], Pekka Aho [a], Maarit Venermo [a]





9 active electronic dosimeters mimicking the positions of the staff members in the Hybrid OR during the procedure

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1) KNOW YOUR ENEMY

TIME – DISTANCE - SHIELDING

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THE RADIATION SOURCE FOR THE PATIENT IS THE X-RAY TUBE

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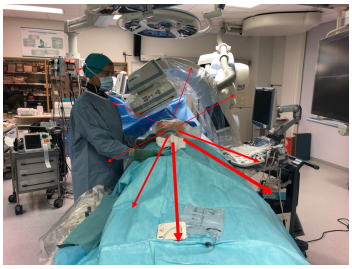

THE RADIATION SOURCE FOR THE PATIENT IS THE X-RAY TUBE

FOR THE STAFF IT IS THE PATIENT

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Radiation Doses to Staff in a Hybrid Operating Room: An Anthropomorphic Phantom Study with Active Electronic Dosimeters

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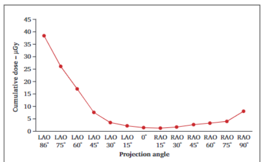
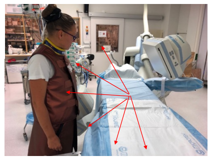
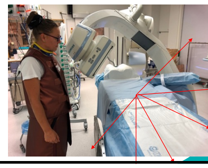


Figure 2. Radiation dose (µGy) vs. variations in axial plane projection in an anthropomorphic phantom study with active electronic dosimeter. Exposure measured at B position, as presented in Fig. 1. LAO = left anterior oblique projection; RAO = right anterior oblique projection.





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2) USE PROTECTION

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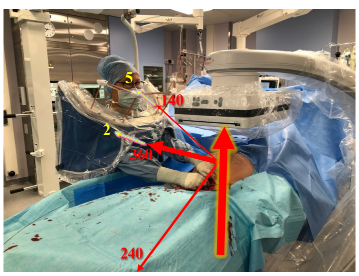
LOW-DOSE FLUORO, µGy/h



With the lead equivalent personal protection, the radiation doses decrease over 95% as can be seen here: Red figures are doses per hour with low dose fluoro without protection and yellow figures with Zero Gravity protection system

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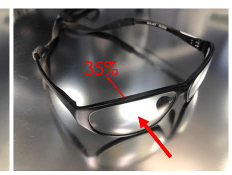
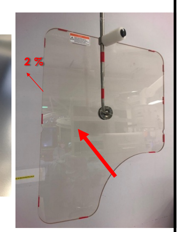
EYE PROTECTION IS IMPORTANT

RADIATION INDUCES CATARACT EASIER THAN EARLIER BELIEVED





If you use your normal glasses, 90% of the radiation comes through compared to only 35% if you use "led" glasses and 2% if you use 5 cm lead equivalent eye shield.

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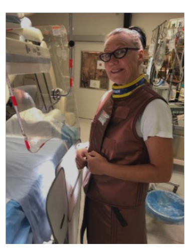
1.

2.



Randomized trial: radiation during basic EVAR
- No clinically significant difference
- Less rdiation to breast in no 1
- Less radiation to the assistant eyes in no 2

Aorta and Major Branches
Eur J Vasc Endovasc Surg (2024) 67, 435–443
EJVES Open Access

The Effect of a Suspended Radiation Protection System on Occupational Radiation Doses During Infrarenal EVAR Procedures: A Randomised Controlled Study

Juan Serna Santos [a,*], Touko Kaasalainen [b], Sani Laukontaus [a], Patrick Björkman [a], Ivika Heinola [a], Matti Laine [a], Pirkka Vikatmaa [a], Antti Pekkarinen [c,d], Maarit Venermo [a,‡], Pekka Aho [a,‡]

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Single use lead cover decreases radiation by 84%

12 19.11.2024

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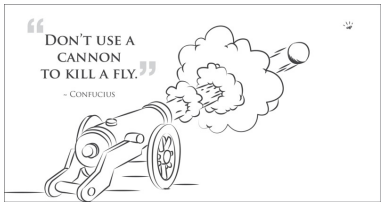
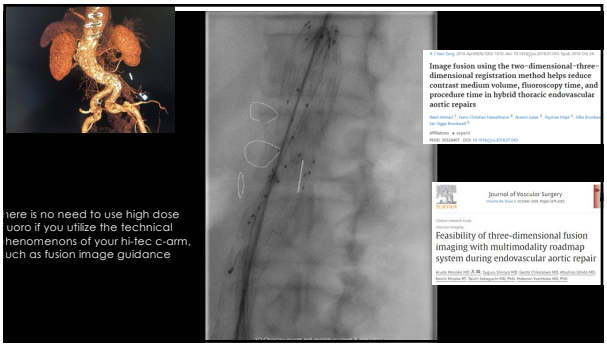
3)OPTIMIZE YOUR WEAPON





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USE LOWEST POSSIBLE PULSED FLUOROSCOPY DOSE AND PULSE RATES:

20 % < 100 % < 165 %

Low-dose Normal High-dose

When you use the lowest possible pulsed fluoroscopy dose and pulse rates, the radiation dose is fifth from the normal settings. If you use high dose, the radiation dose is 165% of the normal setting

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Fluorofade	x 1.1
Road-map	x 3
Cone-beam CT	x 80
Field size decreasing to 25% with collimator blades	x 0.52
Magnification:	
• Zoom #2	x 0.95
• Zoom #3	x 1.07
• Zoom #4	x 2.02
• Zoom #5	x 2.32

When you want to use assistance with navigation, use fluorofade rather than road map as road map increases radiation 300% compared to normal setting when in turn fluorofade increases it 10%

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Fluorofade	x 1.1
Road-map	x 3
Cone-beam CT	x 80
Field size decreasing to 25% with collimator blades	x 0.52
Magnification:	
• Zoom #2	x 0.95
• Zoom #3	x 1.07
• Zoom #4	x 2.02
• Zoom #5	x 2.32

When you decrease field size to 25% with collimator blades, radiation dose decreases 50%

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Fluorofade	x 1.1
Road-map	x 3
Cone-beam CT	x 80
Field size decreasing to 25% with collimator blades	x 0.52
Magnification:	
• Zoom #2	x 0.95
• Zoom #3	x 1.07
• Zoom #4	x 2.02
• Zoom #5	x 2.32

Zooming does not increase the radiation too much due to the fact that in the bigger magnifications the field size is smaller

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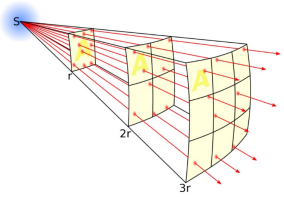
4) LEAVE THE ROOM WHEN DOING ANGIO RUNS



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4) LEAVE THE ROOM WHEN DOING ANGIO RUNS

THE RADIATION EXCEEDS x 30-40 COMPARED WITH LOW-DOSE FLUORO

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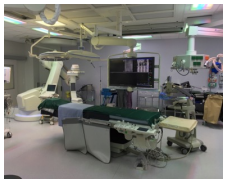
4) LEAVE THE ROOM WHEN DOING ANGIO RUNS

THE RADIATION EXCEEDS x 30-40 COMPARED WITH LOW-DOSE FLUORO

ONE ANGIO RUN CORRESPONDS APPROX 10 MINUTES OF FLUORO



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5) DISTANCE IS YOUR FRIEND: STEP BACK WHEN POSSIBLE

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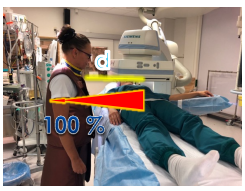
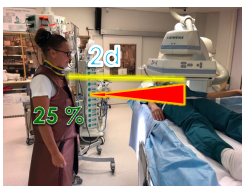
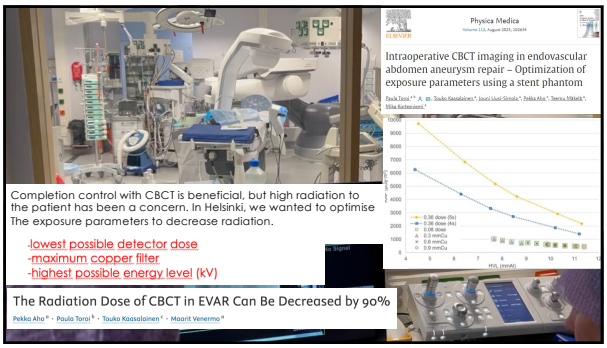
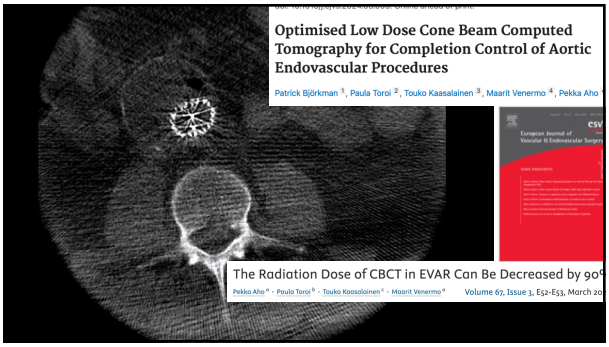
ONE STEP BACK MAY REDUCE YOUR RADIATION DOSE BY 75%

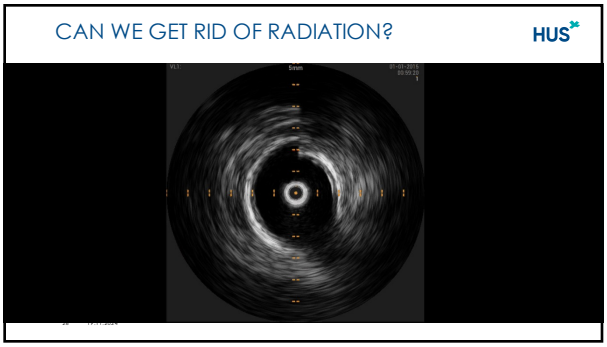


$1/d^2$






Optimised Low Dose Cone Beam Computed Tomography for Completion Control of Aortic Endovascular Procedures
Patrick Björkman [1], Paula Toroi [2], Touko Kaasalainen [3], Maarit Venermo [4], Pekka Aho [1]
European Journal of Vascular & Endovascular Surgery
The Radiation Dose of CBCT in EVAR Can Be Decreased by 90%
Pekka Aho [a] · Paula Toroi [b] · Touko Kaasalainen [c] · Maarit Venermo [a]
Volume 67, Issue 3, E52-E53, March 20


CAN WE GET RID OF RADIATION?
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CAN WE GET RID OF RADIATION?
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J Vasc Surg. 2024 Apr;79(4):954-961. doi: 10.1016/j.jvs.2023.11.002. Epub 2023 Nov 4.
The effect of Fiber Optic RealShape technology on the reduction of radiation during complex endovascular surgery
Andrew P Sanders [1], Nicholas J Swerdlow [2], Gabriel Jabbour [1], Marc L Schermerhorn [3]
Affiliations + expand
PMID: 37931886 PMCID: PMC10960673 (available on 2025-04-01) DOI: 10.1016/j.jvs.2023.11.002
Seminars in Vascular Surgery
Fiber Optic RealShape technology in endovascular surgery
First in Human Clinical Feasibility Study of Endovascular Navigation with Fiber Optic RealShape (FORS) Technology

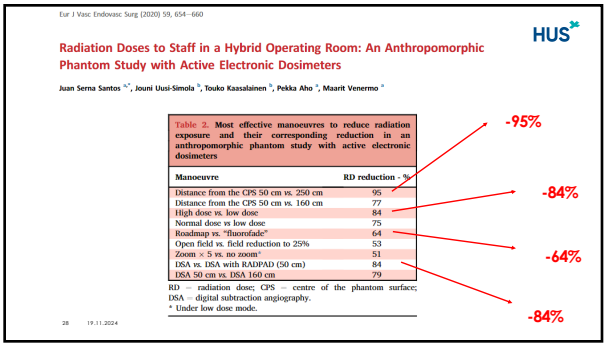
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Table 2. Most effective manoeuvres to reduce radiation exposure and their corresponding reduction in an anthropomorphic phantom study with active electronic dosimeters
Manoeuvre
RD reduction - %
Distance from the CPS 50 cm vs. 250 cm 95
Distance from the CPS 50 cm vs. 160 cm 77
High dose vs. low dose 84
Normal dose vs low dose 75
Roadmap vs. "fluorofade" 64
Open field vs. field reduction to 25% 53
Zoom × 5 vs. no zoom* 51
DSA vs. DSA with RADPAD (50 cm) 84
DSA 50 cm vs. DSA 160 cm 79
RD – radiation dose; CPS – centre of the phantom surface; DSA – digital subtraction angiography.
* Under low dose mode.
-95%
-84%
-64%
-84%
19.11.2024