Image Wisely Radiation Dose in Mammography

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Objectives

- Describe the current issues of medical radiation exposure
- Review MQSA regulations and radiation doses in breast imaging
- Discuss controversies regarding radiation exposure in breast imaging

Objectives

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Medical Radiation Soars, With Risks Often Overlooked

By JANE E. BRODY

August 20, 2012 4:02 pm

PERSONAL HEALTH

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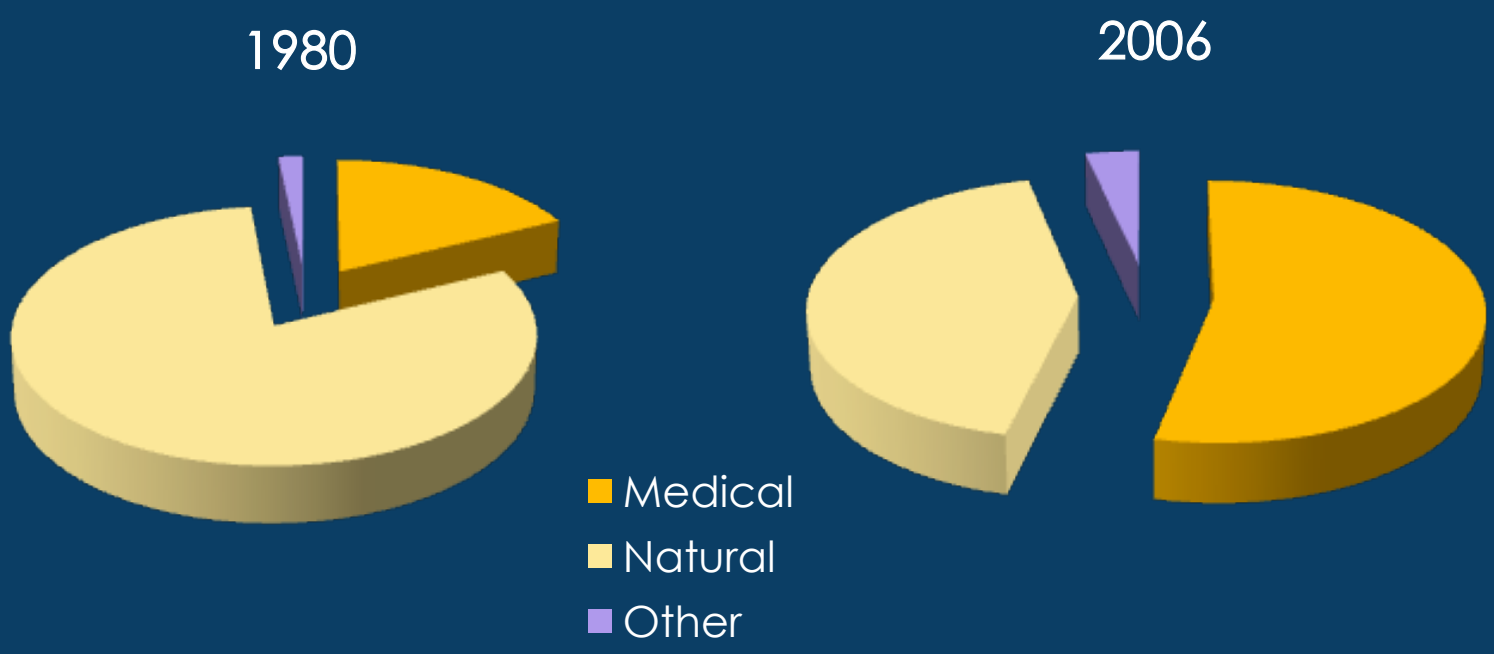
Annual U.S. per-capita Radiation Dose

- Describe the current issues of medical radiation exposure
- Review MQSA regulations and radiation doses in breast imaging
- Discuss controversies regarding radiation exposure in breast imaging



Medical: 0.53 mSV
Total: 3.0 mSv

Medical: 3.0 mSv
Total: 5.6 mSv

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Image Wisely ®

- Joint task force of ACR and RSNA in collaboration with AAPM, ASRT
- Address concerns about the surge of public exposure to ionizing radiation from medical imaging
- Lower the amount of radiation used in medically necessary imaging studies and eliminate unnecessary procedures

www.imagewisely.org

Radiologist's Role

- Expert in understanding radiation dose and risk
- Manage radiation exposure in a way that maximizes the risk/benefit ratio
- Be able to communicate radiation risk to patients and referrers in a way that they will understand

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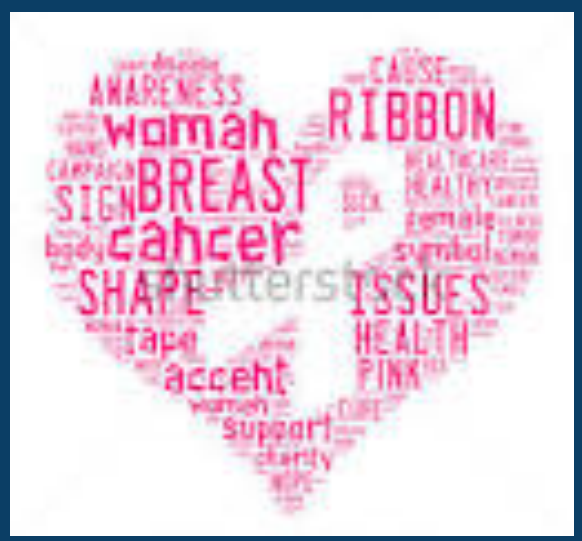
Source of Medical Radiation

- CT scans (almost one half the collective dose from medical procedures)
- Cardiac NM and Cardiac interventions
- What about mammography?



Risk of Radiation Induced Cancer

- Age dependent
  - Younger > older
- Organ dependent
  - Pre-menopausal breast sensitive to radiation induced cancer
- Gender dependent
  - Women > men

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Data on Radiation Induced Breast Cancer

- Atomic bombs Japan
- XRT for Hodgkin's and other diseases
- Adolescent and young women who received large number of diagnostic x-rays for TB/scoliosis monitoring

Risk of Breast Cancer from Screening

- Risks uncertain at doses typical of mammography
- If there is a risk at low does it is small compared with natural incidence of disease
- Extrapolate from high dose to low dose (LNT)
- Lifetime screening 4mGy annual 40-59 and then biennial until 80 would cause 1 breast cancer in 1,400 women

Jerrold T. Bushberg, PhD, FAAPM SBI News 2014, issue 4

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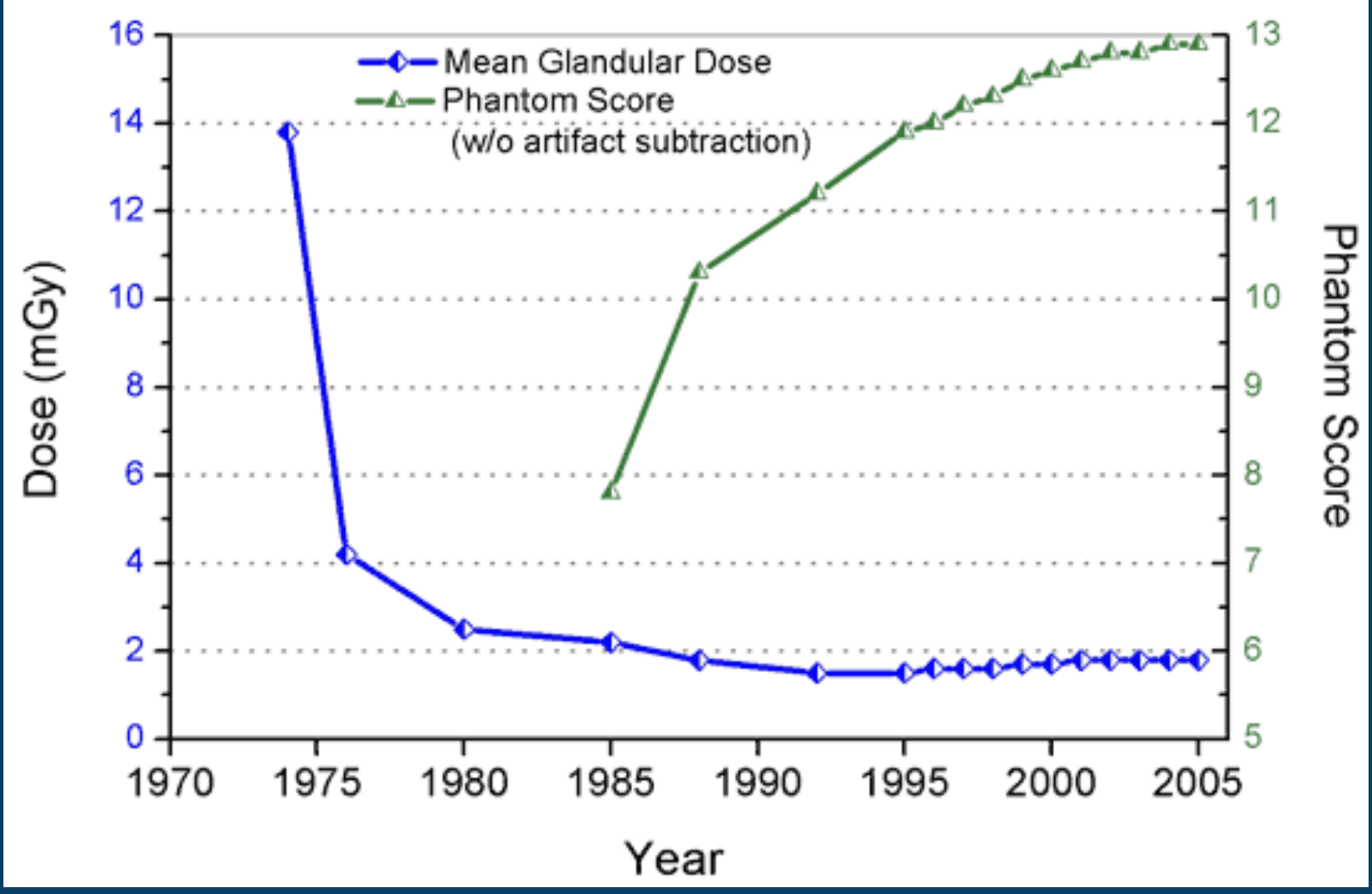
Mammography Dose and Quality over Time



http://www.fda.gov/radiation-emittingproducts/mammographyqualitystandardsactandprogram/facilityscorecard/ucm113352.htm

MQSA Regulation

- Average glandular dose delivered by a single CC view of 4.2cm thick compressed breast consisting of 50% glandular and 50% adipose tissue must not exceed 3.0 mGy (0.3rad)
- Measured by a phantom intended to represent the “average breast”
- Provides means of comparing output of machine but individual patient dose will vary

Radiation dose Tomosynthesis

- MGD for DBT similar to FFDM*
- 1.2mGy FFDM plus 1.3mGy DBT (for 50% dense breast compressed to 5cm)
- Combo mode= 2.5mGY (below the MQSA limit for of 3mGY)
- ACRIN DMIST trial MGD 2.06-3.01mGy for 5-6cm thick breast

*Feng, et al. Radiology 2012; 263(1):35-42

Radiation dose Tomosynthesis

Clinical Condition: Breast Cancer Screening

Variant 3: Average-risk women: women with <15% lifetime risk of breast cancer, breasts not dense.

Radiologic Procedure	Rating	Comments	RRL*
Mammography screening	9		☢☢
MRI breast without and with contrast	3		O
US breast	2		O
MRI breast without contrast	1		O
FDG-PEM	1		☢☢☢☢
Tc-99m sestamibi BSGI	1		☢☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

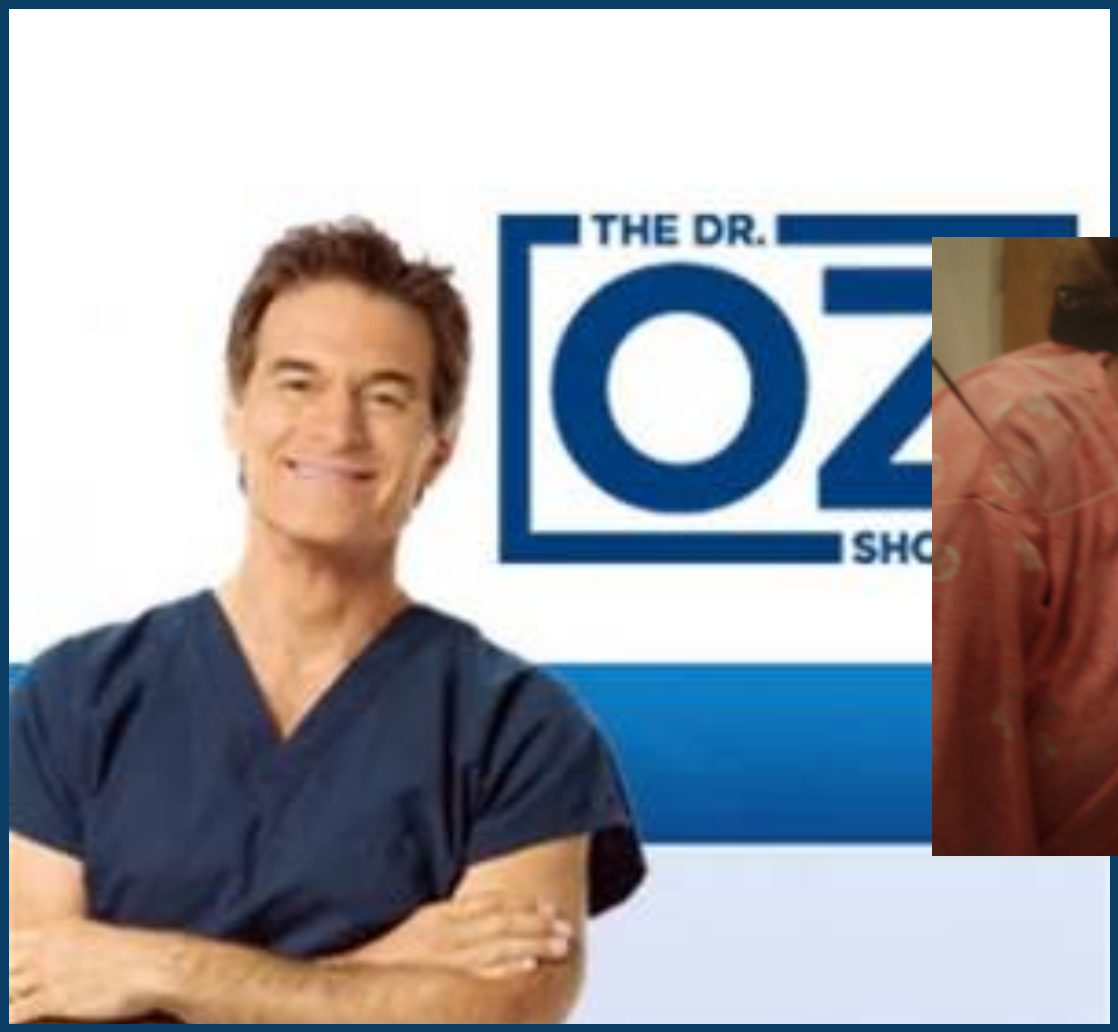
Relative Radiation Level Designations		
Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv
☢☢☢☢☢	30-100 mSv	10-30 mSv

Comparison Exam Dose to Background Radiation

Exam	Equivalent to Background
Chest X-ray PA/LAT	2.4 /12 days
Mammography	***1.5 months***
Abd/pelvis X-ray	3 months
Head CT	8 months
Lung Perfusion (Tc99m)	8 months
Abdominal CT	2.5 years
Cardiac Stress Test	3-13.5 years
High Res Chest CT	5 years

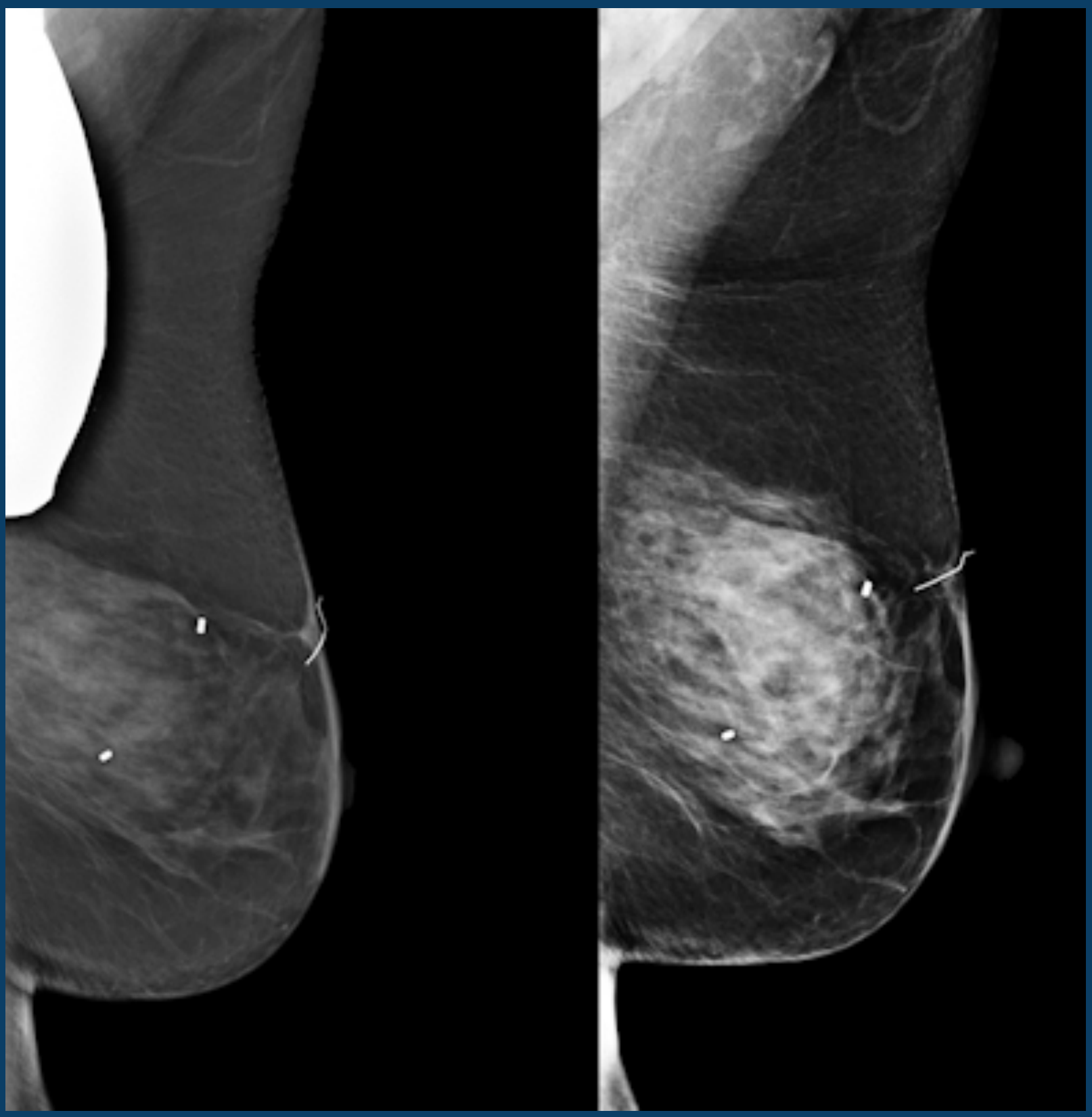
Peck DJ, Samuel E. How to Understand and Communicate Radiation Risk November 2010/www.imagewisely.org

Comparison Exam Dose to Background Radiation



ACR and SBI Response 2011

- Mammography dose to thyroid equal to 30 minutes background
- Risk of shield interfering with image outweighs risk of radiation
- Thyroid shield NOT recommended



ACR and SBI Response 2011

Thyroid Guards

Claim: Patients should request the use of thyroid guards during x-ray procedures.

MIXTURE

Example: *[Collected via e-mail, March 2011]*

Precautions re Mammograms and Dental XRays / A Useful Warning

On Wednesday, Dr. Oz had a show on the fastest growing cancer in women, thyroid cancer. It was a very interesting program and he mentioned that the increase could possibly be related to the use of dental x-rays and mammograms. He demonstrated that on the apron the dentist puts on you for your dental x-rays there is a little flap that can be lifted up and wrapped around your neck. Many dentists don't bother to use it. Also, there is something called a "thyroid guard" for use during mammograms. By coincidence, I had my yearly mammogram yesterday. I felt a little silly, but I asked about the guard and sure enough, the technician had one in a drawer. I asked why it wasn't routinely used. Answer: "I don't know. You have to ask for it." Well, if I hadn't seen the show, how would I have known to ask?

Someone was nice enough to forward this to me. I hope you pass this on to your friends and family.

www.snopes.com/medical/toxins/thyroidguard.asp#xU8gKcU0opBV28