Detecting Breast Cancer: Mammography and Beyond

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What Do I Do in 2013?
Value of mammograms, PSA tests now debated
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Mammograms Cut Risk of Breast Cancer Death by Half, Study Finds

Echoes previous findings, supports calls for routine screening
By Kathleen Doheny
HealthDay Reporter
TUESDAY, Dec. 6 (HealthDay News)-- Women who get routine mammograms can lower their risk of dying from breast cancer by nearly half, a new Dutch study suggests.
"Our study adds further to the evidence that mammography screening unambiguously reduces breast cancer mortality," said Dr. Suzie Otto, a senior researcher in the department of public health at Erasmus Medical Center in Rotterdam, the Netherlands.

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We who battle breast cancer daily are horrified by H. Gilbert Welch’s repeated attacks on screening mammograms ("Cancer Survivor or Victim of Overdiagnosis?" Op-Ed, nytimes.com, Nov. 22). Would he have us return to the era when tumors were discovered only when they were large enough to be felt, meaning more disfiguring surgery, prolonged chemotherapy and lower cure rates?

There Should Be No Controversy
His flawed reanalysis of old data lacks actual screening information...
In contrast, prospective randomized trials of mammography have been...accepted globally: screened women have smaller, more curable cancers that are treatable with cosmetically superior surgery and less toxic medical therapy.

Would Dr. Gilbert, or any rational person, ignore a likely cancer on a mammogram and wait until it grows into a large mass while it possibly spreads throughout the body?
Two Questions

• What do we have now?
• What will we have in the future?
Currently Utilized Modalities

• Mammography
  – Digital
  – Digital Breast Tomosynthesis (DBT)
• Ultrasound
• MRI
Future Technology

- **Mammography-based**
  - Digital Breast Tomosynthesis (DBT)
  - Dedicated Breast CT
- **Ultrasound**
  - Whole Breast US
- **MRI**
  - Diffusion Weighted Imaging (DWI)
  - MR Spectroscopy
- **PET**
- **Nuclear Medicine**
  - Breast Specific Gamma Imaging (BSGI)
Digital Mammography
What Does Cancer Look Like?

Cancer in a fatty breast

Cancer in a dense breast
What does cancer look like?
Breast Ultrasound

- Mammography problem solving
- Palpable lumps
- Focal pain
- ?screening
Breast Ultrasound

- Very dependent on operator
- Used as a supplement not replacement to mammography
- Cannot adequately visualize calcifications
- ?screening: women with dense breasts
Automated Whole Breast Ultrasound

• Being investigated as an adjunct to mammogram in screening patients with dense breasts
• May also be used to evaluate extent of disease or look for additional cancers
• Basis for study is that hand-held ultrasound is time-consuming, operator dependent and has a limited field of view
Digital Breast Tomosynthesis

• Acquiring image of breast at different angles allows reconstruction of 3-D volume
• Multiple images are taken at different angles around compressed breast
• Images are reconstructed into “3-D” images in a way similar to CT and MRI
Conventional 2-D Imaging

- Incident X-rays
- Objects being imaged
- 2-D image
- Images superimposed on image
Tomosynthesis Acquisition

Image from multiple angles

Incident X-rays

Objects being imaged

2-D raw data images

Exposure #1    Exposure #6    Exposure #11
Digital Mammo (2D)

Tomo Slice (3D)
Digital Mammo (2D)

Tomo Slices (3D)
The additional radiation for the 3D exam amounts to what would happen if you move from New York to Colorado for a few months.

Comparison of Doses: Standard 4-view Screening Exam

![Bar chart comparing effective doses](attachment:chart.png)
Breast MRI: Widely Accepted Indications

- High risk screening
- Patients who receive neoadjuvant chemotherapy
- Positive axillary nodes of unknown primary
American Cancer Society Screening Guidelines for Breast MRI

- Known BRCA 1 or 2 mutation carriers
- Untested first degree relatives of proven carriers
- Radiation to chest between ages of 10 & 30
- Those at 20% to 25% lifetime risk for breast cancer
- Certain rare genetic syndromes (Li Fraumeri, Cowden, Peutz Jeger, Ataxia-telangiectasia)
What About Intermediate Risk?

• 15%-20% lifetime risk:
  – Personal history of breast cancer
  – Biopsy that showed atypia or LCIS
  – Dense breasts

• Insufficient evidence to recommend for or against screening with MRI
Screening MRI on 46 year old BRCA1+
Bottom Line

• MRI screening is NOT meant to replace mammography

• MRI screening can detect otherwise occult cancer but it has not been shown to decrease mortality, i.e., life expectancy from breast cancer
What Do I Do Now in 2013?

- Yearly digital mammograms at age 40*
- High risk: yearly MRI/screening ultrasound
- Yearly clinical breast exam
Thank you for your attention