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Breast Cancer

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Epidemiology

- An estimated 211,240 new cases of breast cancer are expected to occur in the United states during 2005.
- The rate of new cases have increased since 1980 but rates have slowed down since the 1990's.
- About 1690 new cases of breast cancer are expected in men.
- An estimated 40,870 deaths (40,410 women, 460 men) are anticipated from breast cancer in 2005.
- Mortality rates declined 1.4% per year during 1989-1995 and by 3.2% afterwards.
- Largest decrease was in younger women for both Caucasians and African Americans.

Epidemiology

- The 5 year survival rate for localized breast cancer has increased from 72% in the 1940's to 97 percent today.
- Regionally spread cancer drops the rate to 78%
- Distant metastases drops the survival rate even lower to 23%

Leading Sites of New Cancer Cases and Deaths – 2003 Estimates*

Estimated New Cases*

Male	Female
Prostate 220,900 (33%)	Breast 211,300 (32%)
Lung & bronchus 91,800 (14%)	Lung & bronchus 80,100 (12%)
Colon & rectum 72,800 (11%)	Colon & rectum 74,700 (11%)
Urinary bladder 42,200 (6%)	Uterine corpus 40,100 (6%)
Melanoma of the skin 29,900 (4%)	Ovary 25,400 (4%)
Non-Hodgkin lymphoma 28,300 (4%)	Non-Hodgkin lymphoma 25,100 (4%)
Kidney 19,500 (3%)	Melanoma of the skin 24,300 (3%)
Oral cavity 18,200 (3%)	Thyroid 16,300 (3%)
Leukemia 17,900 (3%)	Pancreas 15,800 (2%)
Pancreas 14,900 (2%)	Urinary bladder 15,200 (2%)
All sites 675,300 (100%)	All sites 658,800 (100%)

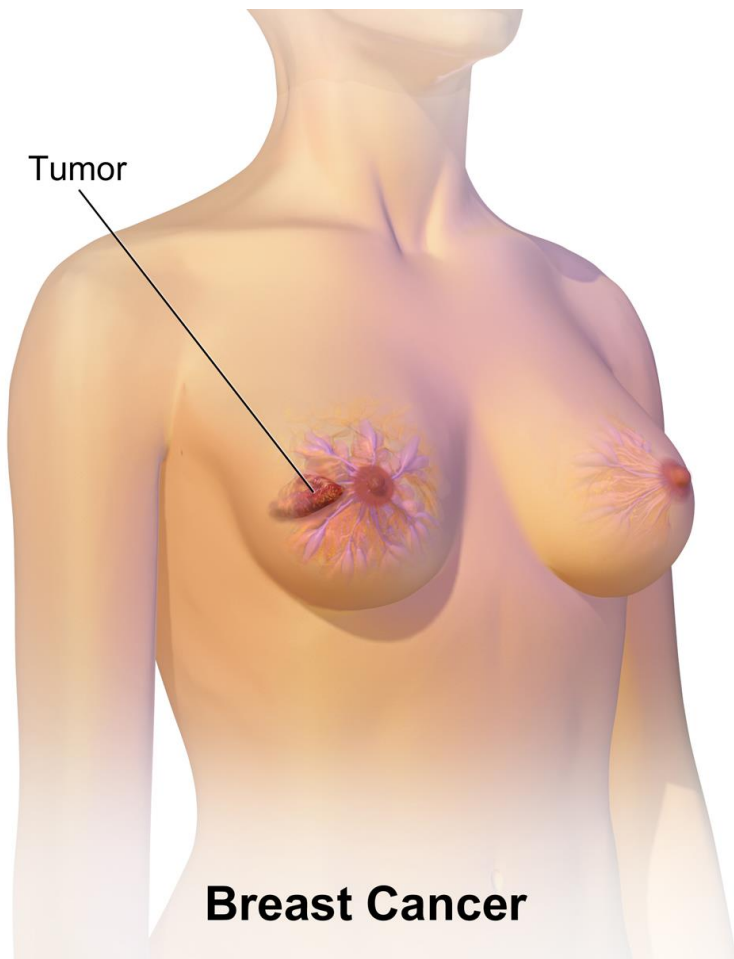
Estimated Deaths

Male	Female
Lung & bronchus 88,400 (31%)	Lung & bronchus 68,800 (25%)
Prostate 28,900 (10%)	Breast 39,800 (15%)
Colon & rectum 28,300 (10%)	Colon & rectum 28,800 (11%)
Pancreas 14,700 (5%)	Pancreas 15,300 (6%)
Non-Hodgkin lymphoma 12,200 (4%)	Ovary 14,300 (5%)
Leukemia 12,100 (4%)	Non-Hodgkin lymphoma 11,200 (4%)
Esophagus 9,900 (4%)	Leukemia 9,800 (4%)
Liver 9,200 (3%)	Uterine corpus 6,800 (3%)
Urinary bladder 8,600 (3%)	Brain 5,800 (2%)
Kidney 7,400 (3%)	Multiple myeloma 5,500 (2%)
All sites 285,900 (100%)	All sites 270,600 (100%)

*Excludes basal and squamous cell skin cancers and in situ carcinoma except urinary bladder.
Percentages may not total 100% due to rounding.

What is Breast Cancer?

- Breast cancer is cancer that develops from breast tissue.
- Signs of breast cancer may include a lump in the breast, a change in breast shape, dimpling of the skin, fluid coming from the nipple, a newly inverted nipple, or a red or scaly patch of skin.
- In those with distant spread of the disease, there may be bone pain, swollen lymph nodes, shortness of breath, or yellow skin.



- Breast cancer primarily effects women but about **1%** of all cases effect **men**.
- Breast cancer is the second **leading cause of death in women** next to lung cancer.
- One out of nine women in the US will develop breast cancer in their lifetime
 - One out of twenty in 1960
- An abnormal, uncontrolled cell growth arising in the breast tissue.

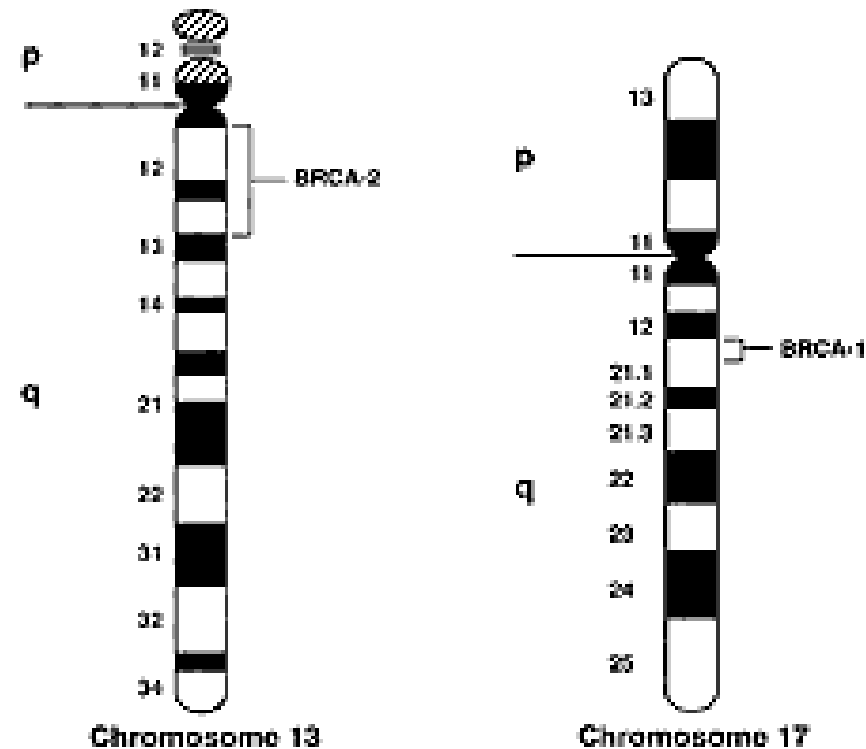
BRCA1/BRCA2

- BRCA1 discovered in 1994
- BRCA2 discovered in 1995
- 5-10% of all breast cancer cases are linked to this gene.
- Having a single copy of either mutated gene appears to confer about an 80% chance of developing breast cancer.

BRCA1/BRCA2

- BRCA1 is located on chromosome 17
- BRCA2 is located on Chromosome 13
- When found, many researchers thought it would shed light on breast cancer in those patients who did not have the mutated gene.

BRCA Genes Tumor Suppressor Genes



What does BRCA1&BRCA2 do?

- Both genes help mediate damage to cell's DNA. Exactly how though is still being studied.
- These genes are tentatively linked to an increased risk for also pancreatic, prostate, and ovarian cancer.
- Puzzle... Why is breast tissue so susceptible?

BRCA1/BRCA2

- A possible explanation is estrogen.
- Studies on mice without BRCA but treated with excess estrogen were found to over stimulate genes and proteins in a hormonal activating pathway.
- Further testing will show whether it affects tumor formation.
- But why mostly women and not many men? Men have estrogen too!!!

BRCA1/BRCA2

In men??

- Study shows that BRCA2 mainly causes increase of risk
- 7% risk of breast cancer by age 80
- Association between *BRCA1* and MBC is less clear
- Female first-degree relatives of MBC cases are at increased risk of breast cancer

BRCA1/BRCA2

- Women who have the *BRCA1* gene tend to develop breast cancer at an early age
- Possible BRCA carriers are females whose mother and grandmother have had breast cancer
- Testing for these genes is expensive and frequently not covered by insurance
- Women who test positive may have trouble getting or keeping health insurance.

The Breast

The breasts are made of fat, glands, and connective (fibrous) tissue

The breast has several lobes, which are divided into lobules and end in the milk glands

Tiny ducts run from the many tiny glands, connect together, and end in the nipple

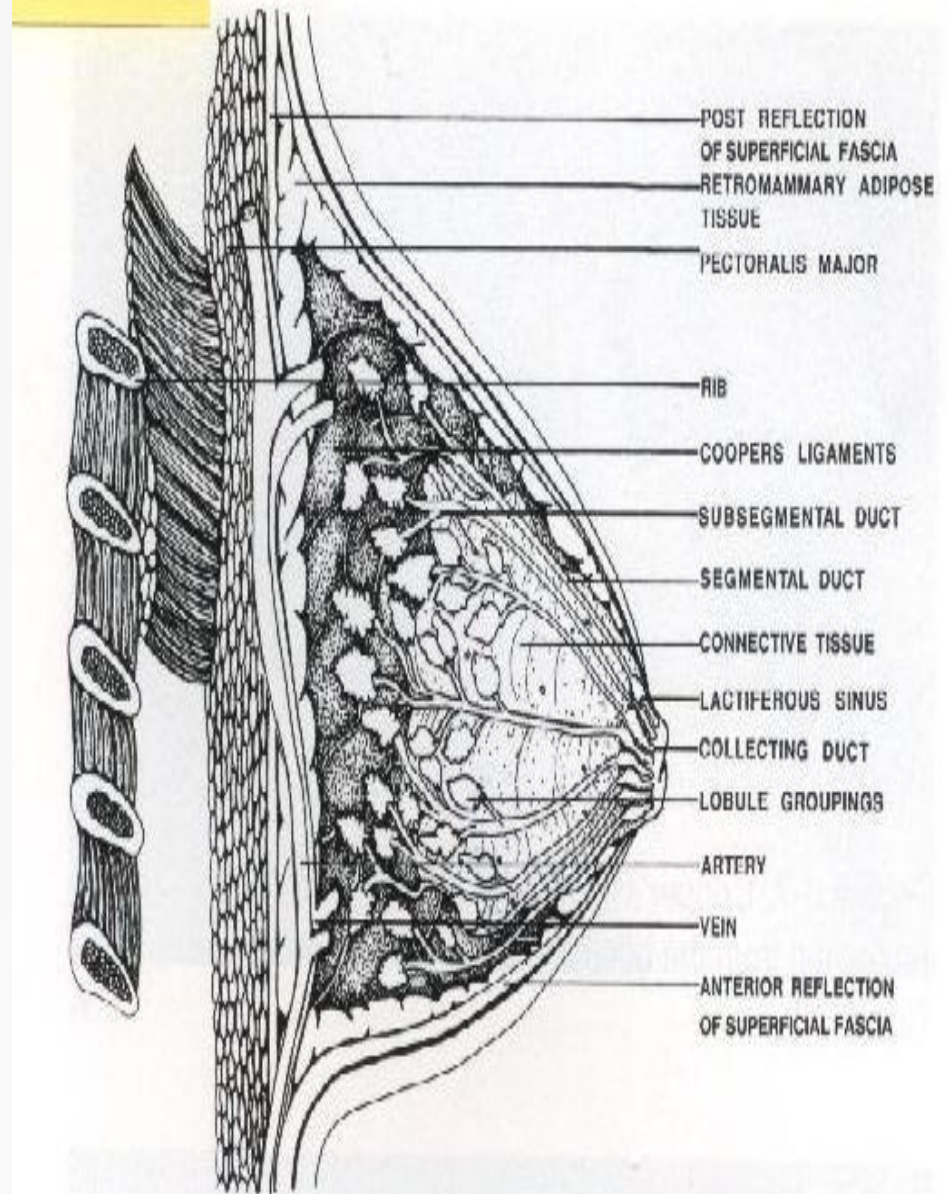


Figure 8-6. Normal anatomy of the breast.

The Breast

- These ducts are where 78% of breast cancers occur. This is known as infiltrating ductal cancer
- Cancer developing in the lobules is termed infiltrating lobular cancer. About 10-15% of breast cancers are of this type
- Another type of breast cancer is inflammatory breast cancer (Often Misdiagnosed and dangerous)

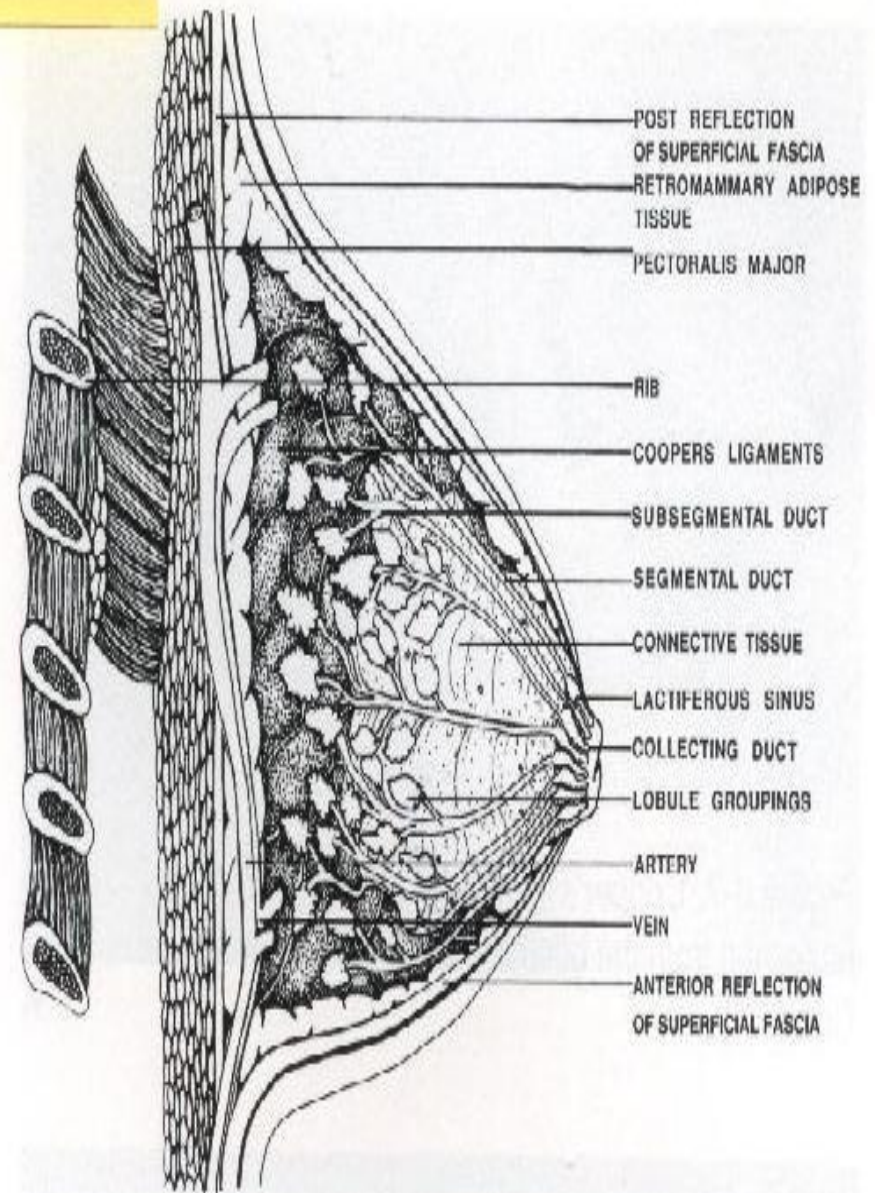


Figure 8-6. Normal anatomy of the breast.

Inflammatory Breast Cancer

- Rare, serious, aggressive form of breast cancer
- Looks red (erythema), feels warm
- Thickening of skin
- Ridges, welts and hives may be observed
- Skin may look wrinkled
- Sometimes misdiagnosed as infection



Causes and Risks

- Personal or family history
- Not having children
- Having first child after age 30
- Radiation therapy to chest/upper body
- Overweight or obese
- Age
- Late menopause
- Diets high in saturated fat
- Your sex
- Estrogen replacement therapy

Causes and Risks

Although breast cancer can occur at any age the risk factor increases the older one gets.

- The average woman at age 30 has 1 chance in 280 of developing breast cancer in the next 10 years
- This chance increases to 1 in 70 for a woman aged 40
- By age 50 the chances are 1 in 40
- A 60-year-old woman has a 1 in 30 chance of developing breast cancer in the next 10 years.

Causes and Risks

- Shields

- Being older at first menstration and having an earlier menopause lowers risk
- Having children before the age of 30 helps. Having no children increases risk.
- Physically active women may have a lower risk.
- Preventive mastectomy

Symptoms

- Early breast cancer has little or no symptoms. It is not painful.
- Breast discharge, especially if only from one breast or both
- Sunken nipple, Though a common variant of normal nipples a new development should cause concern
- Redness, changes in texture, and puckering. Usually caused by skin disease but sometimes can be associated with breast cancer.
- Lumps on or around breast. Most lumps are not cancerous
- Other lumps around the under arm or collarbone which don't go away

Metastasis

- The most common place for breast cancer to metastasize is into the lymph nodes under the arm or above the collarbone on the same side as the cancer.
- **Brain**
- **Bones**
- **Liver**

Early detection

- **Early detection is the key!**
 - Self/Doctor examinations
 - Mammography
 - Ultrasound
 - MRI
 - Biopsy
 - Self VS Mammography VS Ultrasound
VS MRI VS Biopsy

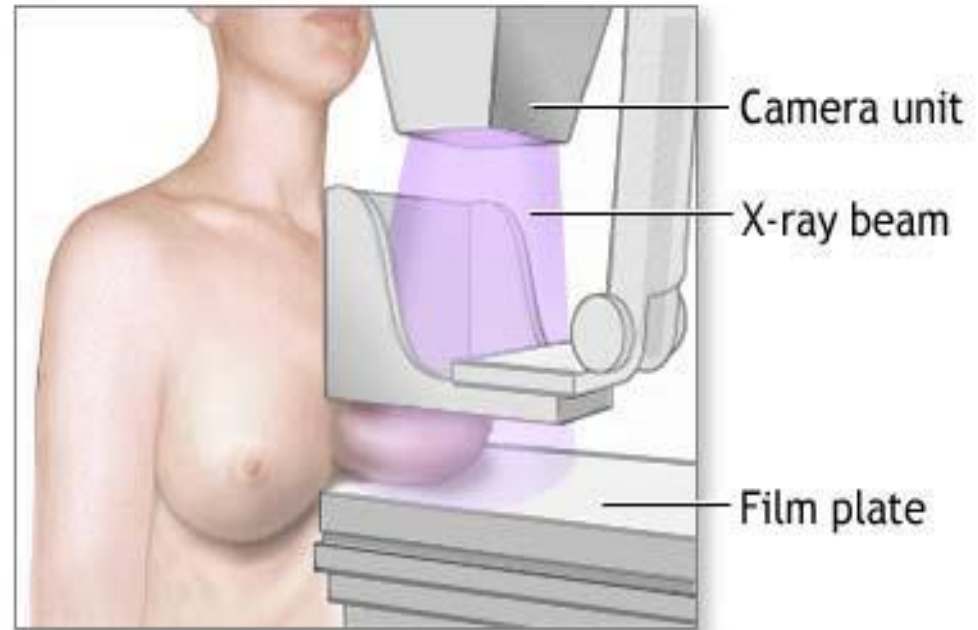
Self / Doctor examination

- includes visual inspection and careful feeling of the breasts, the armpits, and the areas around the collarbone.
- Looking for lumps or abnormalities around the breast.
- Most lumps are NOT cancerous
- Best time for examination is immediately after the monthly period
- Not 100% accurate

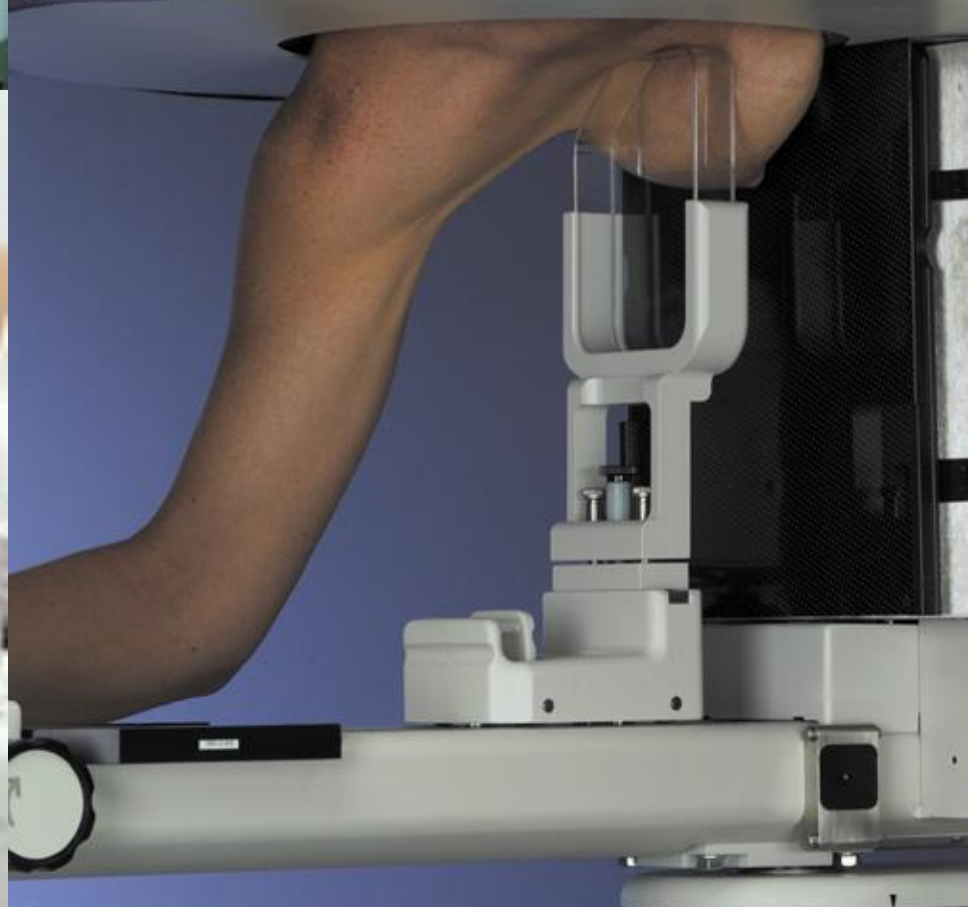
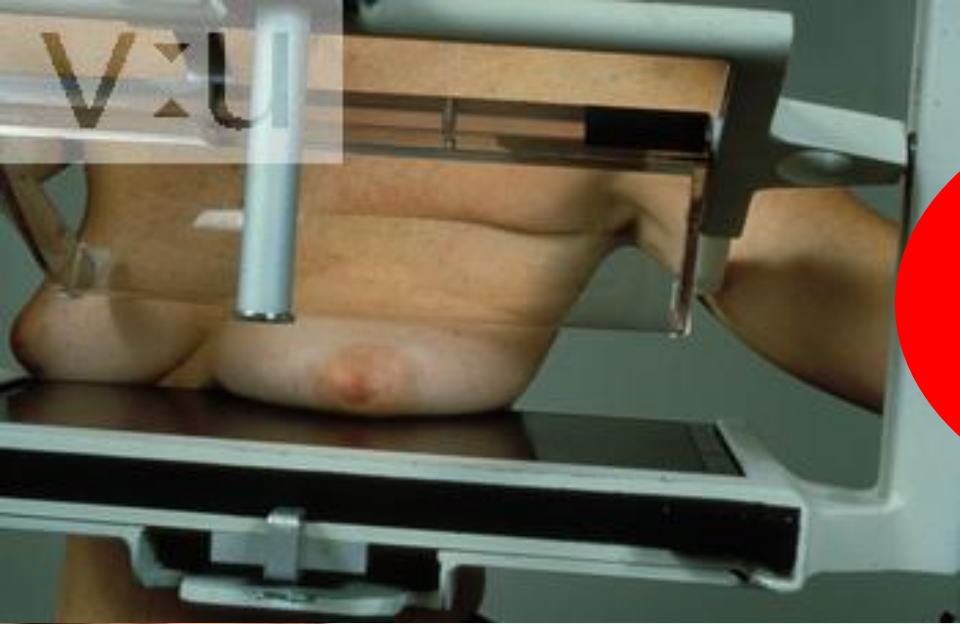


Mammography

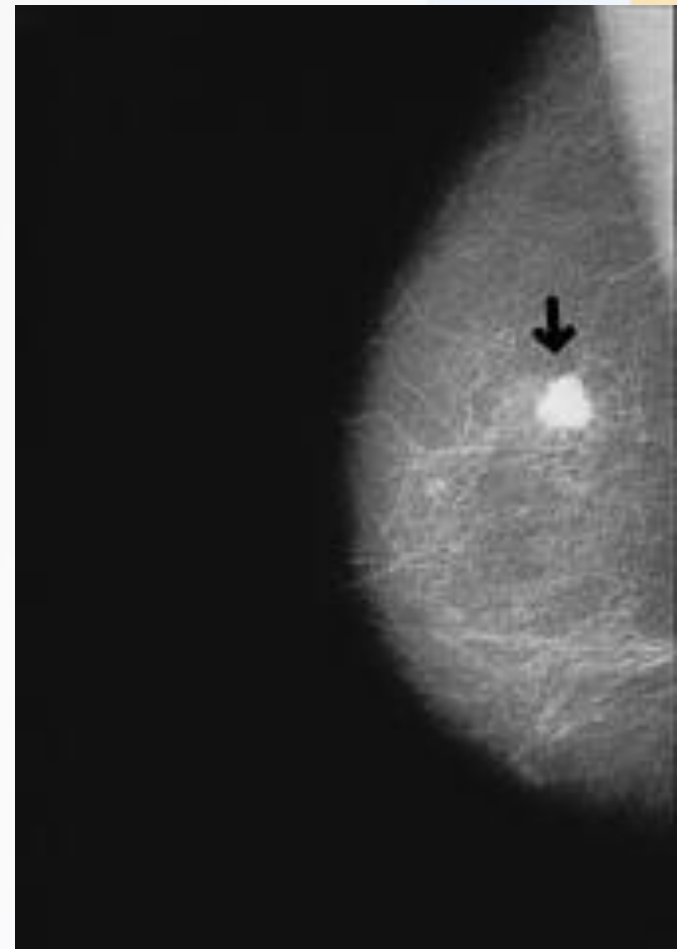
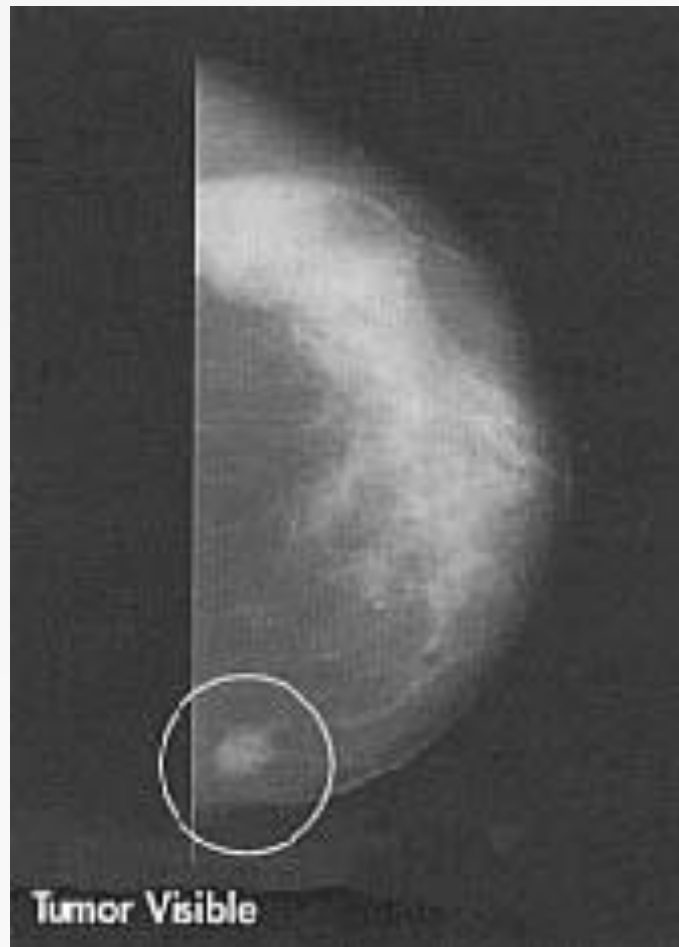
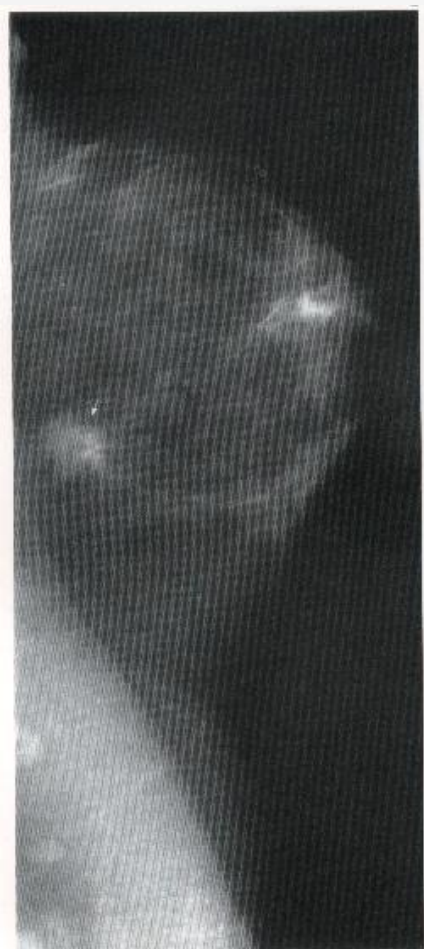
- X-ray picture of the breast taken from several angles by compressing the breast horizontally, diagonally, and sometimes vertically.
- Not 100% accurate



In mammography, each breast is compressed horizontally, then obliquely and an x-ray is taken of each position

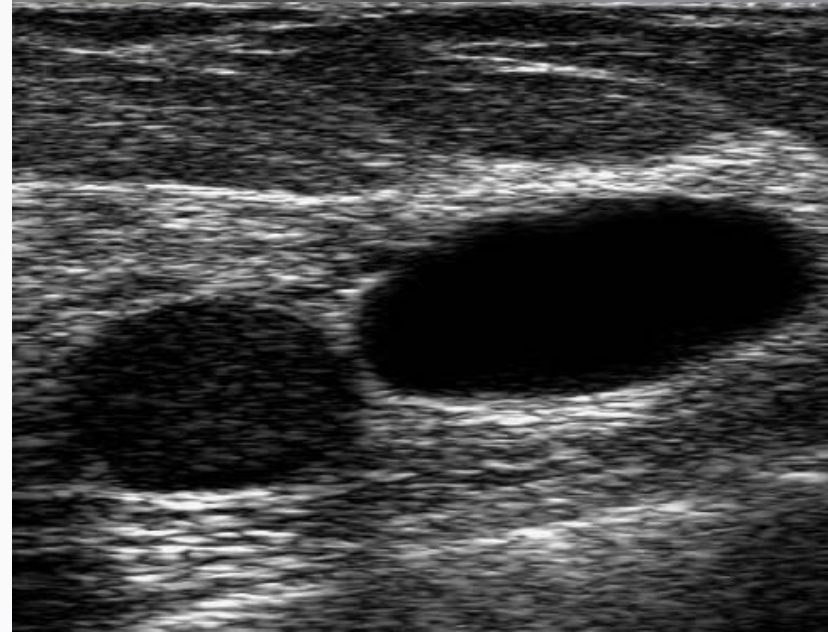


Mammography images



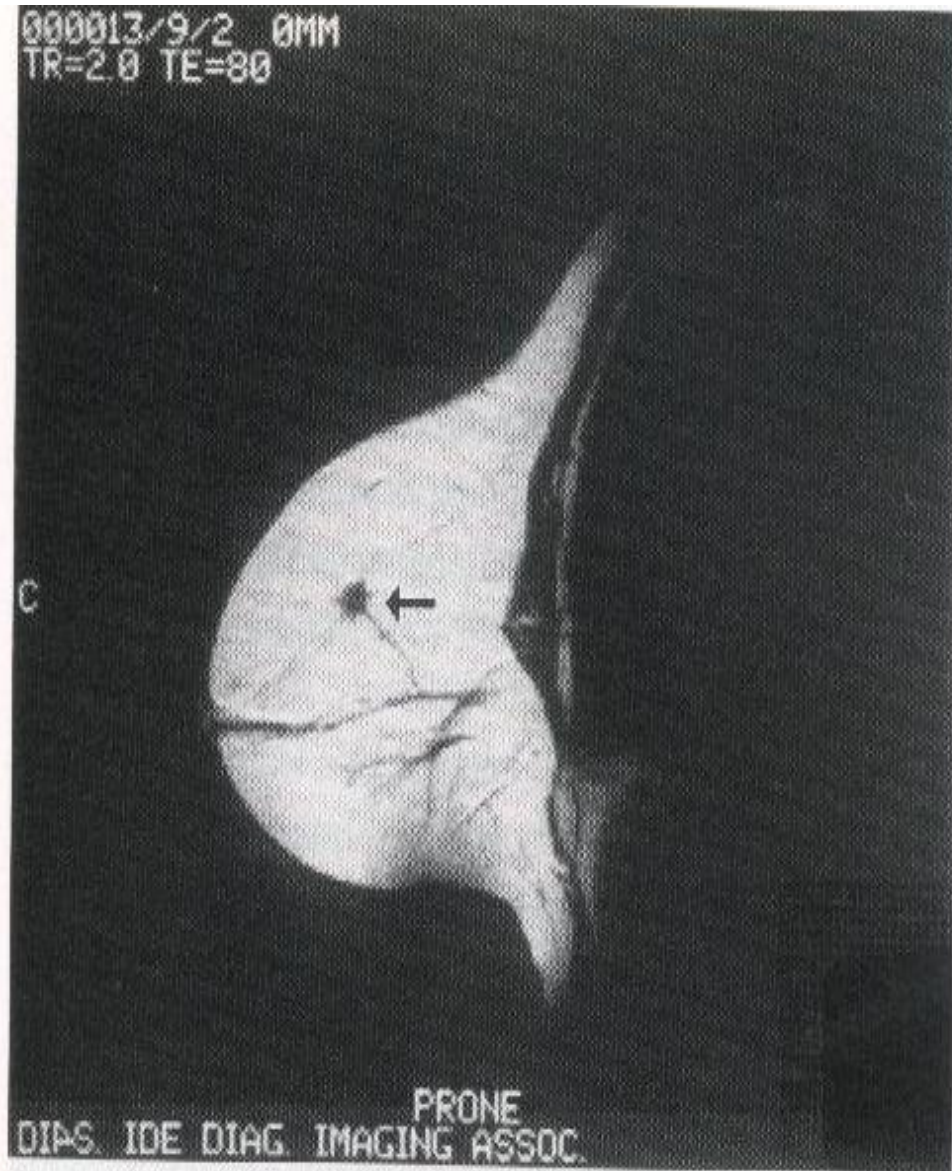
Ultrasound

- Usually done in addition to the mammogram.
- Shows whether a mass is filled with fluid or solid. Cancers are solid.
- Not 100% accurate



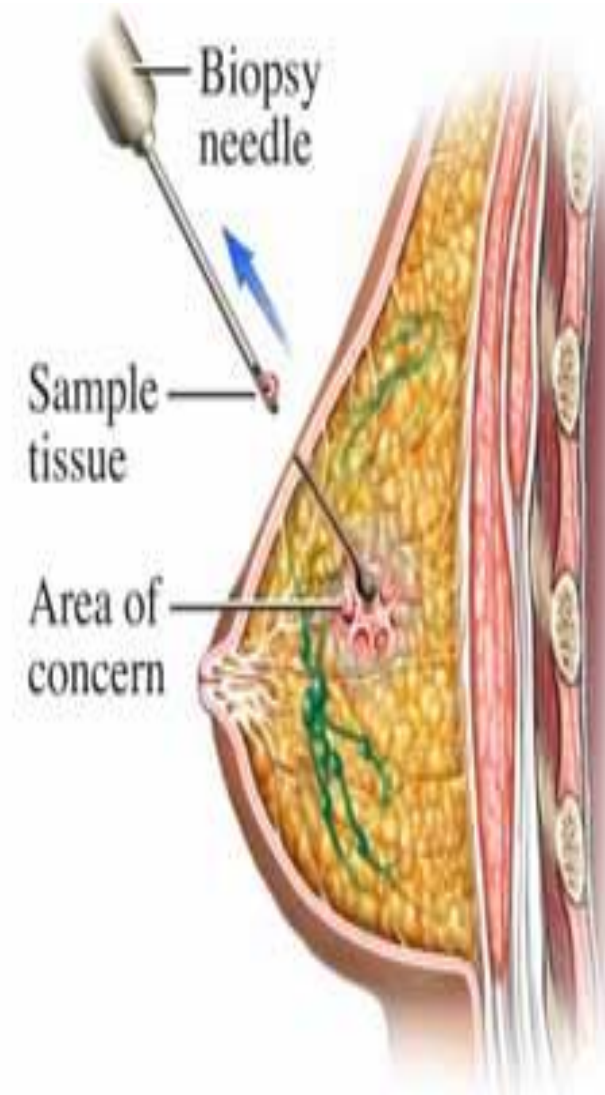
MRI

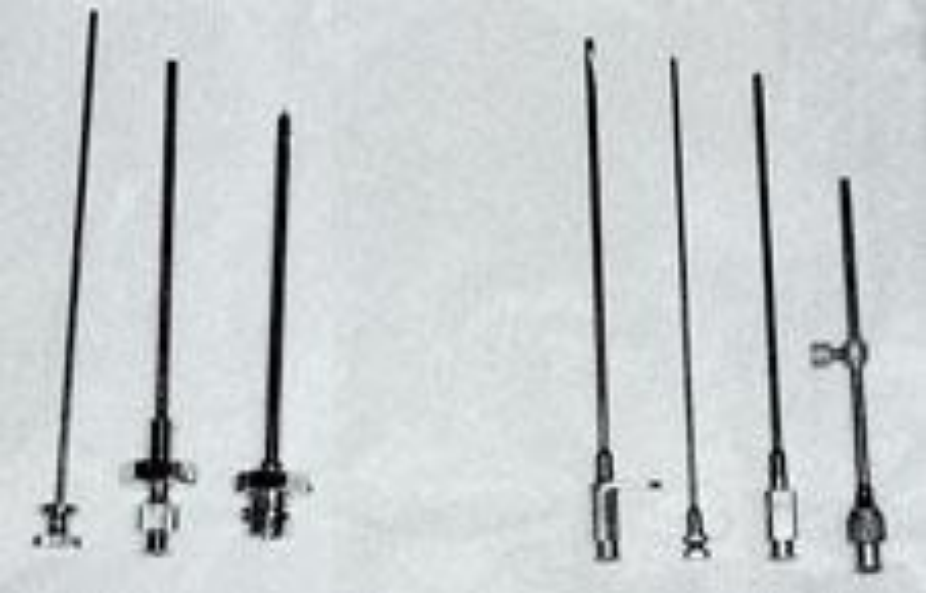
- Magnetic resonance imaging.
- Differentiates diseased or dying tissue from normal healthy tissue
- Almost 100% accurate



Biopsy

- take a very small piece of tissue from the body for examination and testing.
- examined by a pathologist
- 100% accurate





Early detection

- **Self/doctor exam**

VS

- **Mammography**

VS

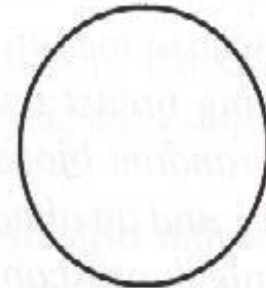
- **Ultrasound**

VS

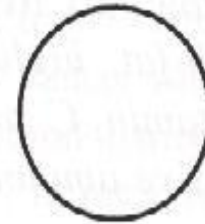
- **MRI**

VS

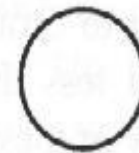
- **Biopsy**



1" or about 2.5cm



3/4" or about 2cm



1/2" or about 1.2cm

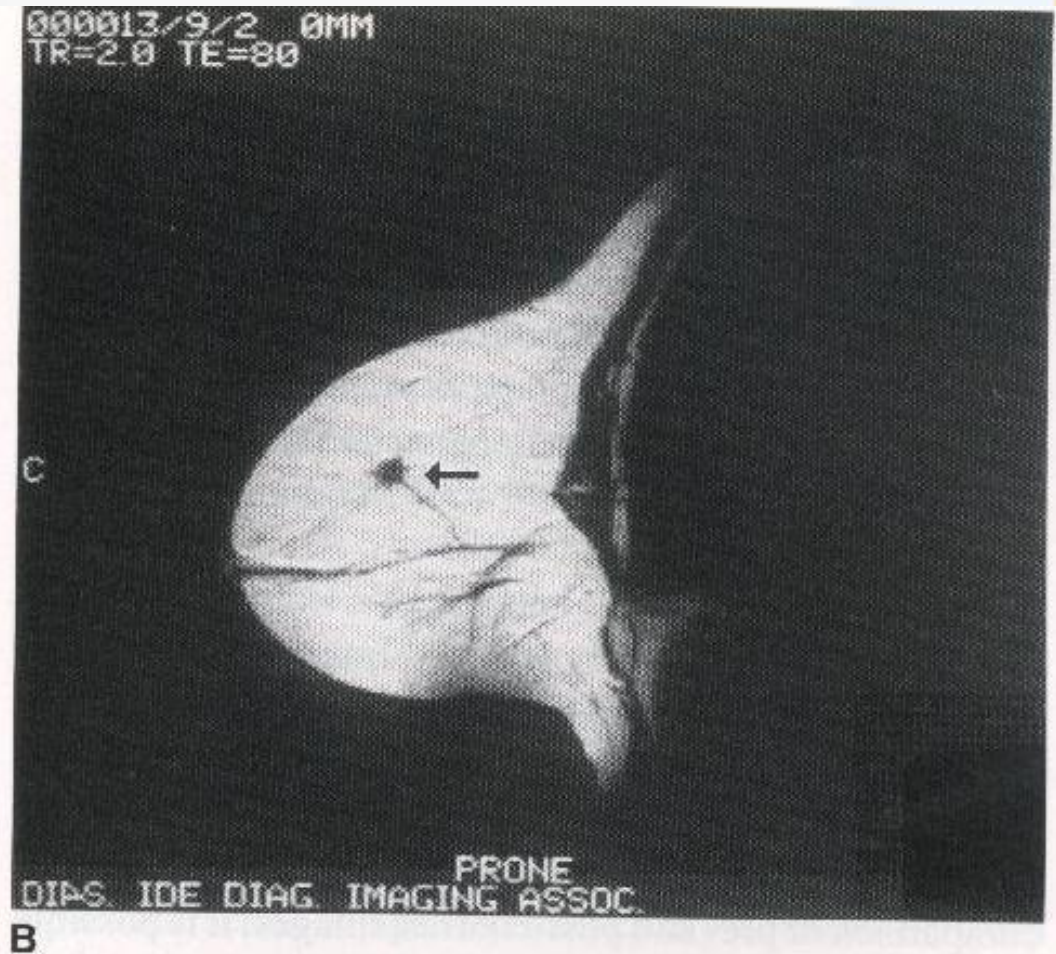
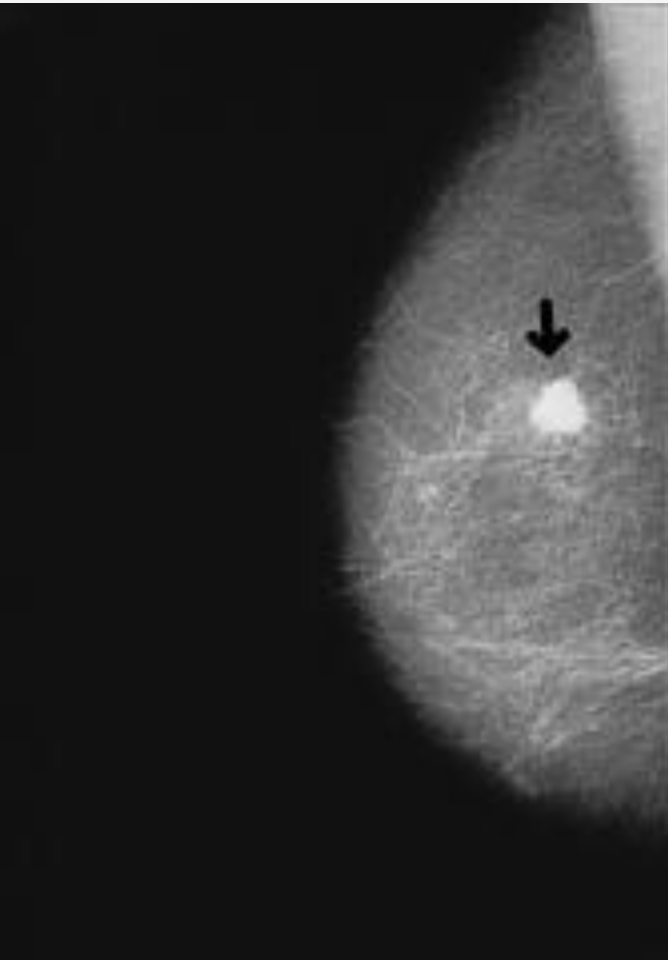


1/4" or about .5cm

Early detection

- Self/doctor exams usually only feel lumps after tumor is about 1 inch diameter
- Mammography & ultrasound detect tumors at about $\frac{1}{4}$ inch
- MRI uses cell contrast for excellent detection but costs 8-20 times more than standard mammography
- 100% assurance on any suspicious lumps can only be obtained by a biopsy

Which image looks more distinct?



Stages 0-IV

- **Stage 0** is noninvasive breast cancer, that is, carcinoma in situ with no affected lymph nodes or metastasis. This is the most favorable stage to find breast cancer.
- **Stage I** is breast cancer that is less than three quarters of an inch in diameter and has not spread from the breast.
- **Stage II** is breast cancer that is fairly small in size but has spread to lymph nodes in the armpit OR cancer that is somewhat larger but has not spread to the lymph nodes.

Stages 0-IV

- **Stage III** is breast cancer of a larger size (greater than 2 inches in diameter), with greater lymph node involvement, or of the inflammatory type. Spreading to other areas around the breast.
- **Stage IV** is metastatic breast cancer: a tumor of any size or type that has metastasized to another part of the body (ex. bones, lungs, liver, brain). This is the least favorable stage to find breast cancer.

Treatment

- Radiation
- Chemotherapy
- Vaccines
- Surgery
- Hormonal therapy
 - Tamoxifen (Nolvadex) is the most commonly prescribed hormone treatment.

Therapeutic Vaccines

- Treat existing cancers
- Under development
- “Kick-start” immune system
- Prevent further growth of existing cancers
- Block recurrence of treated cancers
- Kill cancer cells not destroyed by previous treatment



← Lumpectomy



Simple Mastectomy →



← Modified Radical



Radical →

Treatment

- BRCA1/BRCA2?
 - No “treatment”
 - Mastectomy cuts risk by 90%
 - Hysterectomy slashes another 50%
 - Tamoxifen
 - anti-estrogen drug
 - Lowers risk of diagnosis of benign tumors Influenced by estrogen
 - Reduces risk about 28%
 - May reduce need for biopsies in high-risk women
 - Intervenes before invasive cancer begins

The checklist

- Age 20-39
 - Monthly self breast exam
 - Yearly breast exam by doctor
 - Mammogram every 2-3 years
- Age 40+
 - Monthly self breast exam
 - Breast exam by doctor every 6 months
 - Mammogram once a year
 - Skin exam yearly

Conclusion

- The biggest risks for breast cancer are age, sex, and genetics
- Second highest cancer killer in women
- Rates of new cases have slowed
- BRCA1/BRCA2 only affect 5% of cases
- Several early detection techniques and devices
- Vaccines show promise but are not a solution
- Surgery helps prevent recurrence.

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