What Part Of Interventional Physicians Are At Risk From Radiation And Is Protective Gear Really Protective: Light Weight Lead Aprons Are A Hoax

Lindsay Machan, MD
University of British Columbia
Vancouver, British Columbia

Disclosure Statement of Financial Interest
Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship
• Major Stock Shareholder/Equity
• Ownership/Founder
• Intellectual Property Rights

Company
• Analytics 4 Life
• Calgary Scientific
• Harmonic Medical
• Innovere Medical
• NDC
• Zymeworks
• Ikomed Medical
• Middletoe Industries

What Do You Need To Know About Radiation?
• There is NO safe dose
• You have varying levels of repair genes
  – There is no test (as yet) for the repair genes
• Brain and eyes are MUCH more radiosensitive than previously thought
• Your radiation physicist probably does not know this

Traditional Dose Exposure Guidelines
• All premised on assumption everyone of a specific age is equally sensitive to radiation injury

Higher Incidence Cataracts
• astronauts¹
• interventional cardiologists²,³
• nursing and technical staff in fluoro.⁴,⁵

⁵. Radiat Res 2010; 174: 490-495
Radiation Induced Cataracts

**Radiation Cataracts: New Data and New Recommendations**

**OBJECTIVE.** The manuscript discusses radiation cataracts and makes some basic suggestions for preventing cataracts.

**CONCLUSION.** For many years, radiation-induced cataracts were considered to be a well-recognized complication of radiation therapy and a recognized occupational hazard for radiation therapists. The recent work suggests that the likelihood of developing radiation-induced cataracts is much higher than previously thought, and that the risk may be even higher than previously estimated. Further research is needed to better understand the risk factors and to develop effective preventive strategies.

AJR 2014; 203:W345–W346

Examination of Interventionalists’ Lens

B. Worgul

- 59 attendees Veith conference
- Age 29 – 62
- 45% had radiation damage

Brain and Neck Tumors Among Physicians Performing Interventional Procedures

Ariel Regen, MD, PhD**, Jacob Goldstein, MD**, Olivier Bar, MD*, and James A. Goldstein, MD

Physicians performing interventional procedures are chronically exposed to ionizing radiation, which is known to cause increased cancer risks. We recently reported 9 cases of brain tumors among cerebral angiographers in our institution. Our findings were confirmed by the reports of another case of a physician who had been treated for a brain tumor in another institution. Our findings underscore the need for further studies to assess the risk of brain tumors among physicians performing interventional procedures.

Am J Cardiol 2013;111

Brain and Neck Tumors Among Physicians Performing Interventional Procedures

Ariel Regen, MD, PhD**, Jacob Goldstein, MD**, Olivier Bar, MD*, and James A. Goldstein, MD

- 223 cath lab personnel (mean age, 45)
  - 113 interventional cardiologists
  - 110 nurses
- 222 unexposed subjects
- Left and right carotid intima-media thickness
- Leukocyte telomere length
- DNA repair gene polymorphism
  - XRCC3 Thr241Met

? Accelerated Atherosclerosis In The Cath Lab

Accelerated Atherosclerosis In The Cath Lab

Cath lab workers – problems with the study
- Males
- Smokers (29% vs 16%)
- Hypercholesterolemia (11% vs 4%)
- Radiation exposure calculated
  - Dosimetry data available
    - Interventional cardiologists (19%)
    - Nurses (29%).

Should You Wear More Lead?
"Backache or Death"

Radiation Protection – pure lead

| Table IV. Effective transmission (%) of the six radiation qualities used in this study by different thicknesses of pure Pb. |
|---|---|---|---|---|---|---|
| 60 kVp | 80 kVp | 100 kVp | 120 kVp | N120 kVp | N250 kVp |
| 0.25 mm Pb | 4.28% | 11.95 | 16.73 | 20.16 | 30.11 | 77.52 |
| 0.5 mm Pb | 0.42 | 2.55 | 4.96 | 6.31 | 10.05 | 60.50 |
| 1.0 mm Pb | 0.01 | 0.27 | 0.86 | 1.09 | 1.63 | 37.13 |
| 2.0 mm Pb | 0.00 | 0.01 | 0.05 | 0.06 | 0.16 | 14.20 |

Medical Physics 34, 2007; 530-538

Scatter Radiation

- Main source of exposure to operator and staff
Lightweight Aprons
Lead Equivalent Materials

Evaluation of the transmitted exposure through lead equivalent aprons used in a radiology department, including the contribution from backscatter

<table>
<thead>
<tr>
<th>Table I: Transmission range, mean and standard deviation values for 0.25 mm and 0.5 mm lead equivalent aprons at 70 kVp and at 100 kVp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
</tr>
<tr>
<td>kVp</td>
</tr>
<tr>
<td>70</td>
</tr>
<tr>
<td>0.5</td>
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<tr>
<td>100</td>
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</table>

Med. Phys. 30:36, 2003:1033

Use As Much Passive Protection As Possible

Lightweight Lead Equivalent Materials

- **Increase** dose to glandular breast tissue to lead for 60, 75, and 120 kV:
  - Tin - 143%, 37%, and 45%
  - Tin/bismuth - 35%, 15%, and 39%

Med. Phys. 34:2007; 4270-4281
Dynamic Coning With Automated Tracking

15 frames/sec

1 frame/sec

102x545 to 168x631

IKOMED Technologies Inc.

Take Home Points

- Knowledge base about radiation effects in evolution
- There are NO safe doses of radiation
- All measures to reduce radiation are additive

Take Home Points

- Effects documented in endovascular caregivers primarily head and neck
- Great variation in efficacy of lead equivalent aprons

Early radiography – radiologist establishes imaging parameters on own hand

Early radiography – radiologist establishes imaging parameters on own hand