

## New Facts And Myths About Decreasing Radiation Exposure: Leaded Caps And Glasses Don't Help, What does?

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## Disclosures

- Consultant for Gore Medical

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From the Southern Association for Vascular Surgery  
 2015 SAVS S. Timothy String Presidential Award

### Surgeon radiation dose during complex endovascular procedures

Melissa L. Kirkwood, MD,\* Jeffrey B. Guild, PhD,\* Gary M. Arblique, PhD,\* Jon A. Anderson, PhD,\*  
 R. James Valentine, MD,\* and Carlos Timaran, MD,\* Dallas, Tex

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## The Problem

**Deterministic effects**  
 Skin injury, Cataracts  
 Dose-related response/ Threshold level

**Stochastic injury**  
 Cancer risk  
 Not dose dependent

**60% of interventionalists exceed the ocular radiation dose limit**

**Up to 80% have radiation-related cataracts on ophthalmic exam**

**Average brain exposure is 10 times greater than the whole body exposure limit**

HEALTH EFFECT	ODDS RATIO (95% CI)
CATARACTS	6X RISK
CANCER (ALL CAUSES EXCEPT BRAIN)	3X RISK
CARDIOVASCULAR (MYOCARDIAL INFARCTION)	2X RISK

**Increased risk of malignant brain tumors in interventionalists**

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## What doesn't work for Radiation Protection?

Leaded Surgical Caps

Leaded Eyewear

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Leaded eyewear will only attenuate direct x-rays at the level of the eye

Majority of x-rays to the operator's eyes are from scatter radiation from the patient at oblique angles not protected by standard safety glasses

Leaded glasses are ineffective at Reducing Ocular Radiation Exposure

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From the Western Vascular Society

**Radiation brain dose to vascular surgeons during fluoroscopically guided interventions is not effectively reduced by wearing lead equivalent surgical caps**

Melissa L. Kirkwood, MD,\* Gary M. Arbuque, PhD,\* Jeffrey B. Guild, PhD,\* Katie Zeng,\* Yin Xi, PhD,\* John Eichenwald, MD,\* John A. Anderson, PhD,\* and Carlos Timaran, MD,\* Dallas, Tex.

Temporal dose is not brain dose!  
No significant brain dose reduction with leaded surgical caps

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From the Western Vascular Society

**Novel modification to leaded eyewear results in significant operator eye radiation dose reduction**

Melissa L. Kirkwood, MD,\* Andrea Klein, MD,\* Jeffrey Guild, PhD,\* Gary Arbuque, PhD,\* Yin Xi, PhD,\* Shirling Tsai, MD,\* Saba Ramanan, MD,\* and Carlos Timaran, MD,\* Dallas, Tex.

No significant radiation dose reduction with leaded or leaded eyewear with side shield

Modified eyewear had a 62% left ocular radiation dose reduction in clinical practice

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**Phantom Experiment**

Modified Eyewear led to an 86% Ocular Radiation Dose Reduction

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From the Western Vascular Society

**Disposable, lightweight shield decreases operator eye and brain radiation dose when attached to safety eyewear during fluoroscopically guided interventions**

Melissa L. Kirkwood, MD,\* Andrea Klein, MD,\* Carlos Timaran, MD,\* Michael Siah, MD,\* Michael Shih, MD,\* Shadman Baig, MD,\* Yin Xi, PhD,\* and Jeffrey Guild, PhD,\* Dallas, Tex.

Leaded Eyewear + Shield decreased eye and brain dose by 83%

Non-Leaded Eyewear + Shield decreased eye and brain dose by 85%

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**Clinical Practice**

RD No.	RAK, mSv	DAP, Gy · cm <sup>2</sup>	Operator	Image	Operator
1	303.9	56.6	2382	482	79
2	747.9	117	186.6	222	88
3	89.2	26.8	45.9	44	82
4	144.5	26.6	128.5	93	58
5	89.6	29.9	22	25	89
6	27.4	6.47	13	3	77
7	118.6	30.6	38	32	81
8	29.9	7.8	24	1	96
9	31.86	74.7	188	4	90
10	98.37	31.0	120	9.6	92
11	372.86	54.7	140	38.5	94
12	158.43	142	78	3.9	95
13	84.36	215	247	74	97
14	98.05	271	210	23	99
15	19.38	265	197	80	90
Average (SD)	98.4 (94.225)	50.122 (46.6)	100 (42.74)	8.3 (5.93)	84
Median (IQR)	NA	NA	NA	NA	NA
Standard Deviation	NA	NA	NA	NA	NA

Lead equivalent shielding, sleeve for temple of eyewear, conformable wire, adhesive strip to attach to the surgical mask, reversible, reusable and disposable

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**EggNest™ Protect System**

- Replaces table mattress with carbon fiber shell and shielded mattress
- Moves with x-ray table
- 360° Protection - Protects Everyone working in the Lab


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## EggNest™ Protects Workflow

**Patient-Ready to Case Ready in Seconds**

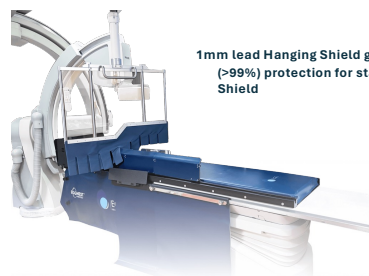


**Hanging Shields Retract for Spins**



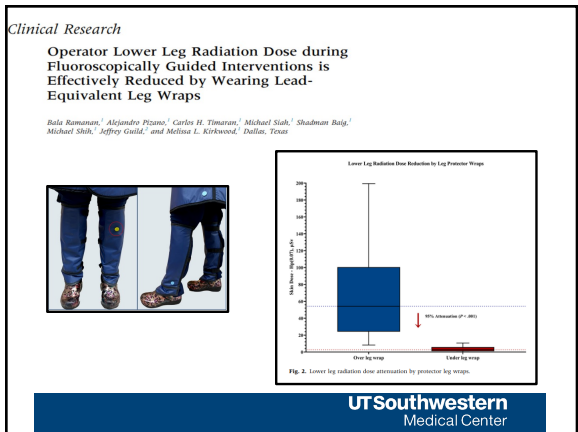
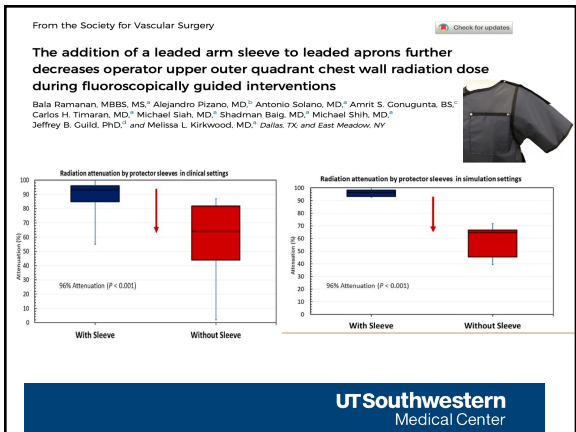
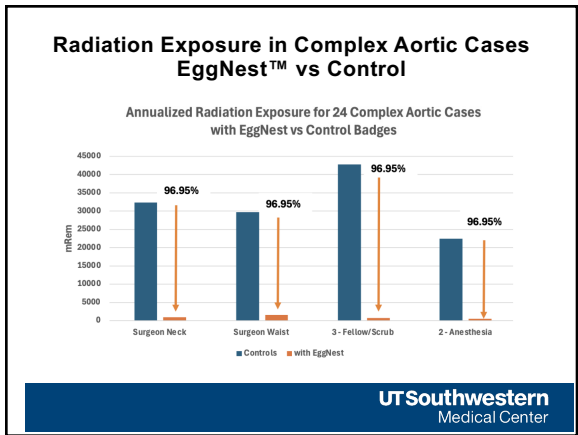
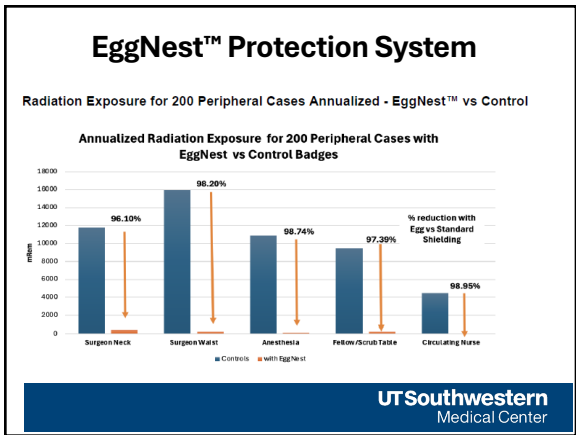
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## EggNest™ Complete System

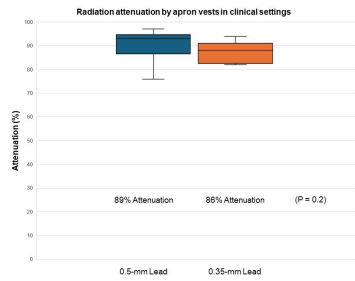


**1mm lead Hanging Shield gives complete (>99%) protection for staff behind the Shield**

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0.35-mm Lead-equivalent aprons provide similar radiation protection to interventionalists compared to 0.5-mm lead-equivalent aprons during Fluoroscopically Guided Interventions



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