ROLE OF ULTRASOUND IN SCREENING OF BREAST CANCER

Dr Ioan Stoian

16th November, Bucharest

ROLE OF ULTRASOUND IN SCREENING OF BREAST CANCER

Breast Cancer Screening = is the medical screening of **asymptomatic**, **apparently healthy** women for breast cancer in an attempt to achieve an earlier diagnosis.

The assumption is that early detection will improve outcomes.

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SENSITIVITY is the percentage of breast cancers detected in a given population when breast cancer is present

SPECIFICITY is the likelihood of test being normal when cancer is absent

FALSE POSITIVE RATE is the likelihood of the test being abnormal when cancer is absent

Specificity ↓ -false positive examinations
-follow-up
-procedures

↑

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Numerous studies investigating the benefits of screening programmes have demonstrated a reduction in mortality rates, with maximal benefit seen in women aged 50-70 years

**Humphrey L, Wolf S. Breast Cancer Screening: A Summery of the Evidence for the USPTST. Ann. Intern.Med 2009*

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COMPARISON of USPSTF and ACS SCREENING GUIDELINES (1)

USPSTF	ACS
Biennal screening mammography beginning at age **50**	**Annual** screening mammography beginning at age 40
Evidence is insufficient for assessing the additional benefits of screening mammography in women past **74**	**Continue annual** screening mammography for **as long as a women is in good health**
Recommends against teaching women how to perform **breast self examination (BSE)**	BSE is optional, women who choose to do BSE should receive instruction from their health providers

USPSTF -US Preventative Services Task Force
ACS - American Cancer Society

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COMPARISON of USPSTF and ACS SCREENING GUIDELINES (2)

USPSTF	ACS
Evidence is insufficient for assessing the additional benefits of **clinical breast examination (CBE)** beyond screening mammography in woman 40 year or older	Recommends CBE **every three years** for woman in their **20s and 30s**, and **annualy** for woman aged **40** or older
Evidence is insufficient for assessing the additional benefits and harms of MRI as a screening method for breast cancer	In addition to screening mammography, **annual MRI** screening is reccomended for women with greater than 20% lifetime risk of breast cancer

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The 2010 Written Declaration on the Fight Against Breast Cancer in the European Union, the 2006 European Parliament Resolution on Breast Cancer in the Enlarged European Union, and the first Resolution of 2003, call for every woman across Europe to have access to equal, high-quality breast cancer care, in compliance with the European guidelines.

The aim is to reduce mortality from breast cancer across the EU and to reduce the disparity in survival rates between countries. The European Parliament has judged the most effective means of reducing disparities in care and mortality to be through population-based mammography screening programs and the setting up of specialist breast units, as well as through training and auditing to assure quality standards.

Mammography screening should be offered every two years to all women aged 50-69 as part of the public health system. This is in keeping with both International Agency for Research on Cancer (IARC) recommendations and the European Council Recommendation on Cancer Screening.

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Screening Tests that have been employed:

- SELF BREAST EXAM (SBE)
- CLINICAL BREAST EXAM (CBE)
- MAMMOGRAPHY (MX)- the golden standard
- MAGNETIC RESONANCE IMAGING (MRI)
- ULTRASOUND /ULTRASONOGRAPHY (US)
- MOLECULAR BREAST IMAGING (MBI)
- BRCA TESTING

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ULTRASOUND History (1)

High-frequency ultrasonic waves

1880- Pierre et Jacques Curie- discovered piezoelectric effect (whereby an electrical change is produced in response to the application of mechanical pressure on certain crystals)

Practical aplication in WW I, Paul Langevin- to detect submarines (SONAR- Sound Navigation Ranging)

ULTRASOUND History (2)

1920- 1930 Ultrasound (US) was first used therapeutically (physical therapy, cancer treatment)

1940-1950 Karl Dussig of Austria- ultrasonically depicted intracranial structures

In USA George Ludwig- the velocity of sound waves differed in various tissues

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ULTRASOUND History (3)

1949- John Wild determined that the echoes returned from tumors were different from those returning from normal tissues and suggested that these differences might make ultrasound useful for cancer detection

1950- Wild & Reid John (USA) and Toshio Wagai et al (Japan) **produced us images of breast tumors**

1950s-Wild&Reid- contact scanning

Douglas Howry et al-water bath system

ULTRASOUND History (4)

These early investigators used A-Mode ultrasound technology (oscilloscope)

1950-1960s- B-Mode scanning

Wild and Reid -were the first who develop equipment specifically designed for breast scanning and they attend to differentiate benign from malignant disease

-they were the first to differentiate between cystic and solid masses

-they were able to detect some cancers as small as 2 to 3 mm

-US might prove beneficial in **screening for early breast cancer**

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ULTRASOUND History (5)

- **Ductal Echography (Michel Teboul)**
- Doppler color
- Elastography
- Whole Breast Scanning
- Ultrasound Computed Aided Diagnosis
- Contrast Enhanced Ultrasound
- Photoacoustic Imaging

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BI-RADS (Breast Imaging Reporting and Data System)

BIRADS is a quality control system that refers to the mammography assessment categories and later adapted for use with MRI and US findings

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INDICATIONS FOR BREAST ULTRASOUND* (1)

1-palpable abnormalities
2-mammographic abnormalities
3-breast pain
4-nipple discharge
5-follow-up of lessions not biopsied (BIRADS 3 lessions)
6-determination of extend of lession in pacients with suspicious or malignant nodules

**Basset-Mahoney-Apple-D'Orsi. Breast Imaging, 2011*

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INDICATIONS FOR BREAST ULTRASOUND* (2)

7 -assessment of regional limph nodes in pacients with suspicious or malignant nodes

8 -second look after MRI

9 -guiding interventional procedures

10 -**screening**

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LIFETIME RISK OF BREAST CANCER (BC)*

- 12,4% of women born in USA today will develop BC at some time of their life
- A women born today has about 1 in 8 chance (mischance !) of being diagnosed with BC at some time during their life

or, on the other hand,

the chance that she will never have BC is 87,6% or about 7 in 8

**NIH.National Cancer Institute. Surveillance,Epidemiology and End Results SEER Program. 2007-2009*

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RISK THAT A WOMEN WILL BE DIAGNOSED WITH BREAST CANCER DURING THE NEXT 10 YEARS, STARTING AT THE FOLLOWING AGES*

- Age 30…….0,44% (or 1 in 227)
- Age 40…….1,47% (or 1 in 68)
- Age 50…….2,38% (or 1 in 42)
- Age 60…….3,56% (or 1 in 28)
- Age 70…….3,82% (or 1 in 26)

**NIH.National Cancer Institute. Surveillance,Epidemiology and End Results SEER Program. 2007-2009*

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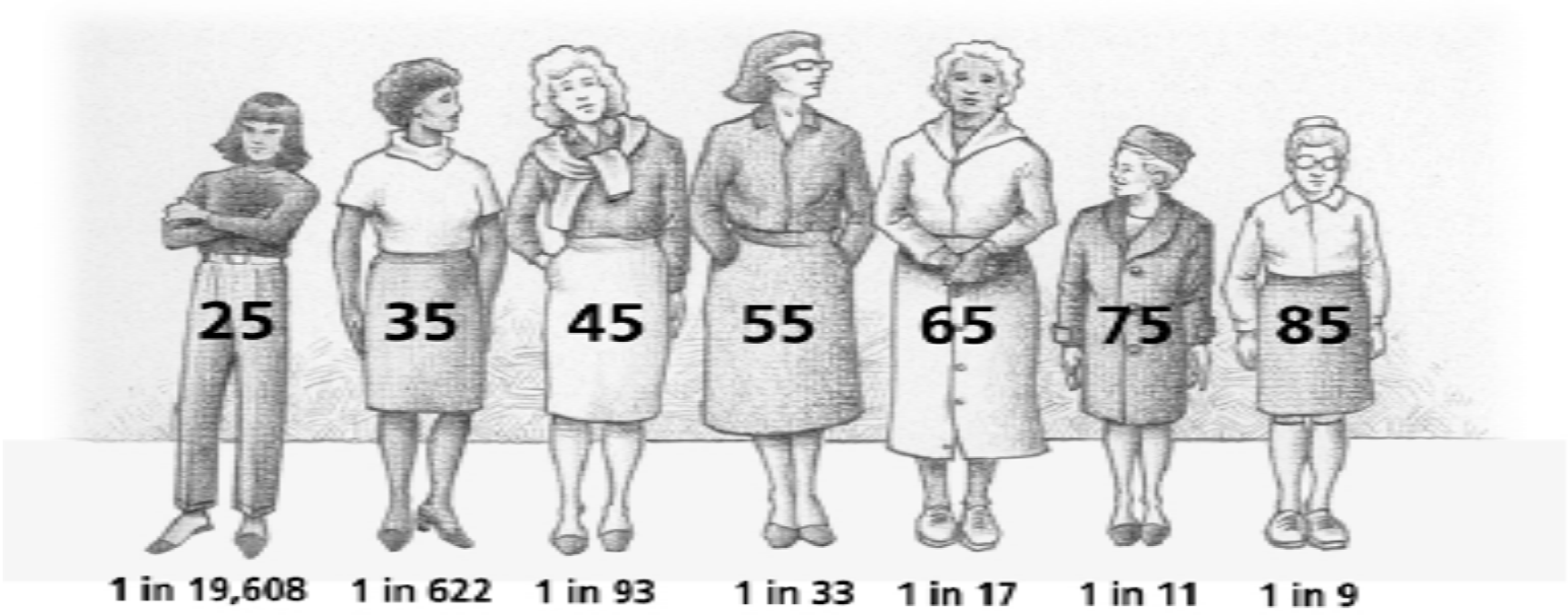
Chances (mischance!) of Developing Breast Cancer by Age



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Cancer cell growth

1 CELL(10microm)----------**1 cmc** TUMOR(**100 bilion cells**)

30 reduplications

1 reduplication= 30-200 days

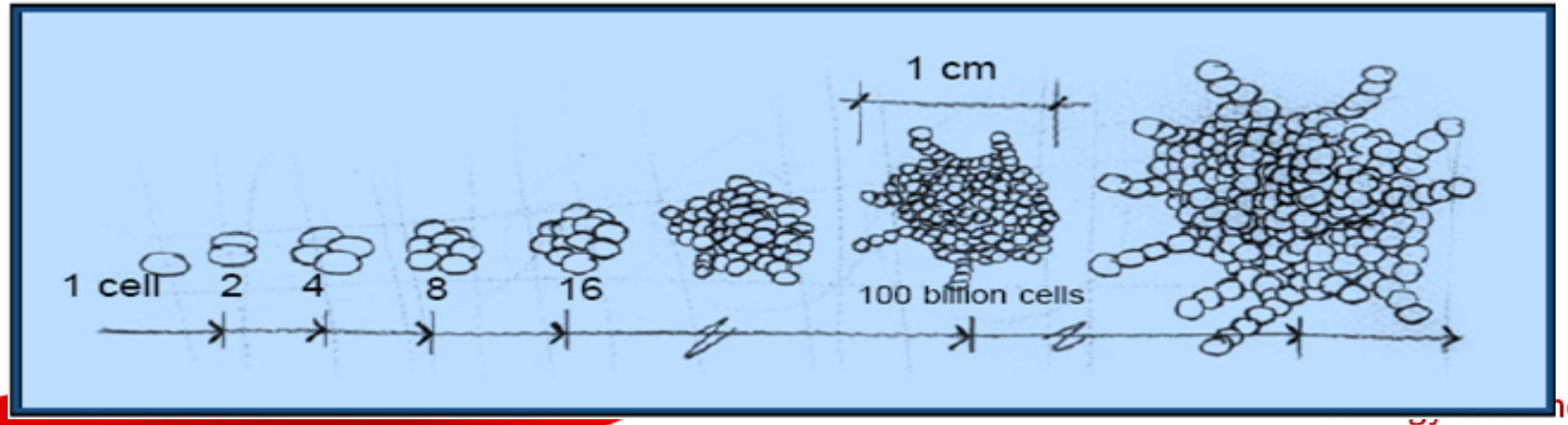
30 reduplications=2-20 years

1cm TUMOR= 2-20 years

40y 74y

---|---------|-------|--|---------|---------|---------|----|-----

20y 30y 38y 50y 60y 70y



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THE LIMITATION OF BREAST ULTRASONOGRAPY IN SCREENING

- Reproducibility
- Operator dependency of the examination
- High false –positive rates
- Low positive predictive value for biopsy recommendation
- Lack of agreement on which solid or complex lesions found at screening require biopsy

Basset, Mahoney, Apple, D Orsi. Breast Imaging, 2011

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ULTRASOUNDS BENEFITS

- relatively low cost
- the accuracy of differentiation of cystic versus solid masses is 96 to 100%
- US reduces the unnecessary biopsies by 30%

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THE COST OF ULTRASOUND

	USA	ROMANIA
ULTRASOUND	108-200$ bilateral , with interpretation 150$-typical reimbursement	10$ (Public Insurance) 50-60$, with elastography (Private Clinic)
MAMMOGRAPHY	120-212$ bilateral, with interpretation	14$ (Public Insurance) 50-60 $ (Private Clinic) 125$ tomosynthesis
MRI	540$, bilateral, with interpretation	110$, native 160$, with contrast

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Because of its relatively low cost US has entered the clinical armamentarium as the **second look for suspicious mammography findings (BI-RADS 3)**

Elastography with B-mode and Doppler color improves specificity to 47% and sensitivity to 99% (for invasive cancers)

Basset- Mahoney-Apple-D'Orsi. Breast Imaging. 2011

ROLE OF ULTRASOUND IN SCREENING OF BREAST CANCER

- Ultrasound of the breast is the main diagnostic test performed after mammography

- Ultrasound is useful in assessing the cause of palpable and mammographic abnormalities and can be expected to show normal and definitively benign findings in more than 90% of cases that can make further work-up or biopsy unnecessary

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- Breast density is an increasingly pertinent issue in breast cancer diagnosis.
- Breast density result in a decrease in the sensitivity of mammography for cancer detection, with a significant increase in the risk of breast cancer
- Ultrasound detects additional cancers, being the second screening method used in imaging

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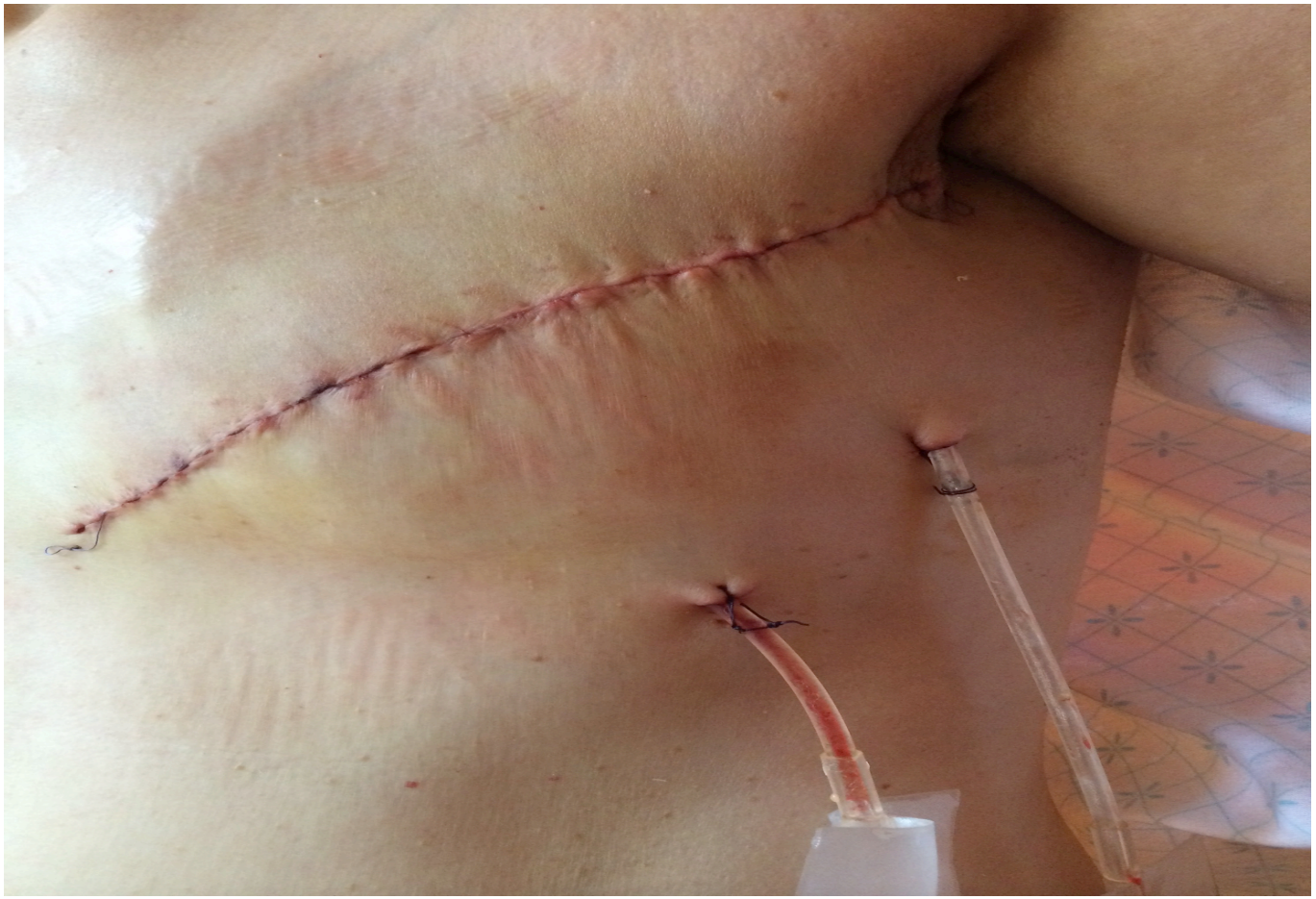

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Thank You !

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