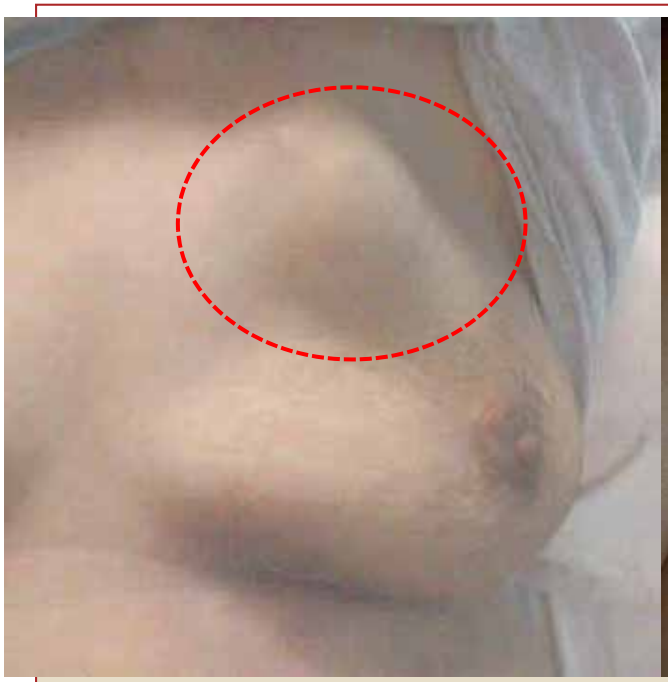
A to Z of Breast Cancer

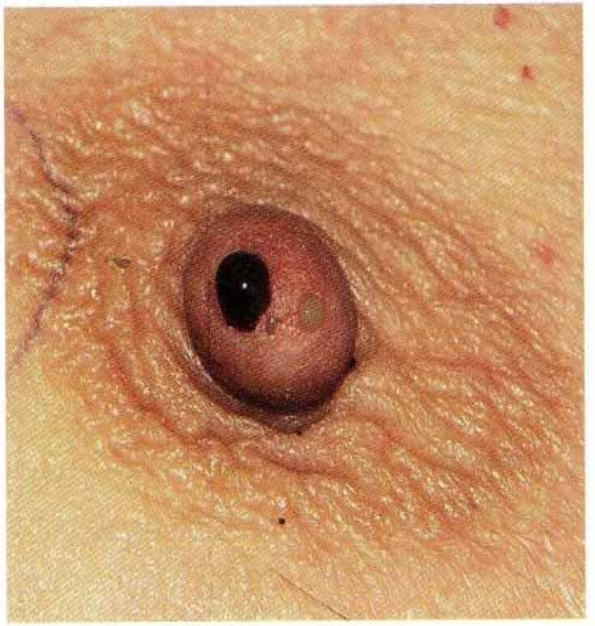
Dr R Soobrah

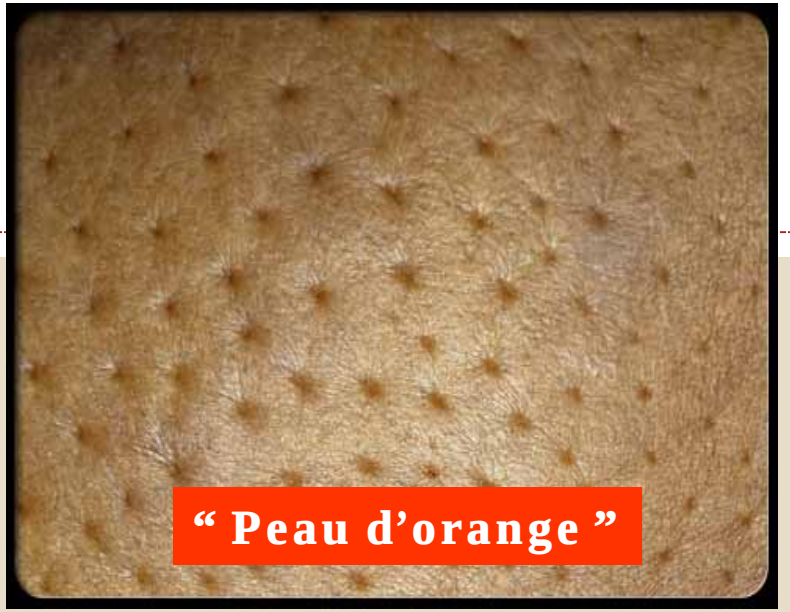
Breast Surgeon

Objectives

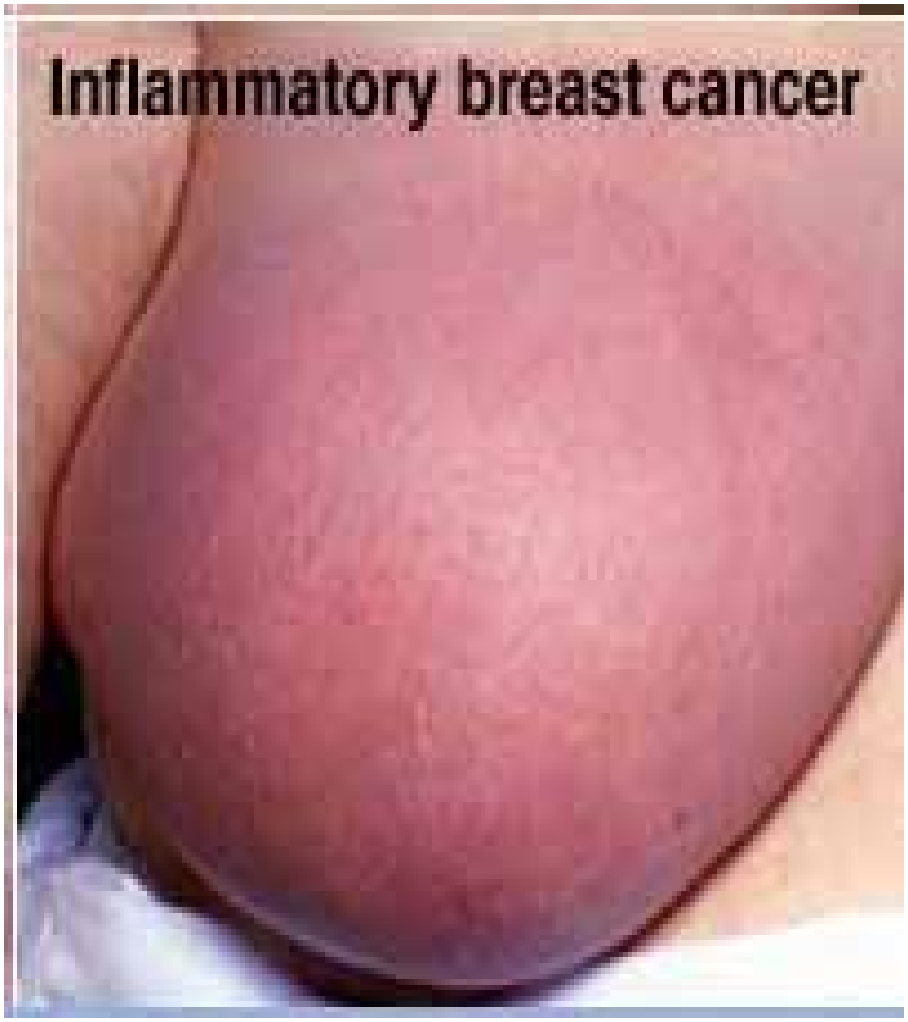
- Describe common signs of BC
- Describe Investigations and importance of **pre-operative planning**
- Operative management – axilla & breast
- Other treatment modalities
- Future …






“ Peau d’orange ”

Inflammatory breast cancer



Inflammatory breast cancer

- Most aggressive form BC (~5%)
- Quick diagnosis!
- 30% have **stage IV** de novo disease

[Stage IV Breast Cancer: 5-year survival ~ 15-20%]

- **chemotherapy** as the **first line** of treatment with the goal of downstaging the tumour to allow for definitive surgery (mastectomy + axillary node clearance)

Before
After

Risk factors

- Risk cancer increases with age:

Age 25 ~ 1 : 20,000 (**0.005%**)

Age 30 ~ 1 : 2500

➔ Age 40 ~ 1 : 200 ⟵ Mammograms

Age 50 ~ 1 : 50

Age 80 ~ 1 : 10

Lifetime risk = 1:8 (~12%)

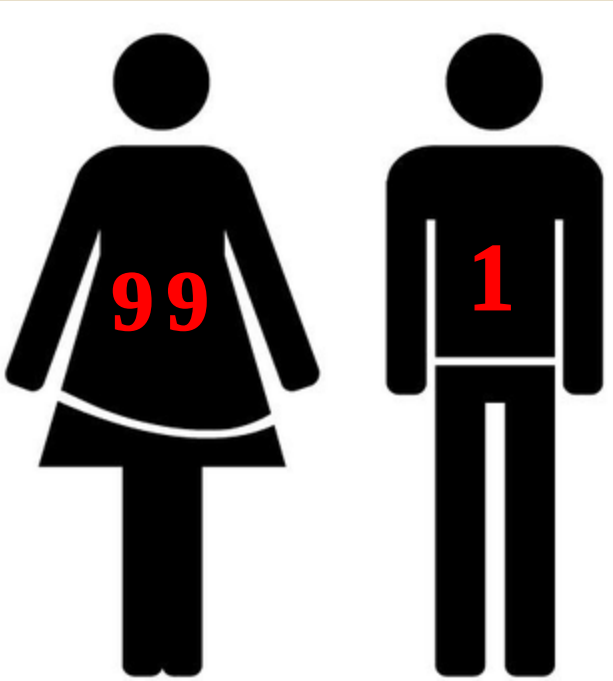
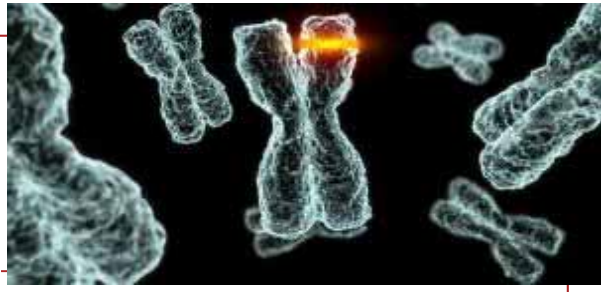


Table 1. Risk Factors for Breast Cancer

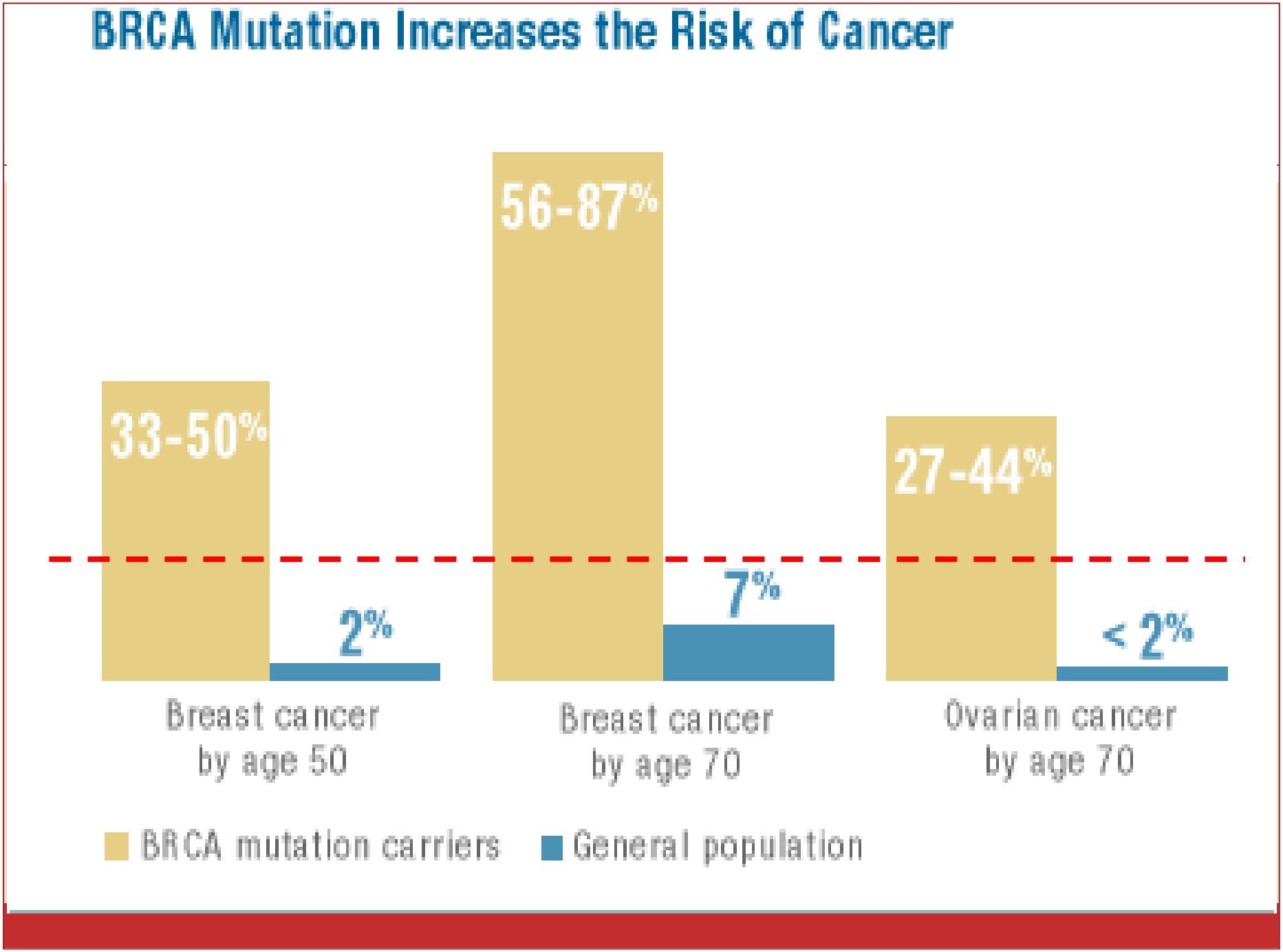
Nonmodifiable	Modifiable
• Female gender	• Not having children (slight risk increase)
• Age (>45 y)	• Oral contraceptives (slight risk increase)
• Genetic changes (mutations, *BRCA*)	• Depo-Provera (slight risk increase)
• Family history of **Breast / Ovarian** Ca	• Hormone therapy after menopause (risk increase after 2 y of use)
• Personal history of breast cancer	• Breastfeeding (slight risk reduction)
• Race and ethnicity (White > African > Asian)	• Alcohol consumption (risk increase)
• Dense breast tissue	• Obesity (risk increase)
• Certain benign breast conditions[a]	• Physical exercise (risk reduction)
• Lobular carcinoma in situ (LCIS)	
• Menstrual periods (early menarche, late menopause)	
• Previous chest radiation	
• Diethylstilbestrol exposure	

Genes

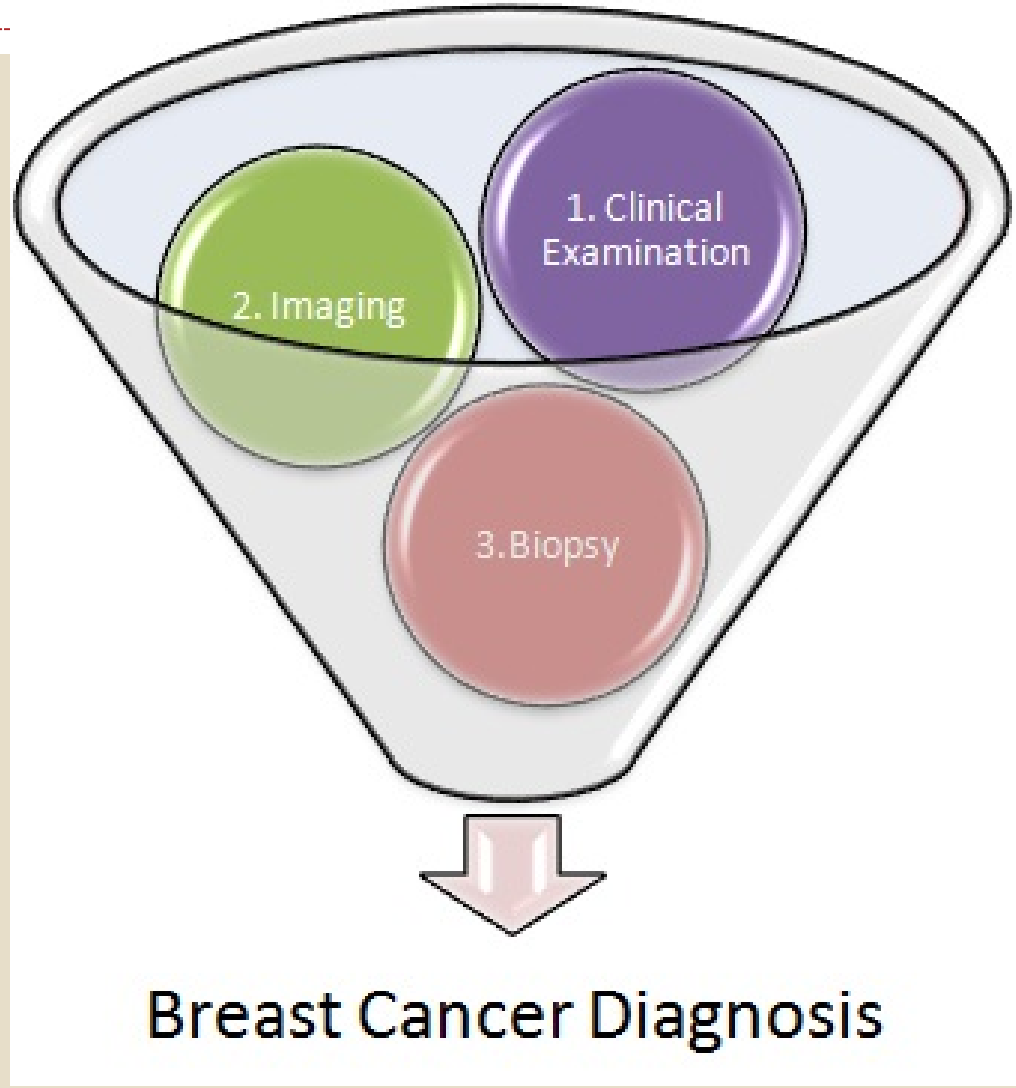


- 10% hereditary
- BRCA 1/2
- TP53, PTEN, ...
- *PALB2 (new gene)*

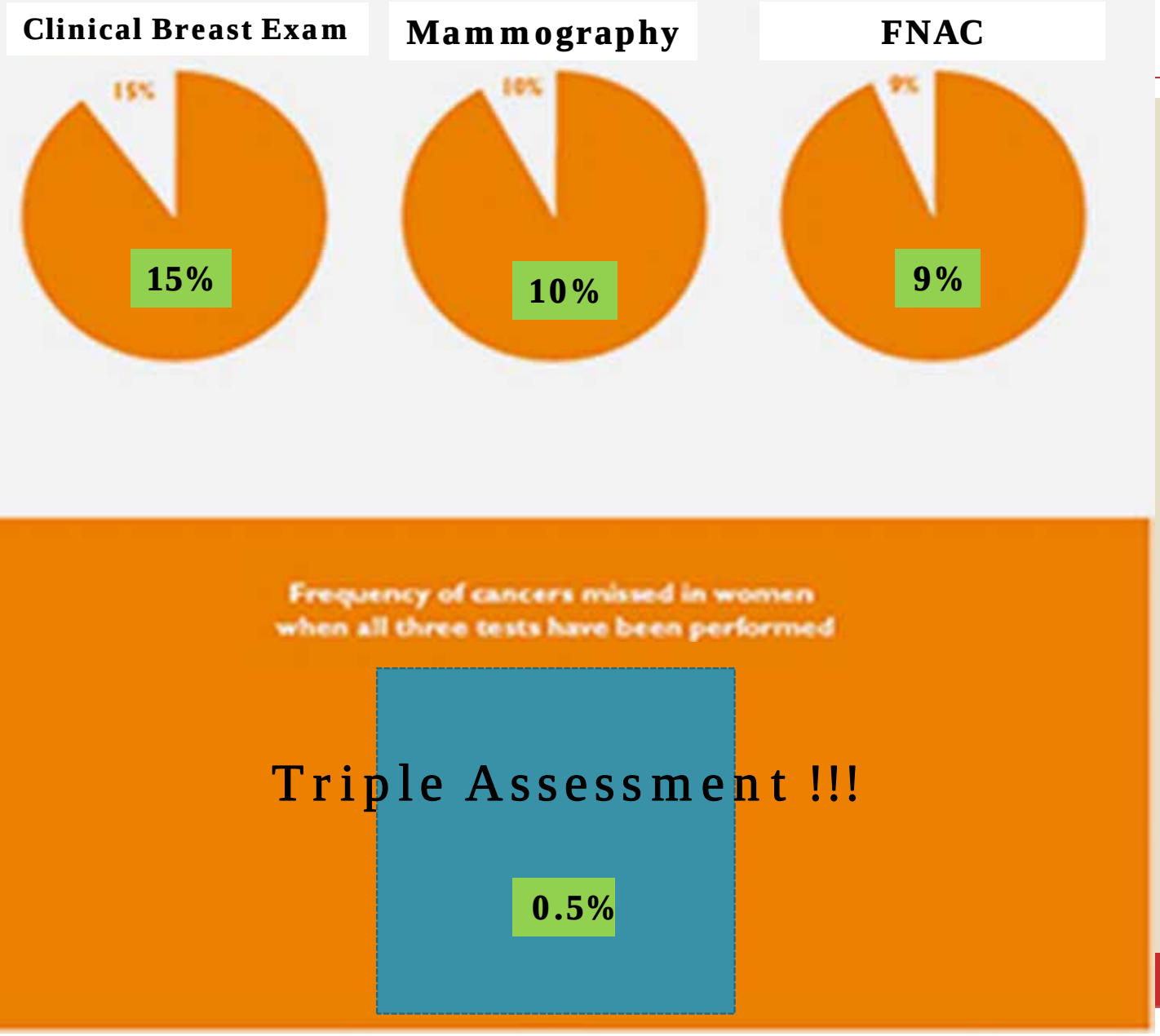
BRCA Mutation Increases the Risk of Cancer



Triple Assessment

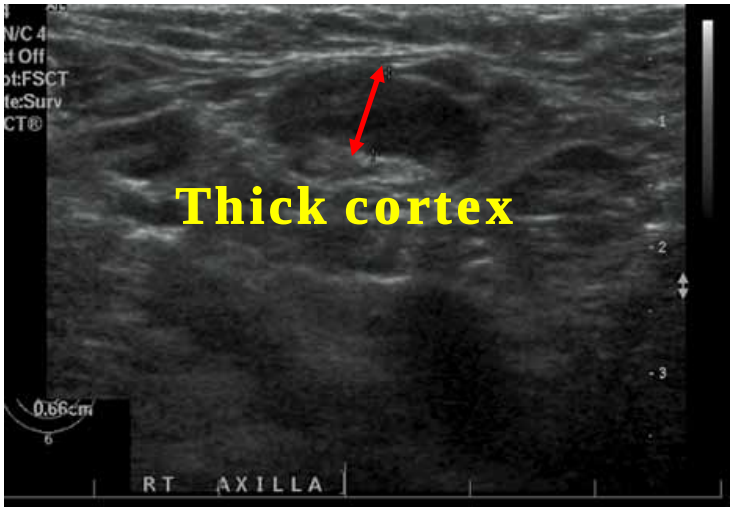


Frequency of cancers missed by each test



Radiological Investigations

Ultrasound scan



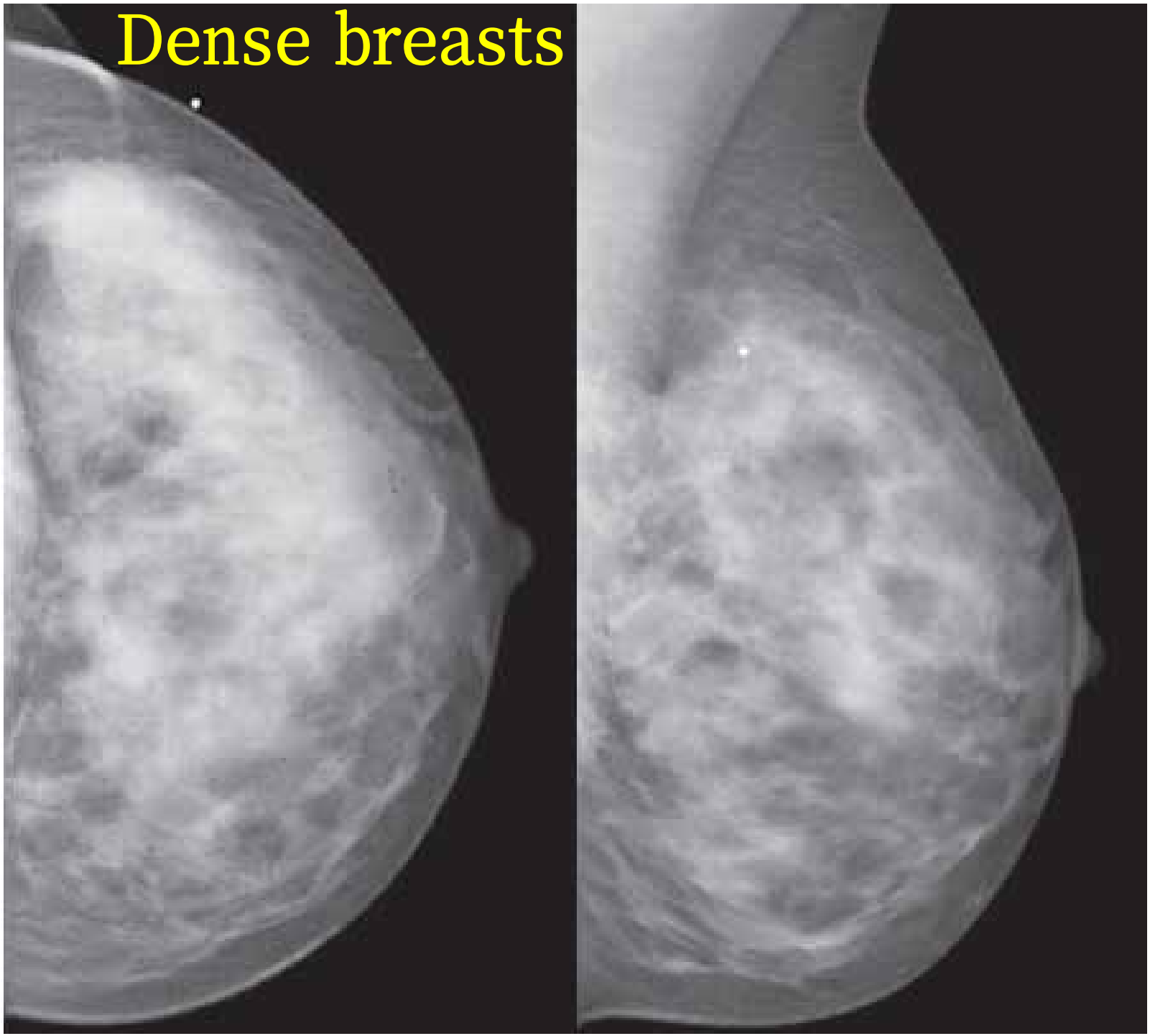
Breasts and Axillae

Mammography

Bilateral cancers: 5 – 10%

Multifocal cancers: 5 – 25%

Right
Left


Dense breasts

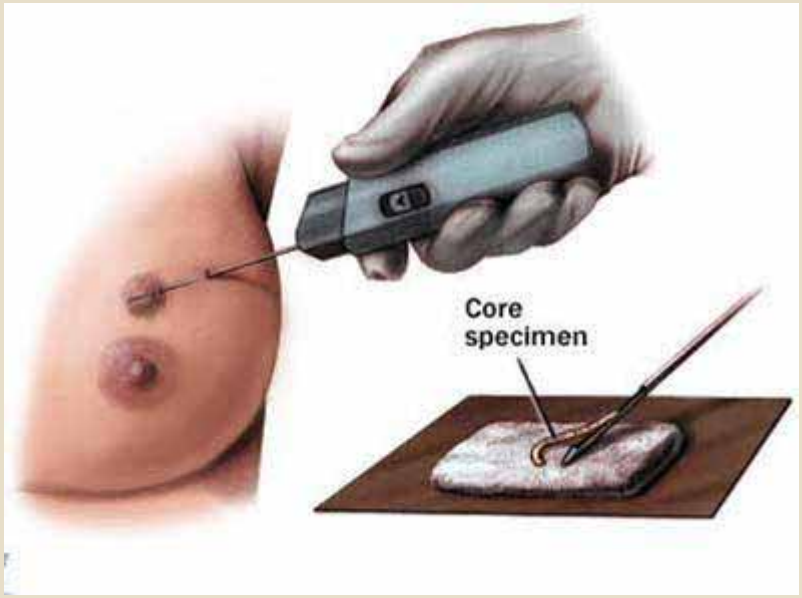
MRI scan

- Determine exact size of cancer
- Cancers not seen on USS/mammo
- High risk patients
- Dense breasts

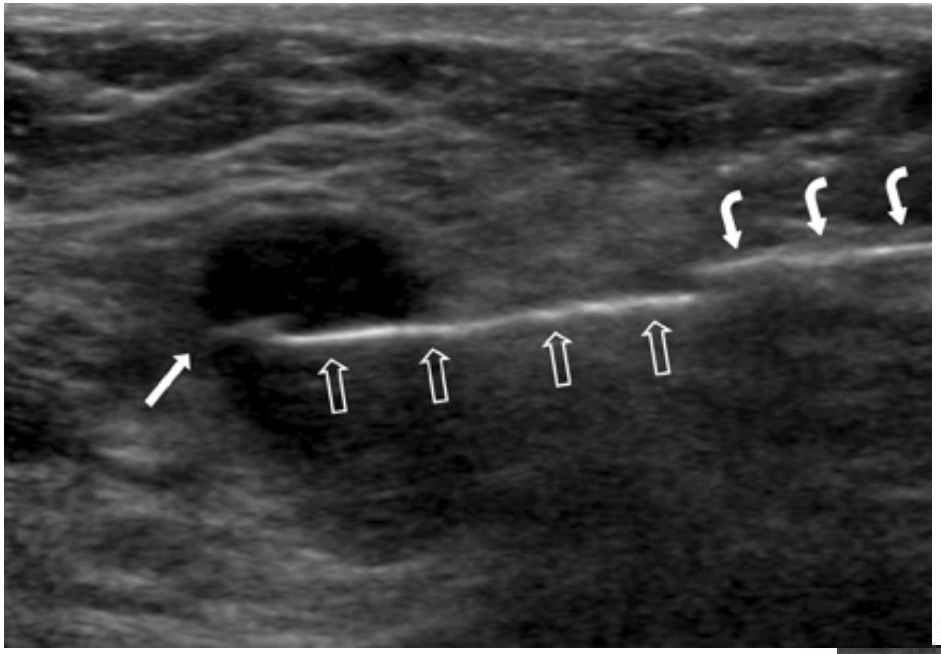
Biopsy

Under Ultrasound guidance

- **Core biopsy**

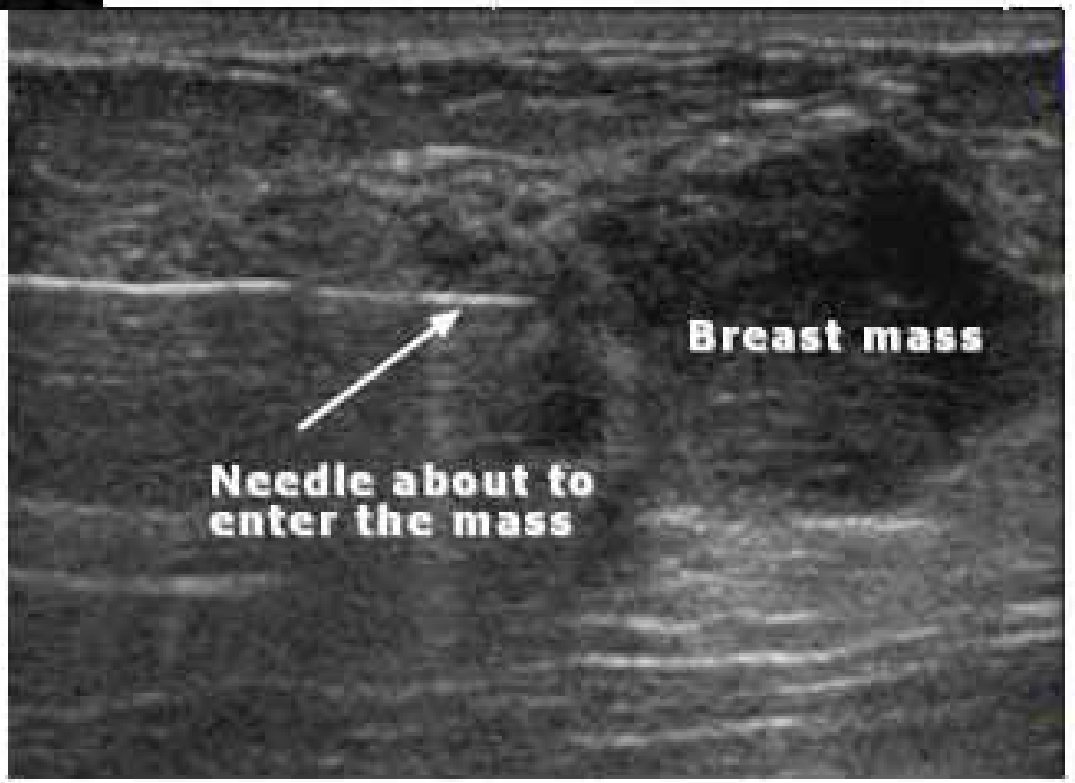


- **FNA**



USS-guided FNA / Core biopsy

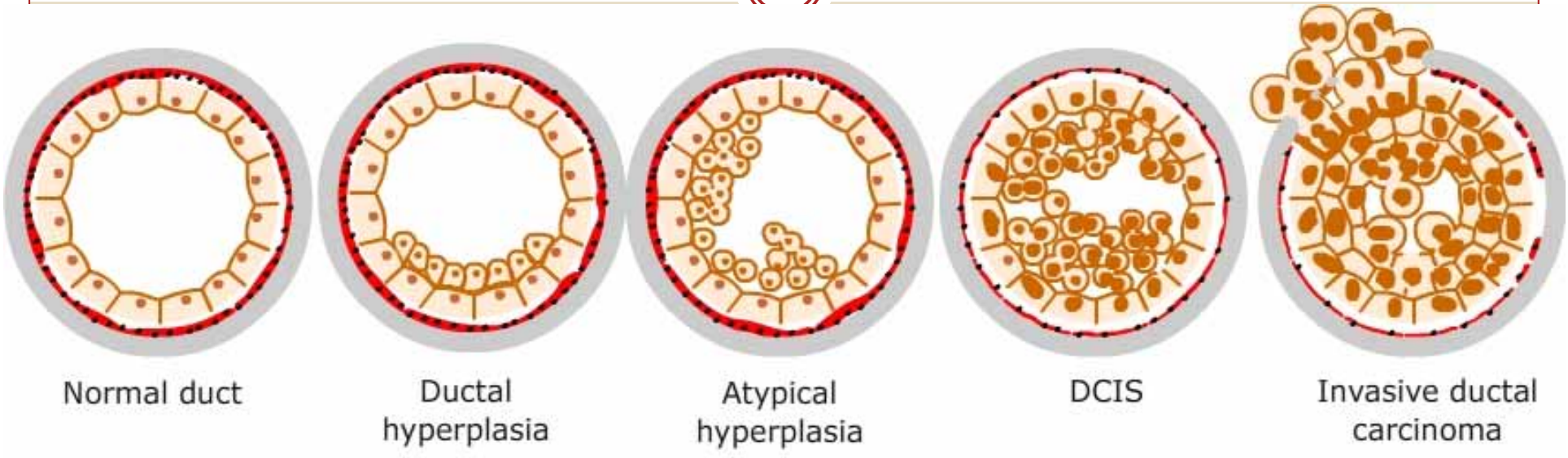
Less false-negative results

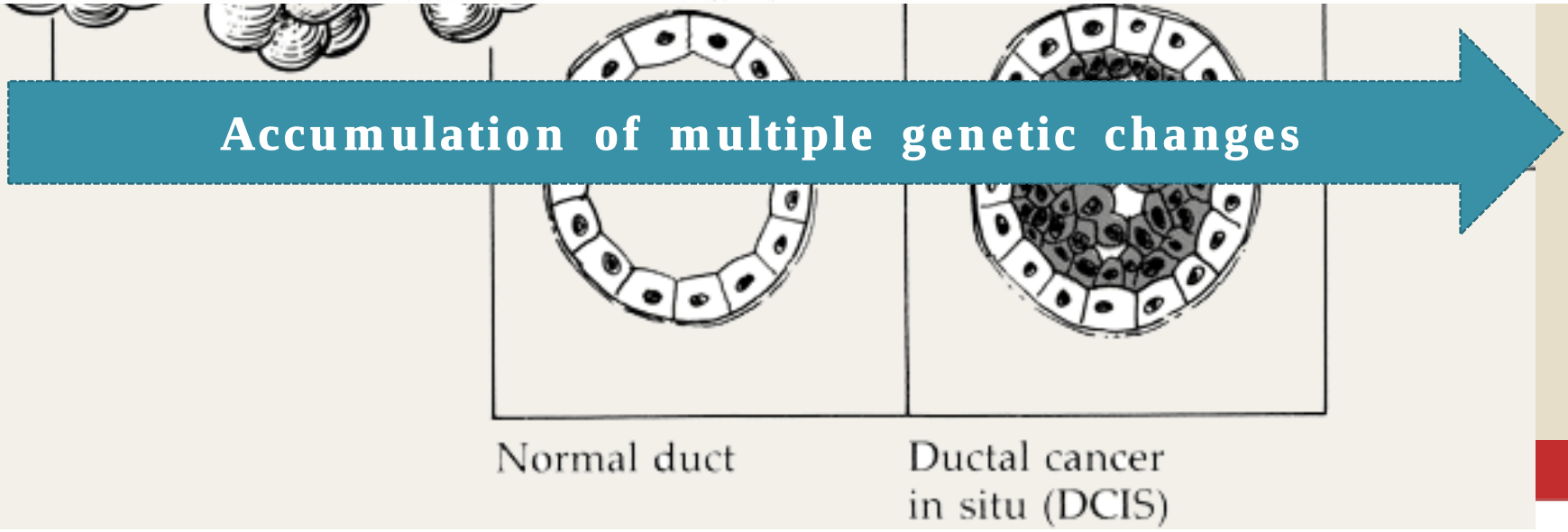


Pathology report

- Invasive ductal carcinoma, invasive lobular carcinoma, ...
- DCIS
- ER / PR
- Ki67
- Tumour size
- Tumour grade
  (Grade1 , Grade 2, Grade 3)
- Tumour margins

DCIS – Ductal Carcinoma in situ





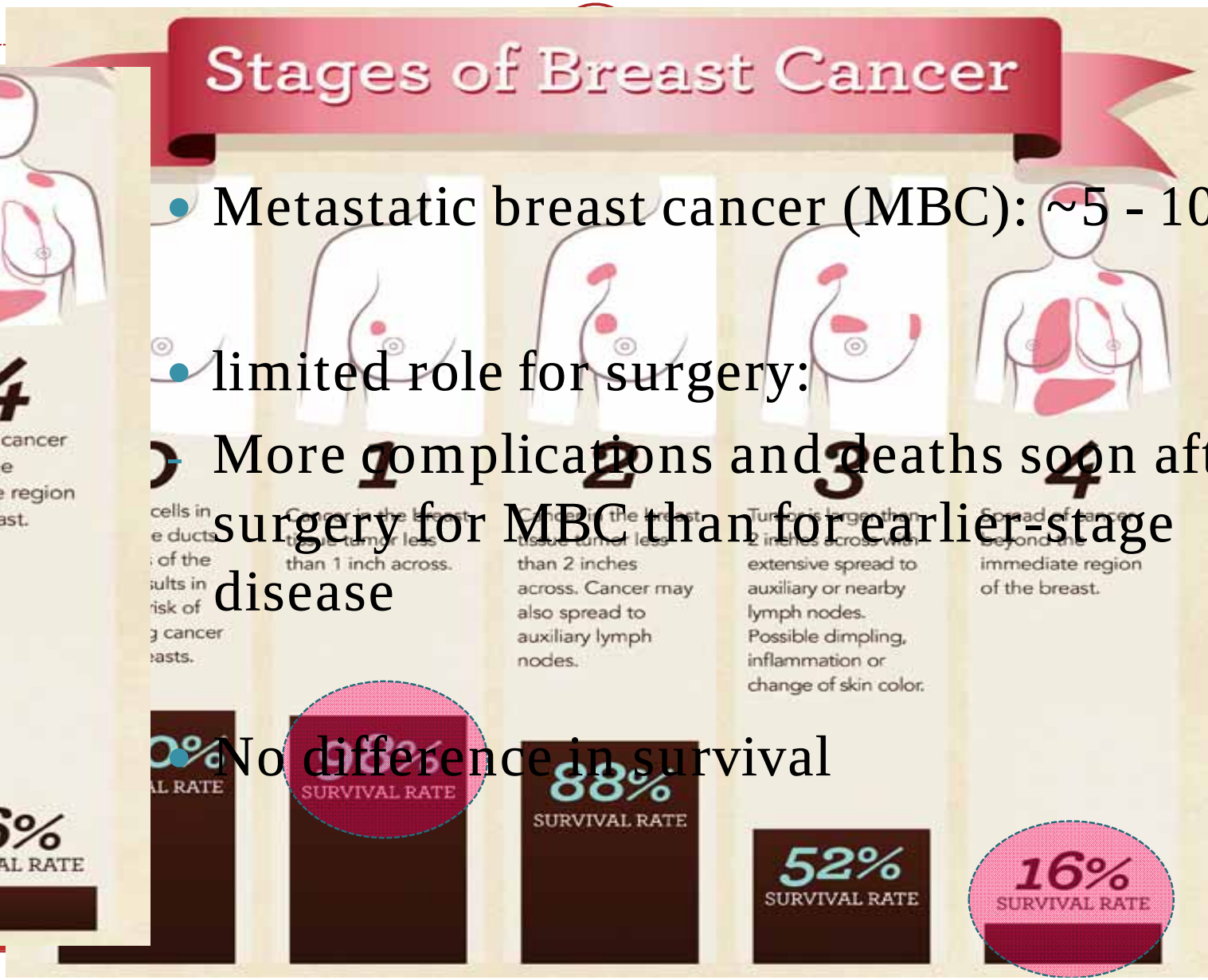
- Grade 1
- Grade 2
- Grade 3

Estrogen / Progesterone receptors (ER / PR)

Ki 67

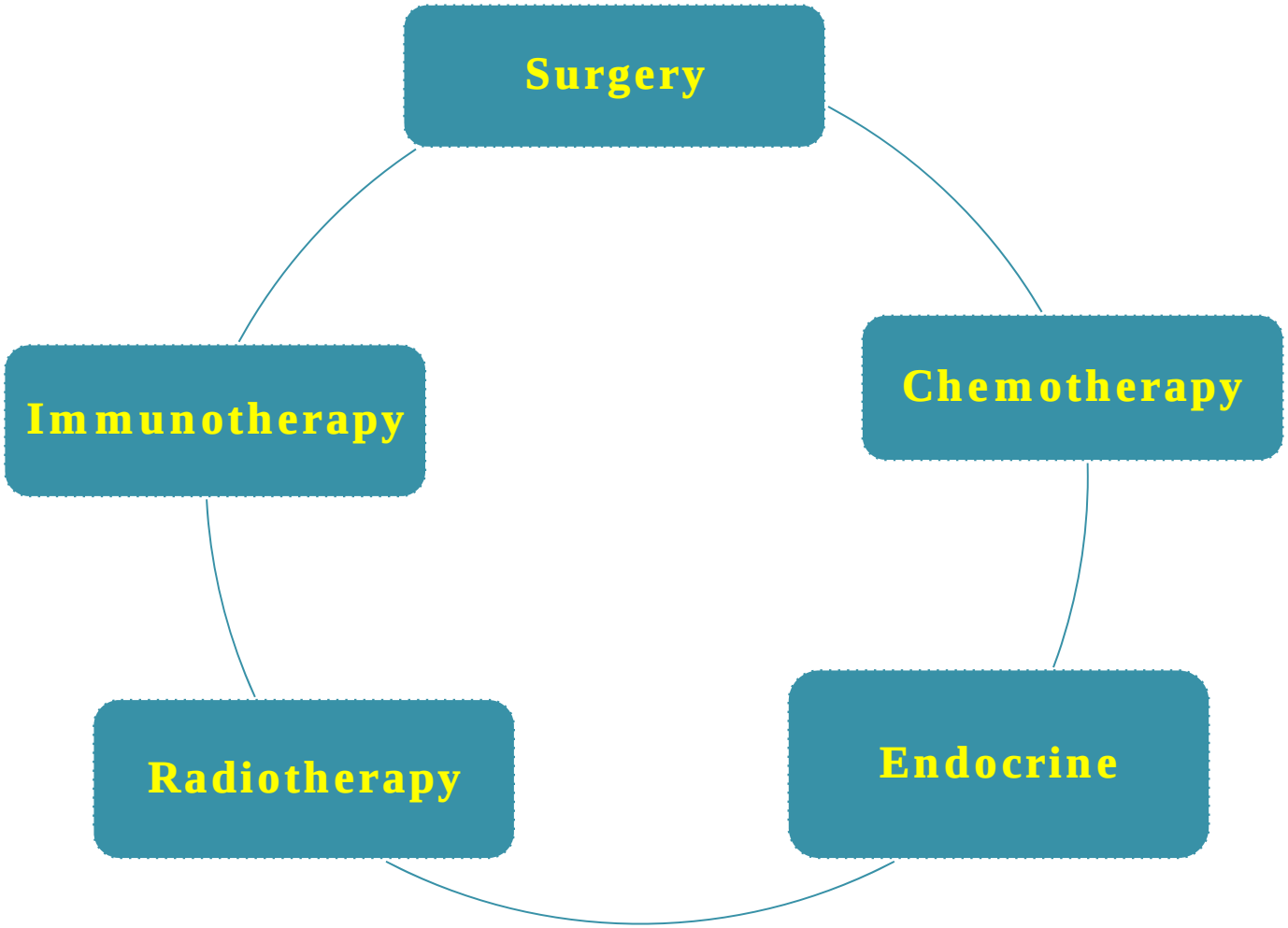
- high levels of **Ki-67** = aggressive tumour = poor prognosis

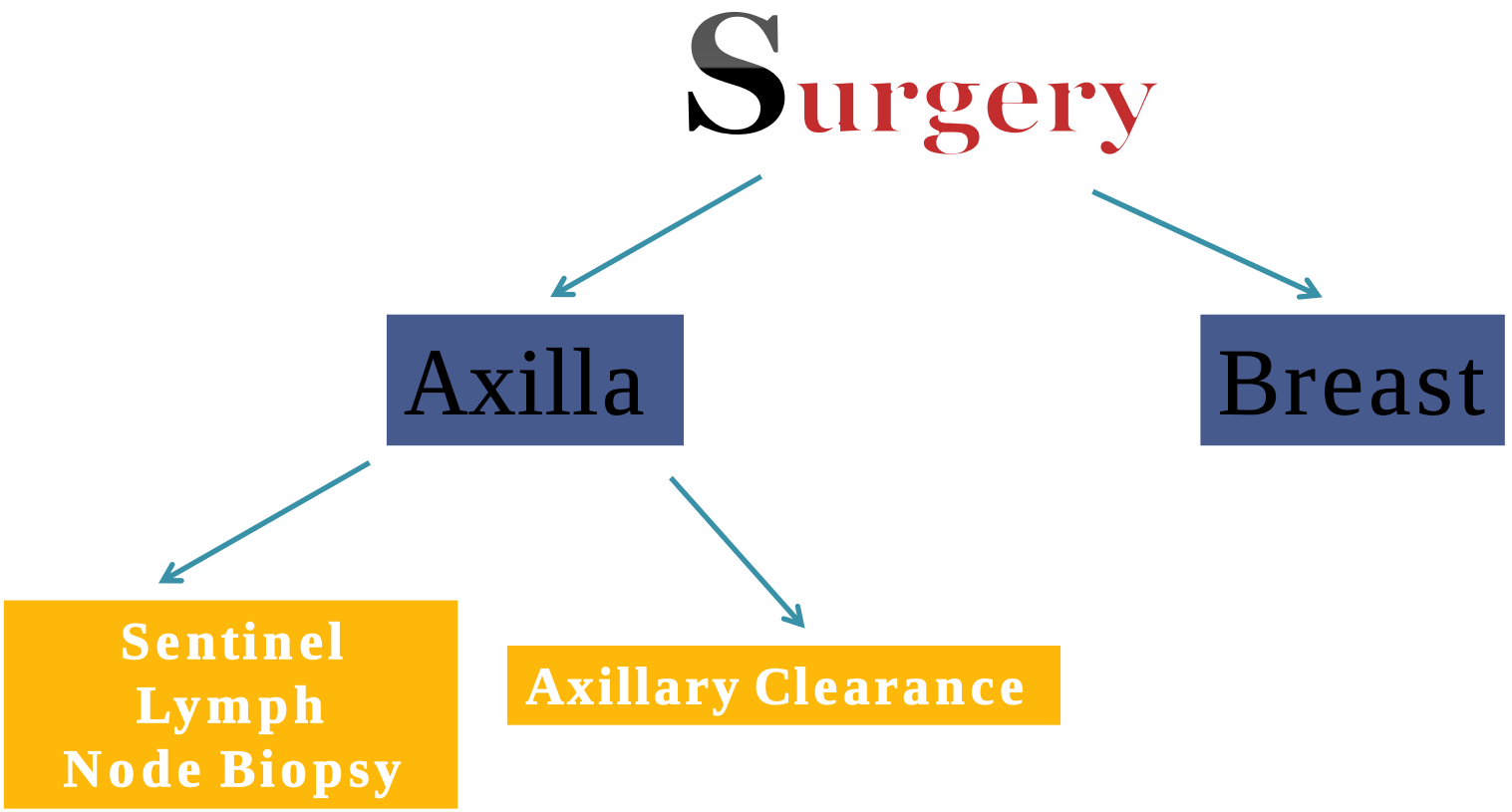
Staging (5-year survival)



- Metastatic breast cancer (MBC): ~5 - 10%
- limited role for surgery:
- More complications and deaths soon after surgery for MBC than for earlier-stage disease
- No difference in survival

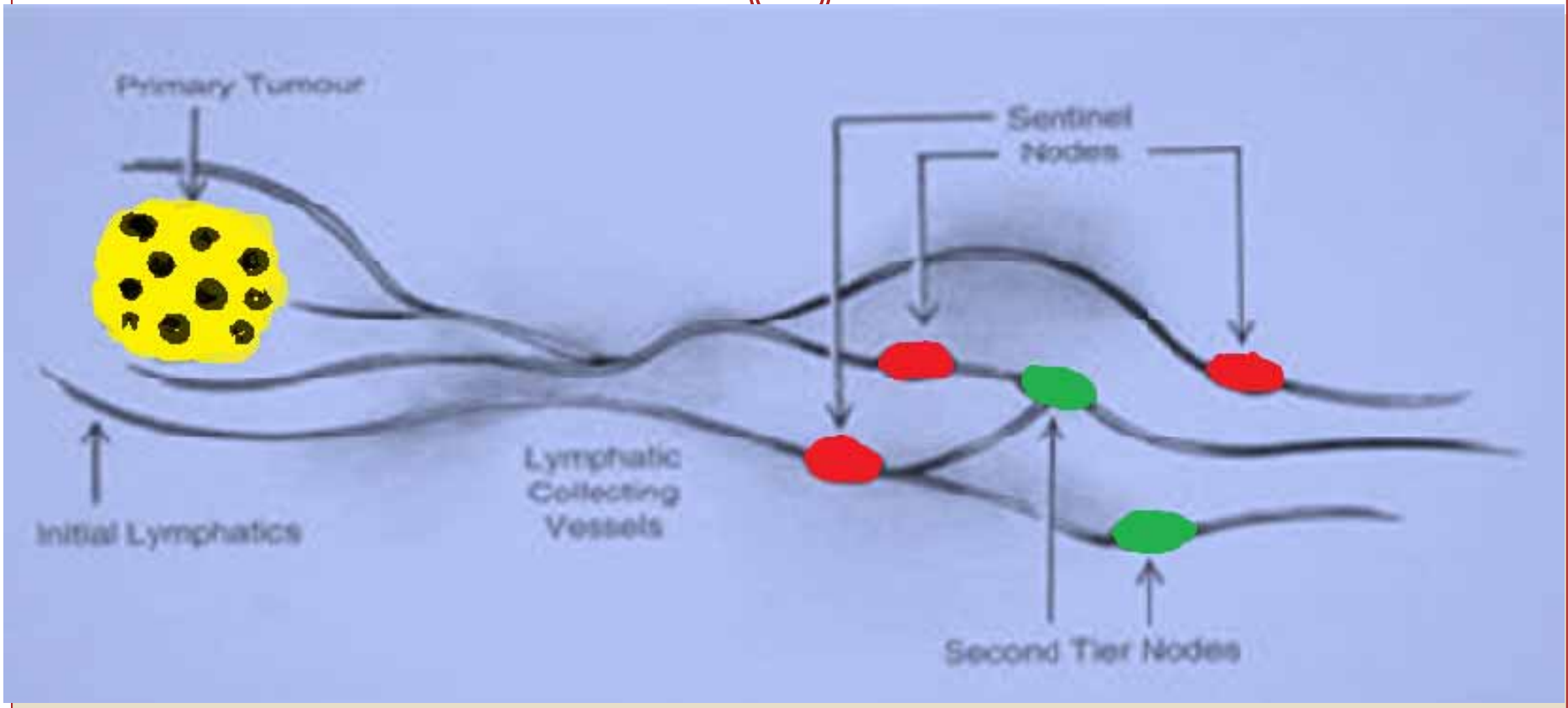
Treatment


Surgery
Chemotherapy
Endocrine
Radiotherapy
Immunotherapy

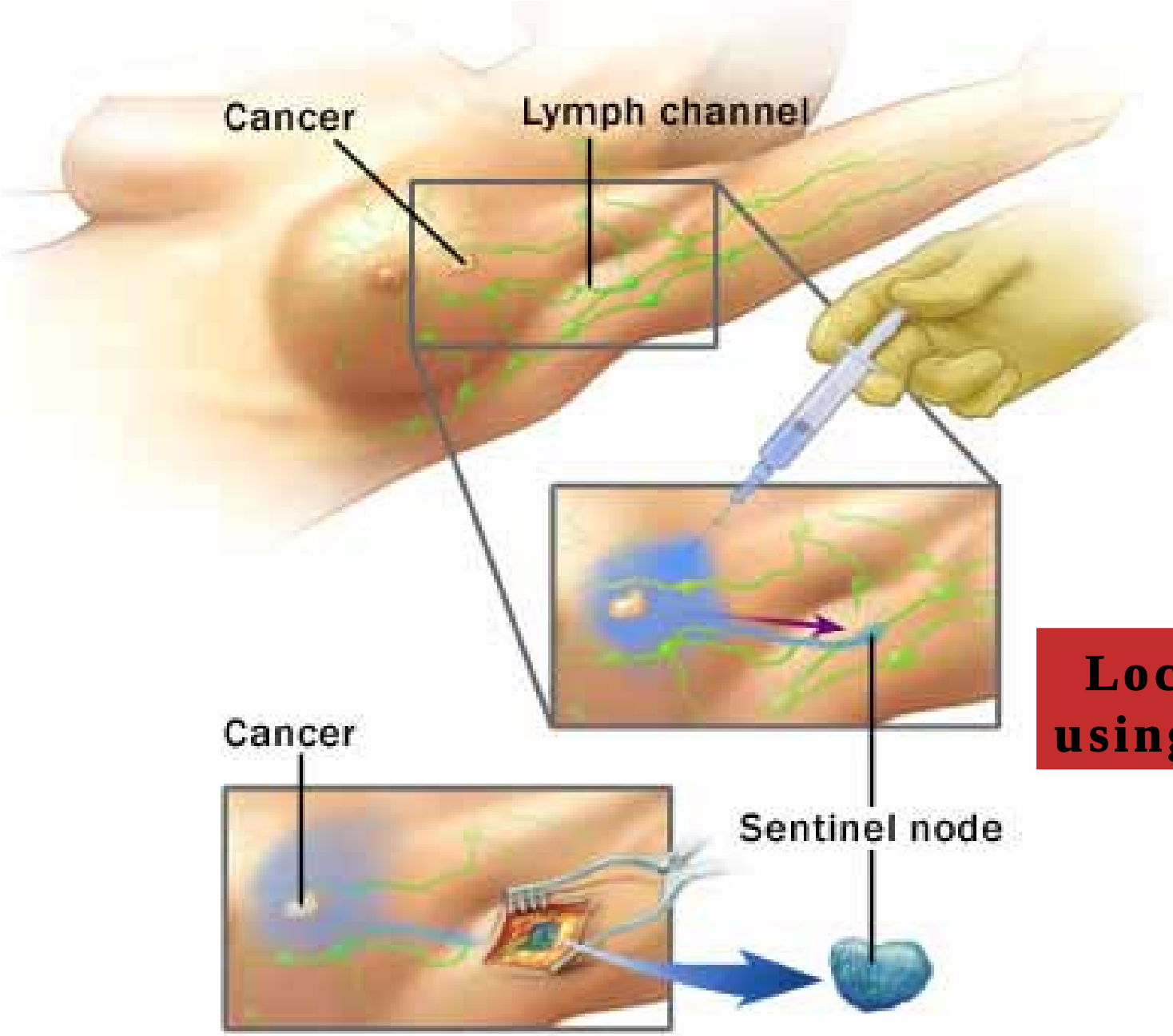


- The status of the axillary lymph nodes is one of the most important prognostic factors in women with early stage breast cancer.

Sentinel Lymph Node Biopsy

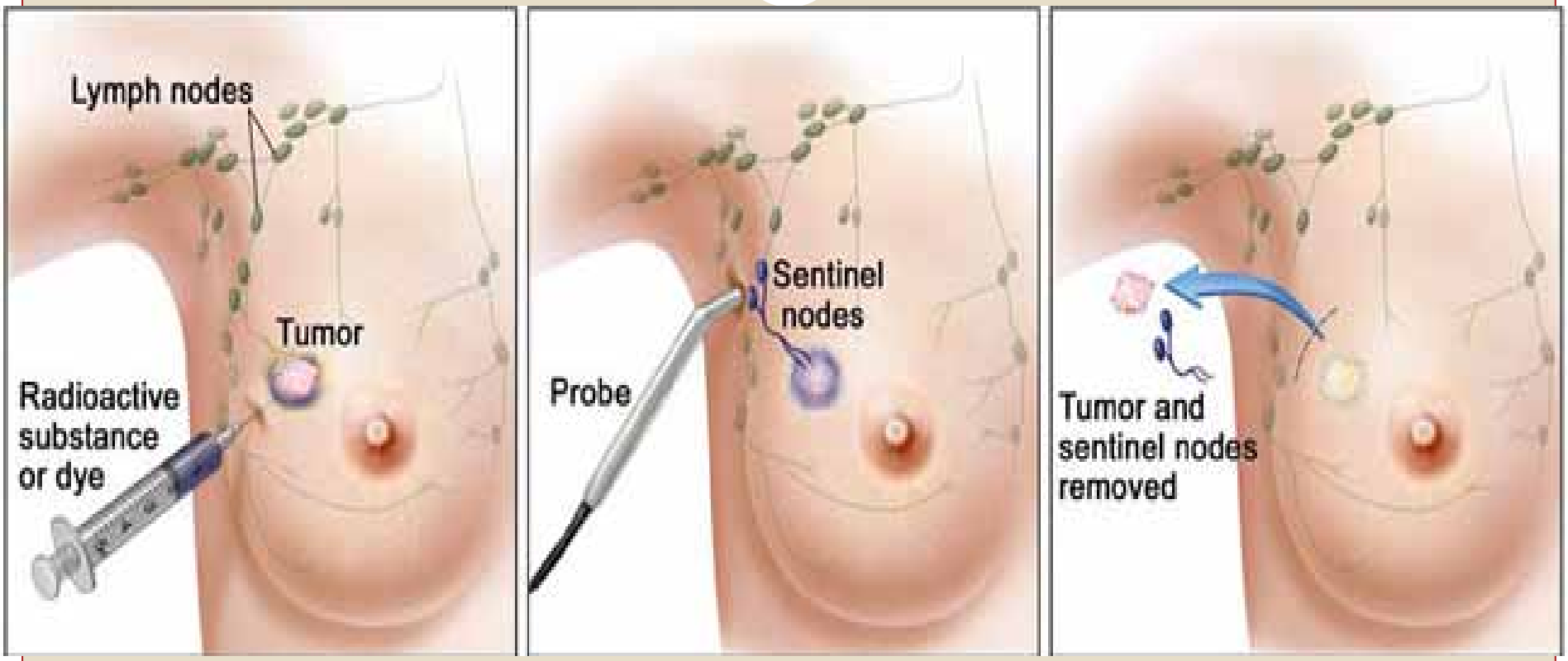


Sentinel Lymph Node biopsy => standard care for staging patients who have clinically node-negative disease.



Localisation using Blue Dye

Localisation using radioactive tracer



Accuracy (combined technique) ~ 99%

Surgery

- Axilla
- Breast
  - **Breast Conserving Surgery**
  - **Mastectomy**

Lumpectomy (wide local excision)

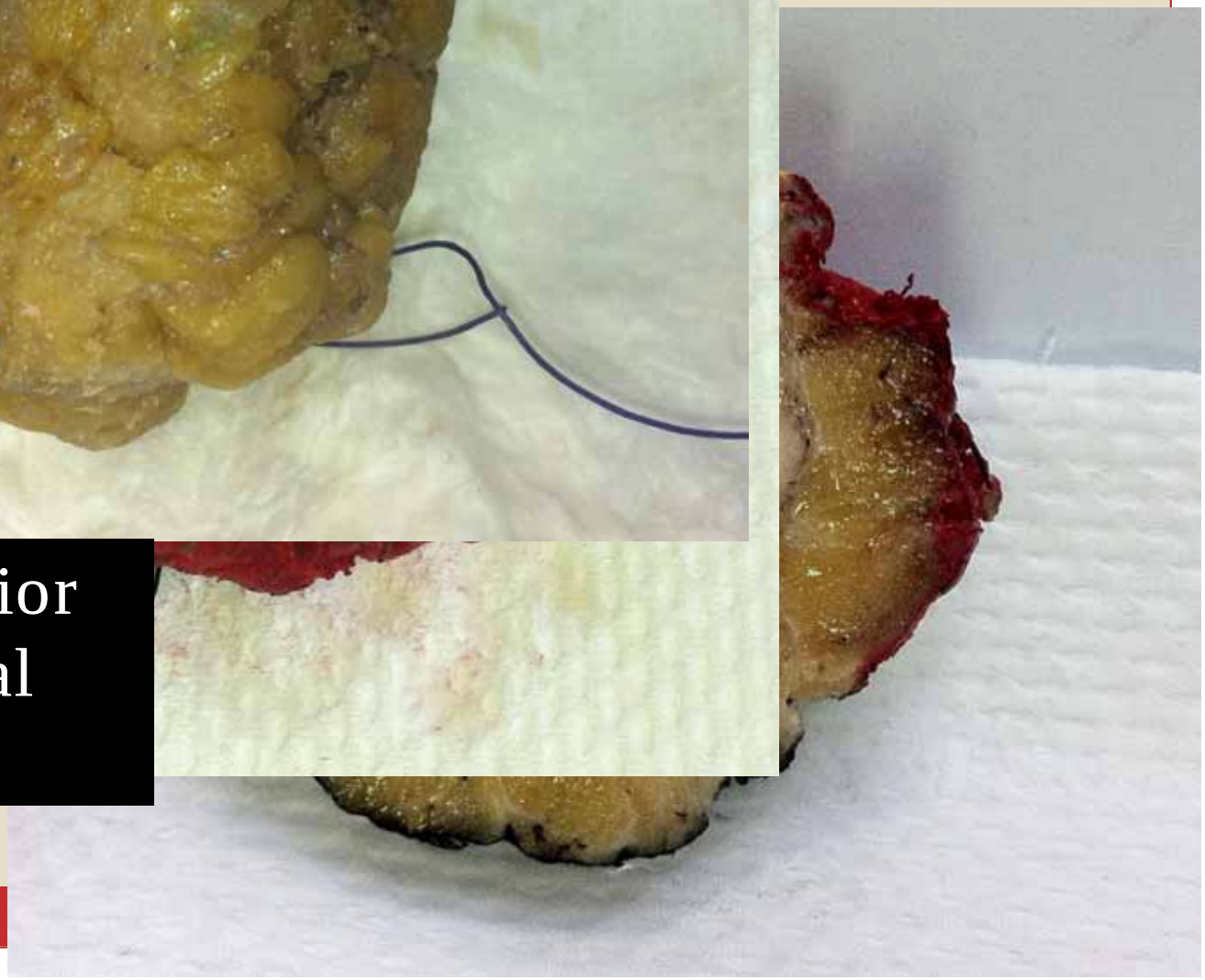
- Remove cancer with a rim of normal breast tissue

Breast-Conserving Surgery: Criteria

- Small tumor-to-breast size
- Not more than one tumor in the same breast (unicentric)
- Negative tumor margins
- No contraindications for radiation

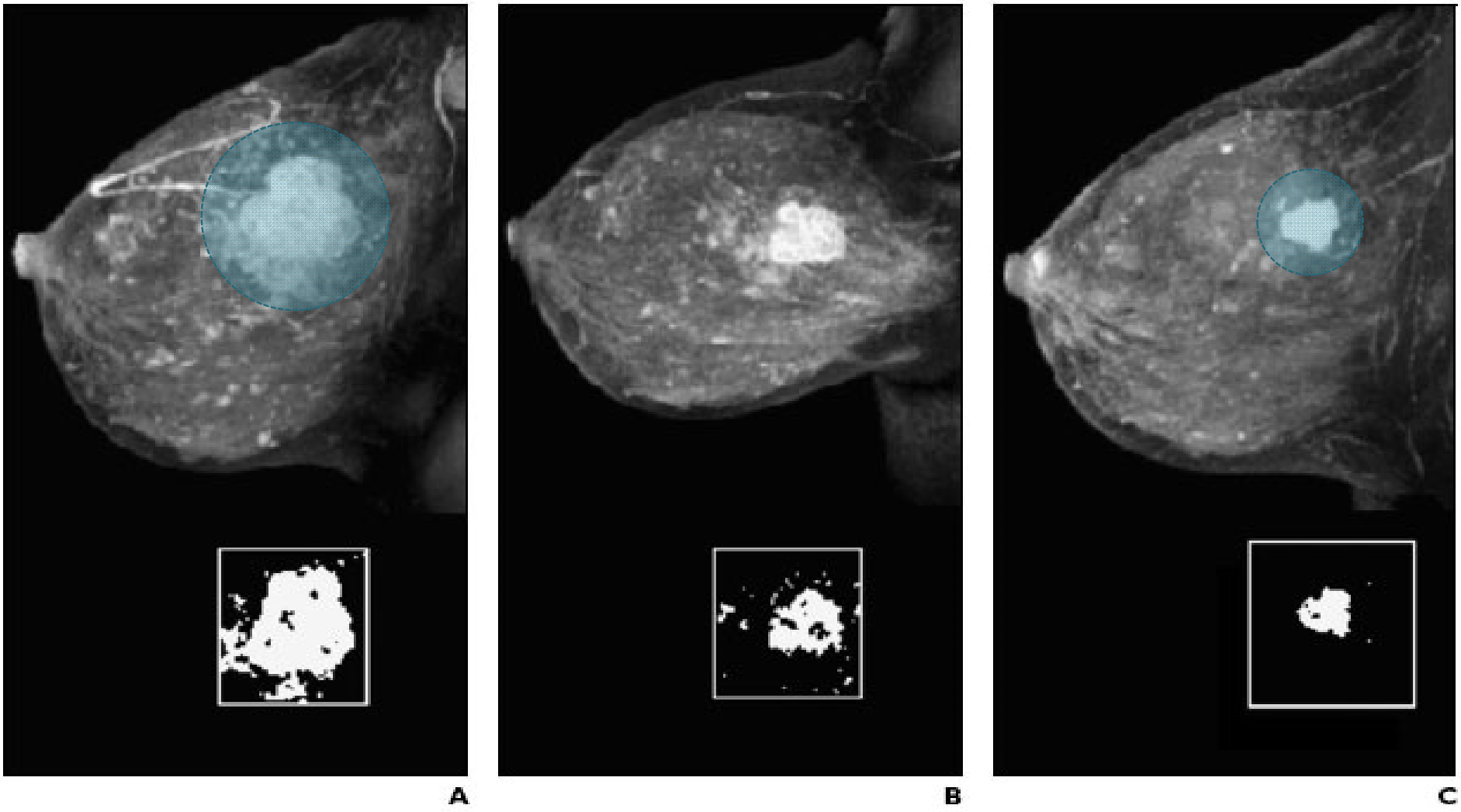
Second operation: Re-excision to clear margins (~20%)

S hort = S uperior
L ong = L ateral
Loop = Deep

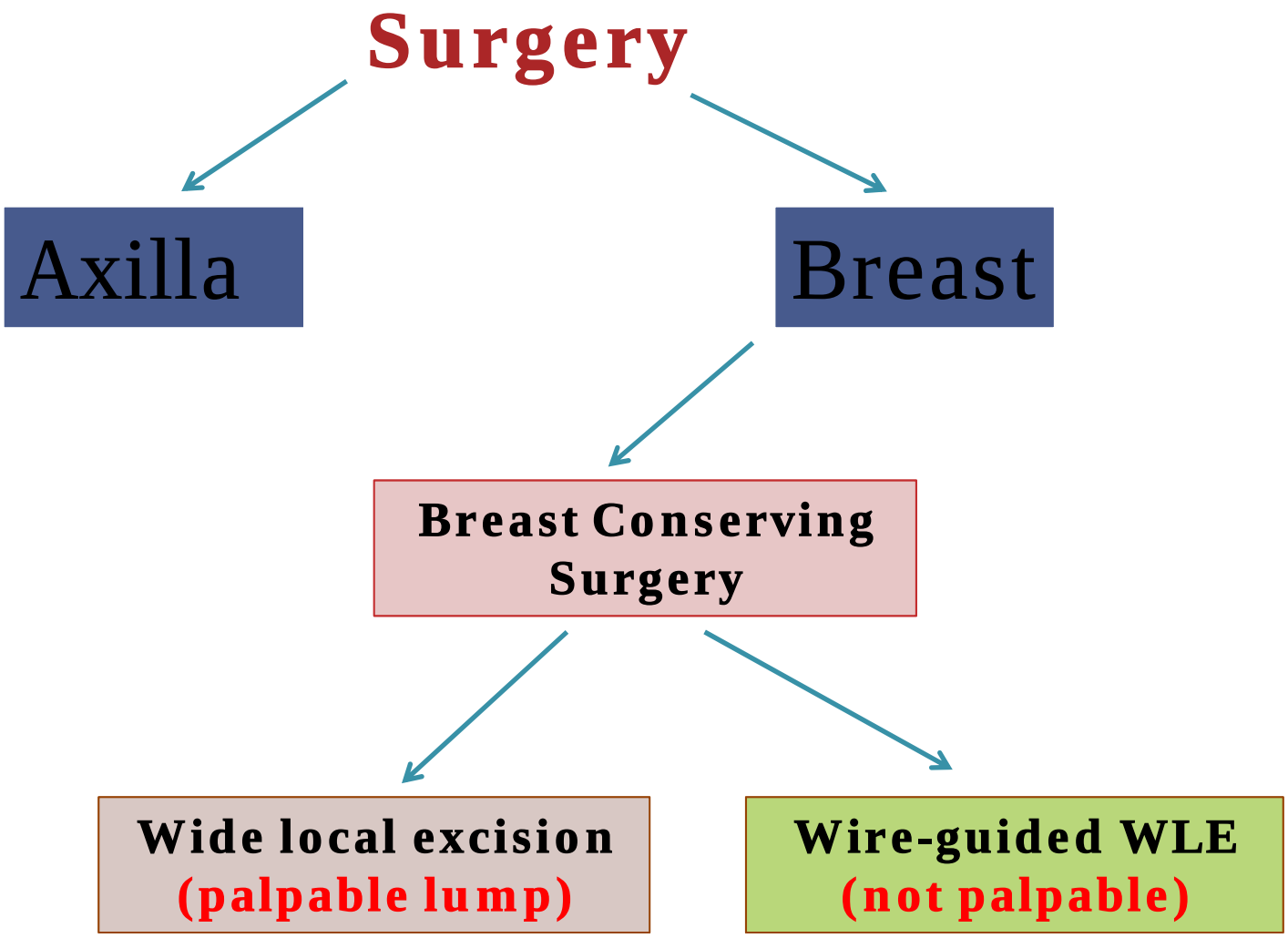


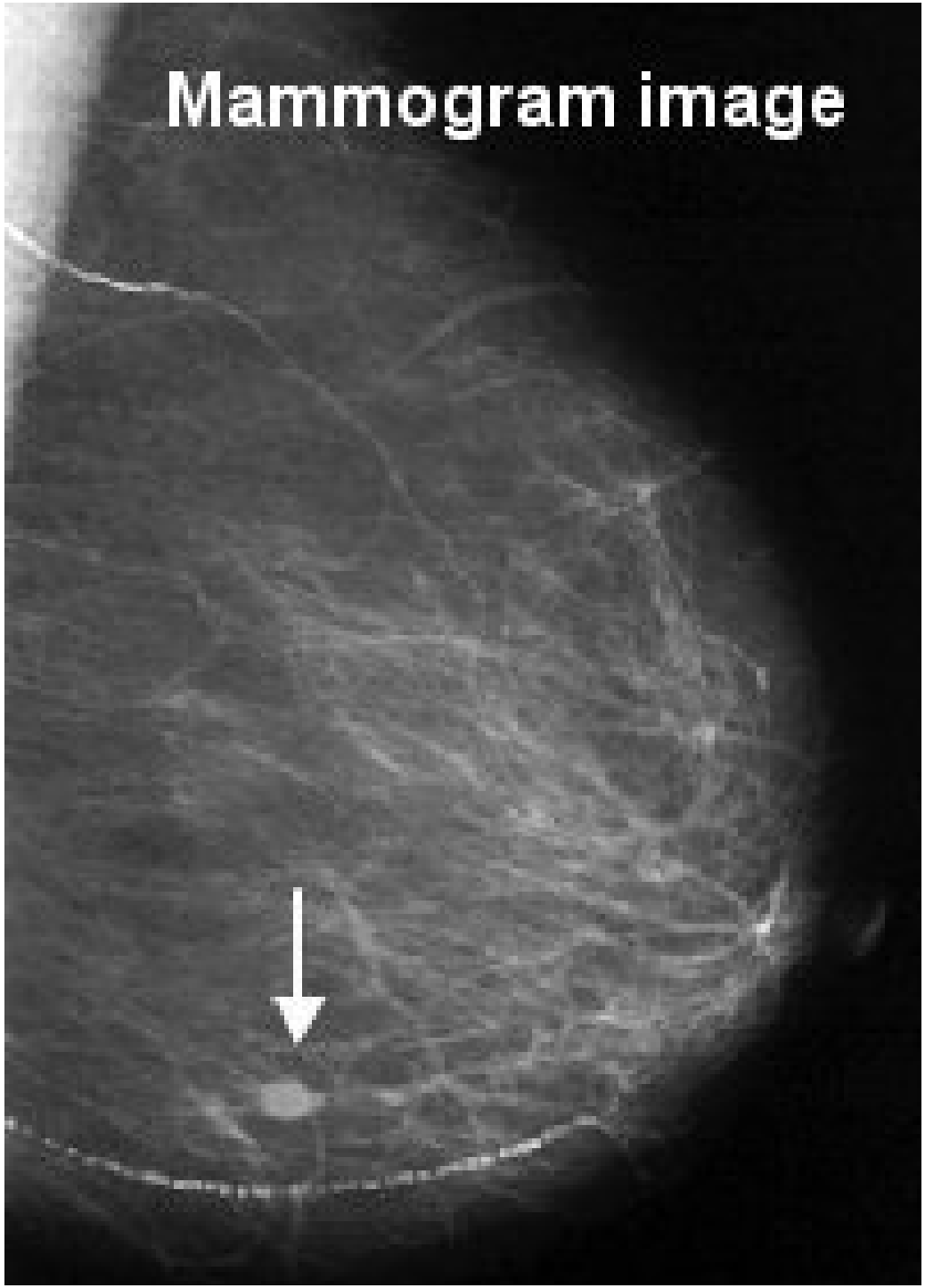
1
cm

Neo-adjuvant chemotherapy

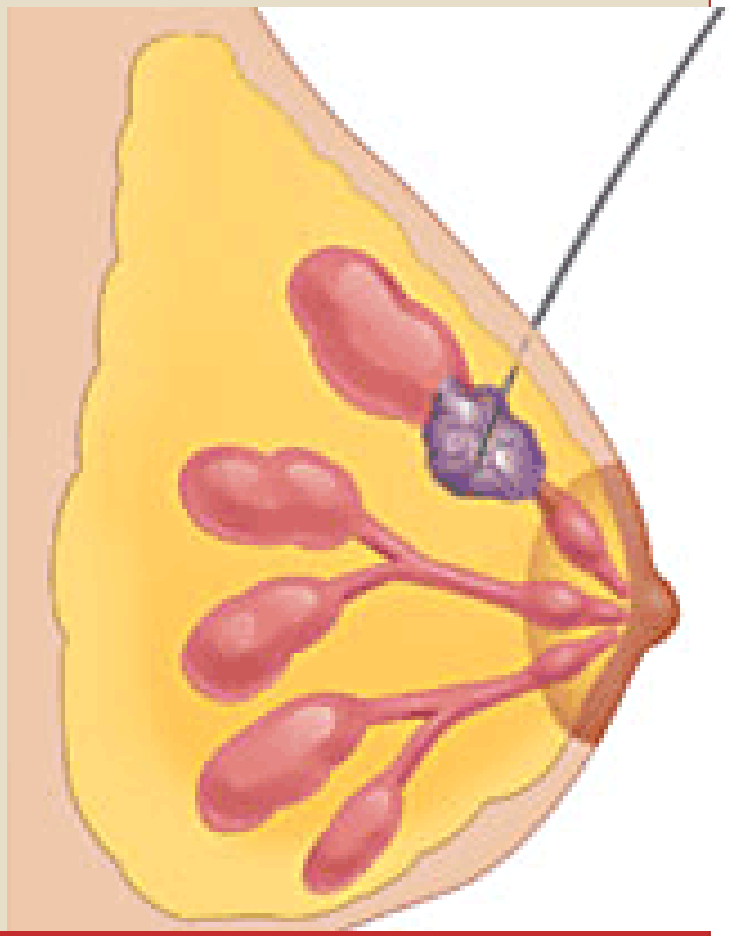


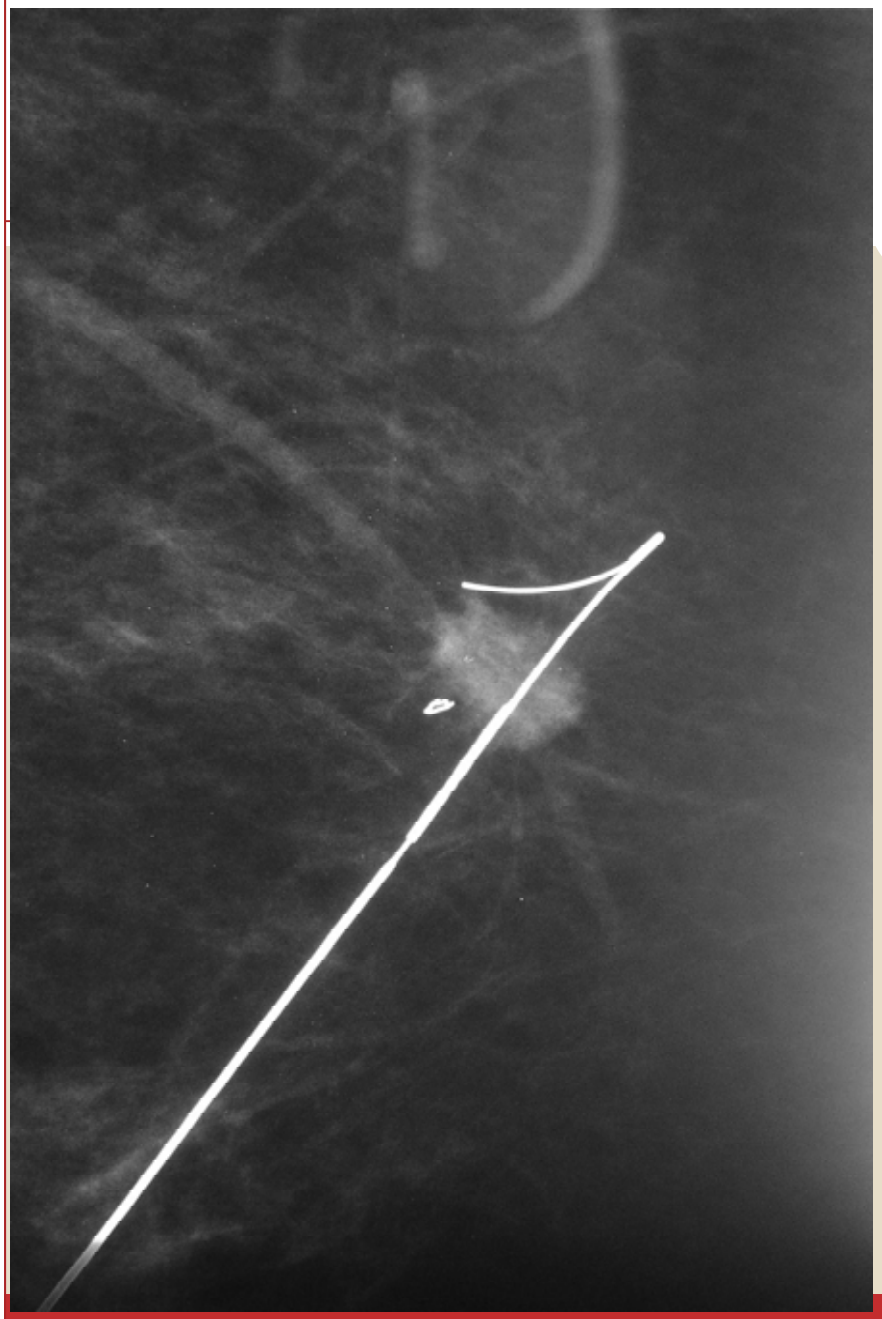
Source: Am J Roentgenol © 2005 American Roentgen Ray Society

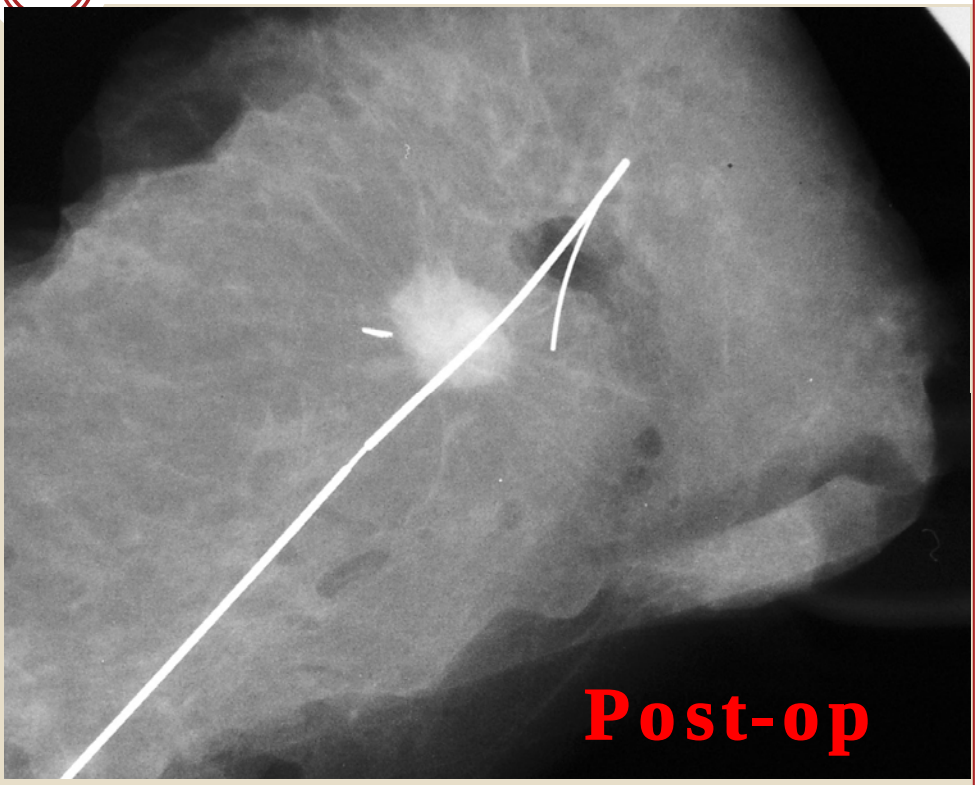

Surgery
Axilla
Breast
Breast Conserving Surgery
Wide local excision (palpable lump)
Wire-guided WLE (not palpable)


Mammogram image

Wire-guided lumpectomy





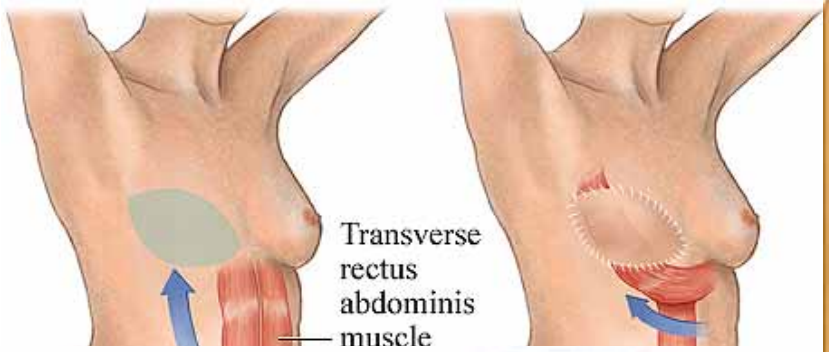

Post-op

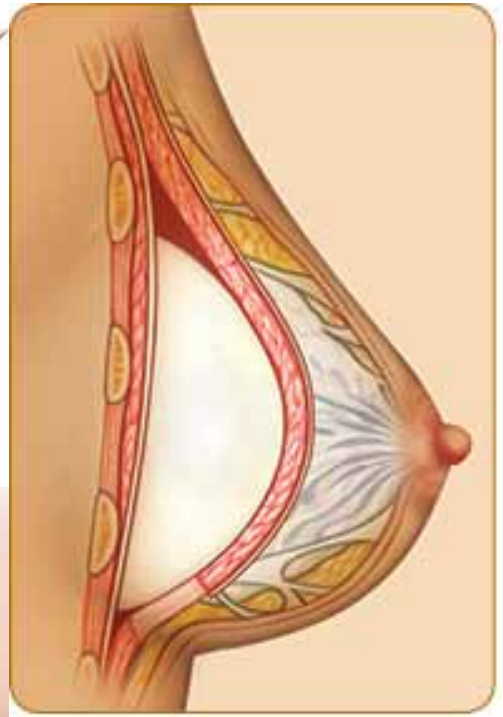
D- Fat is re-injected using very fine cannulas
C- Fat is treated and centrifuged

Angelina Jolie

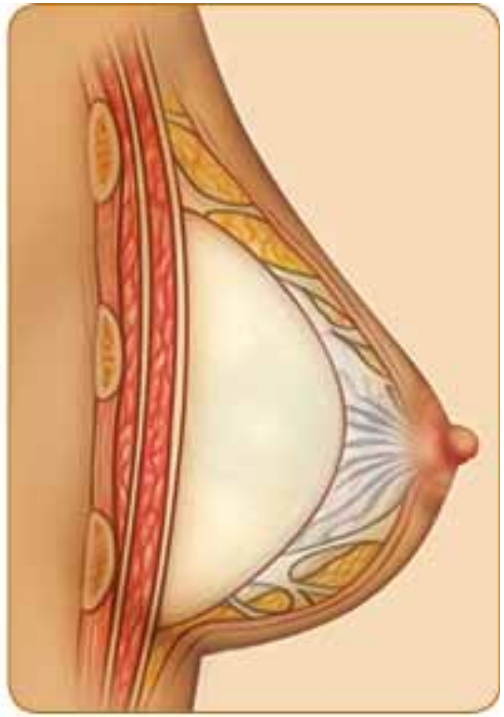
- Bilateral risk-reducing mastectomy
- Survival benefit
- 1-2% will have occult cancer in mastectomy specimen
- Reduces risk of BC by ~90-95%

Breast Reconstruction



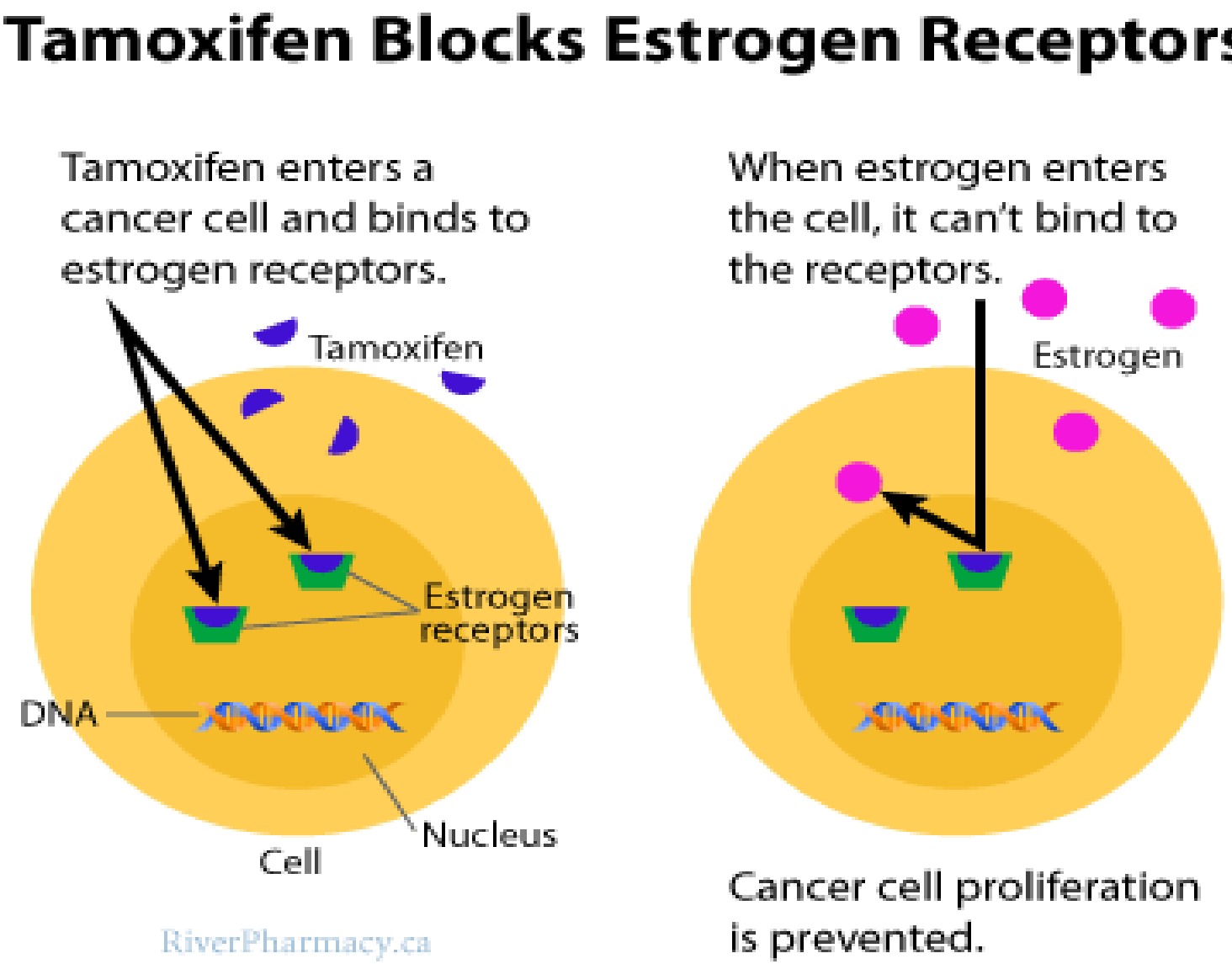


1. Submuscular



2. Subglandular

Hormone Therapy



- When used as adjuvant therapy after surgery in patients with early breast cancer it leads to **Improved overall survival**.

- 50% reduction in risk of developing cancer in other breast

- For ER-positive cancers, allocation to about 5 years of Tamoxifen reduces the annual breast cancer death rate by 31%

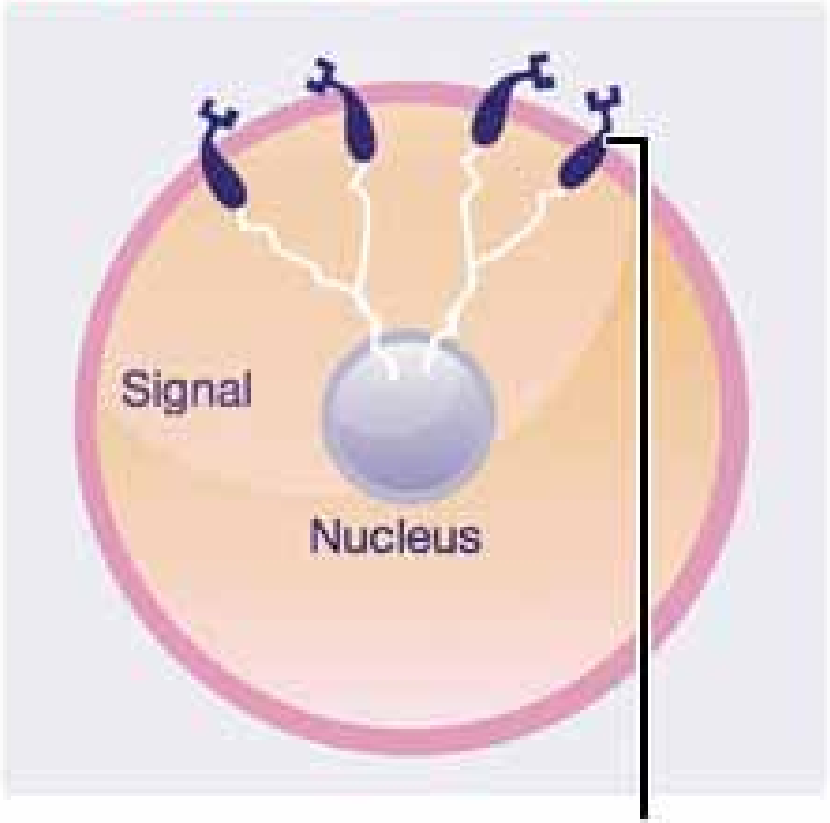
Chemotherapy

Chemo-prevention

- Tamoxifen and Raloxifene reduce the risk of breast cancer in women at increased risk of disease

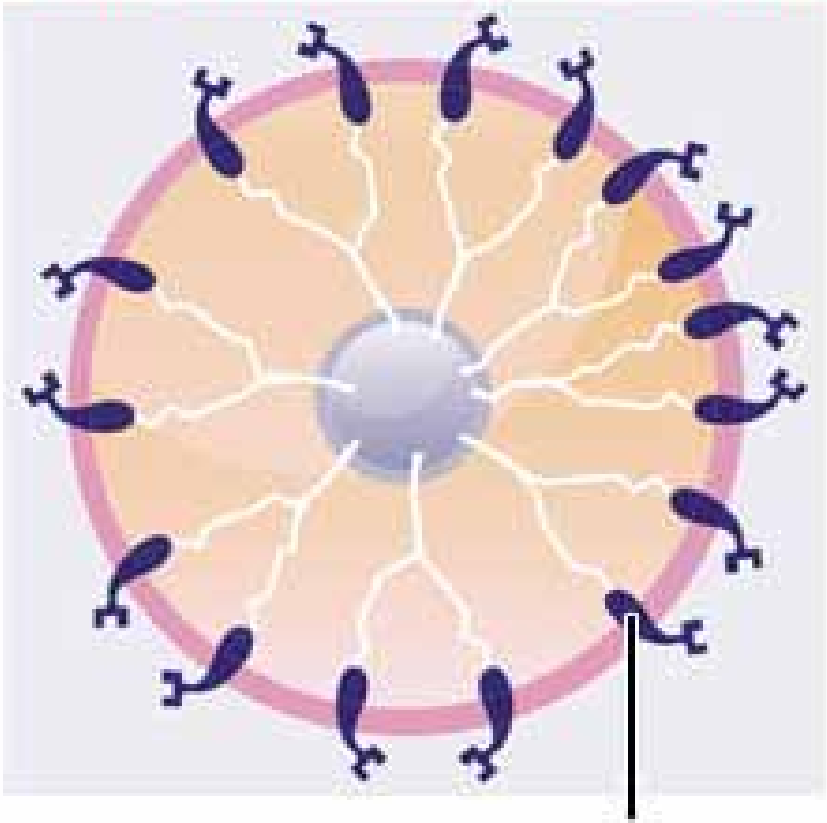
- Tamoxifen – 50% reduction of BC in other breast for BRCA1/2 mutation carriers

Normal breast cancer cell



Normal amount of HER2 receptors send signals telling cells to grow and divide.[1]

Abnormal HER2+ breast cancer cell



Too many HER2 receptors send more signals, causing cells to grow too quickly.[1]

Herceptin

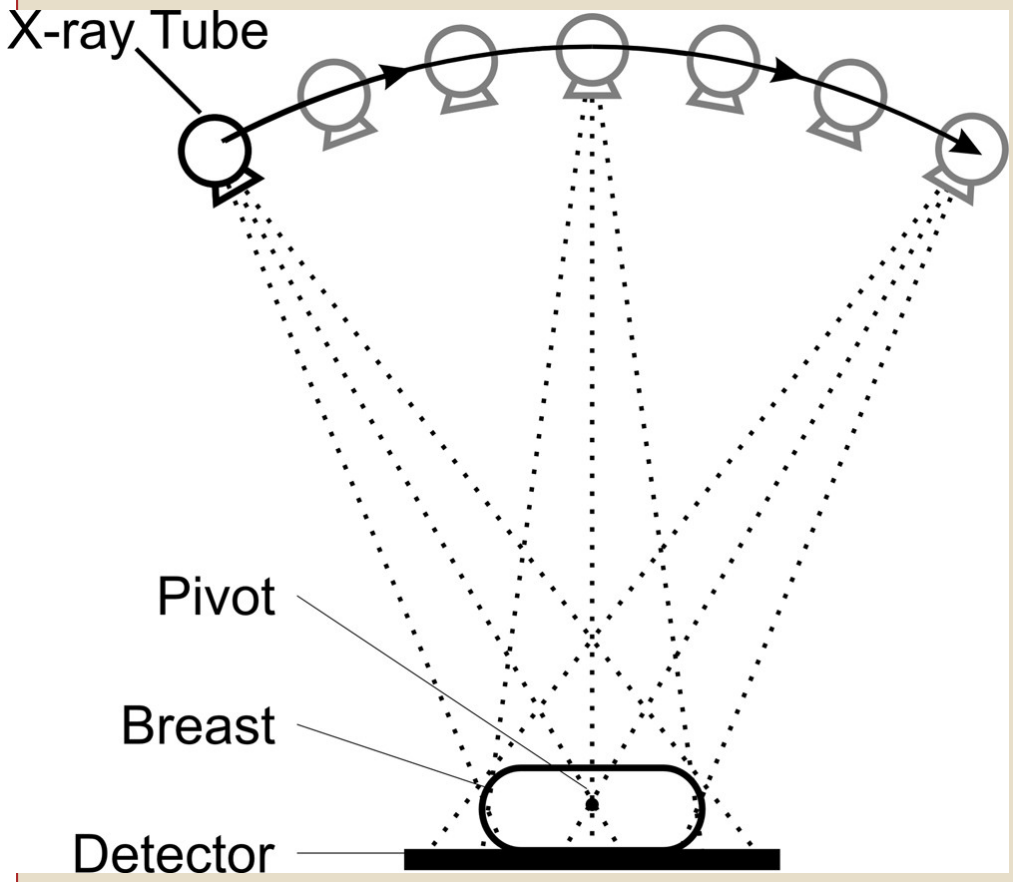
- About 15 – 20% of all breast cancers are HER2+
- **Significant correlation between HER2 over-expression and poor clinical outcome**
- HERCEPTIN - Reduces breast cancer recurrence by ~ 36% and mortality by ~ 40%

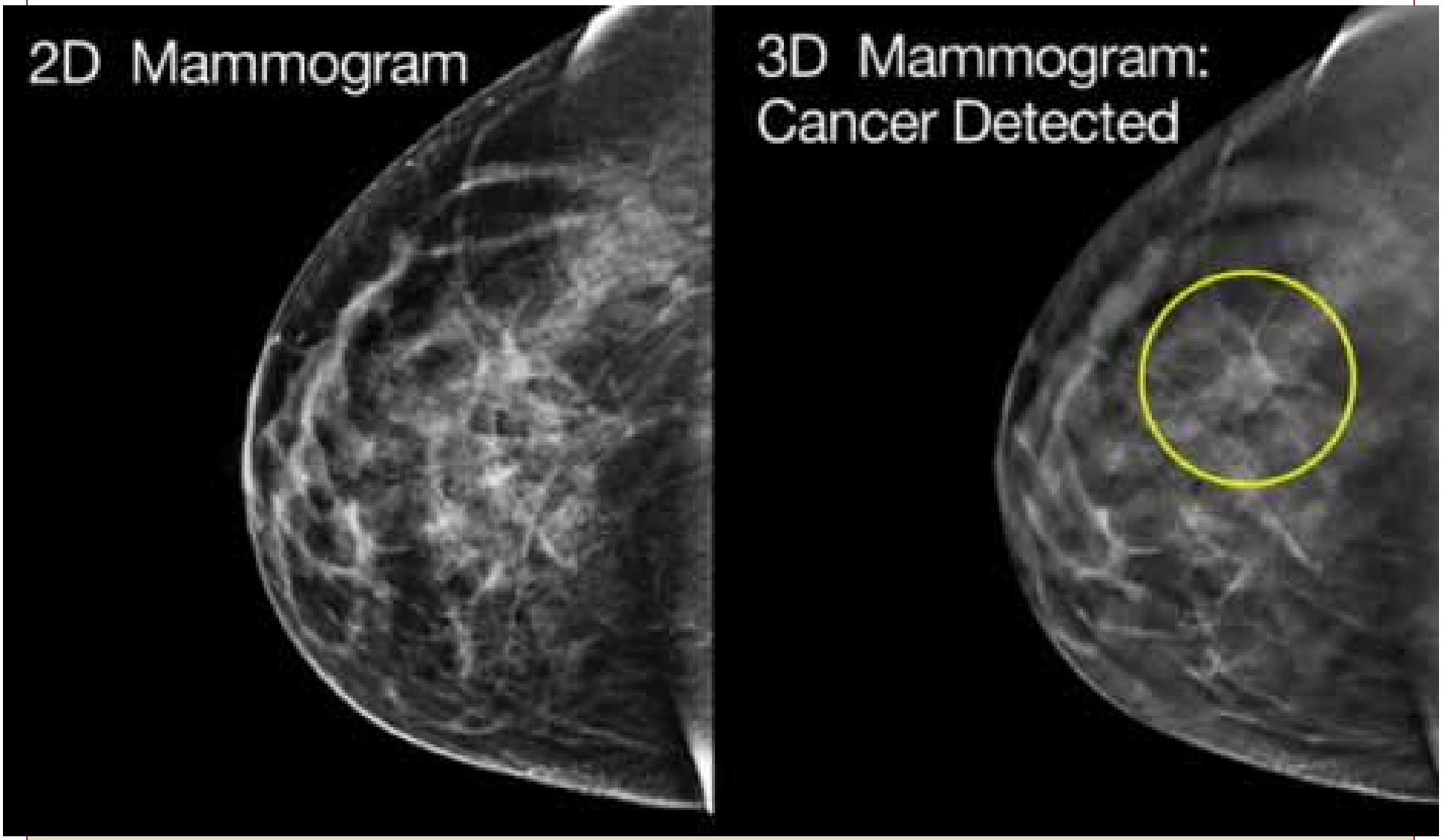
Xray - Radiotherapy

- 50% reduction in any first recurrence
- **reduces breast cancer death ~15%**

Future

Tomosynthesis / 3D mammography

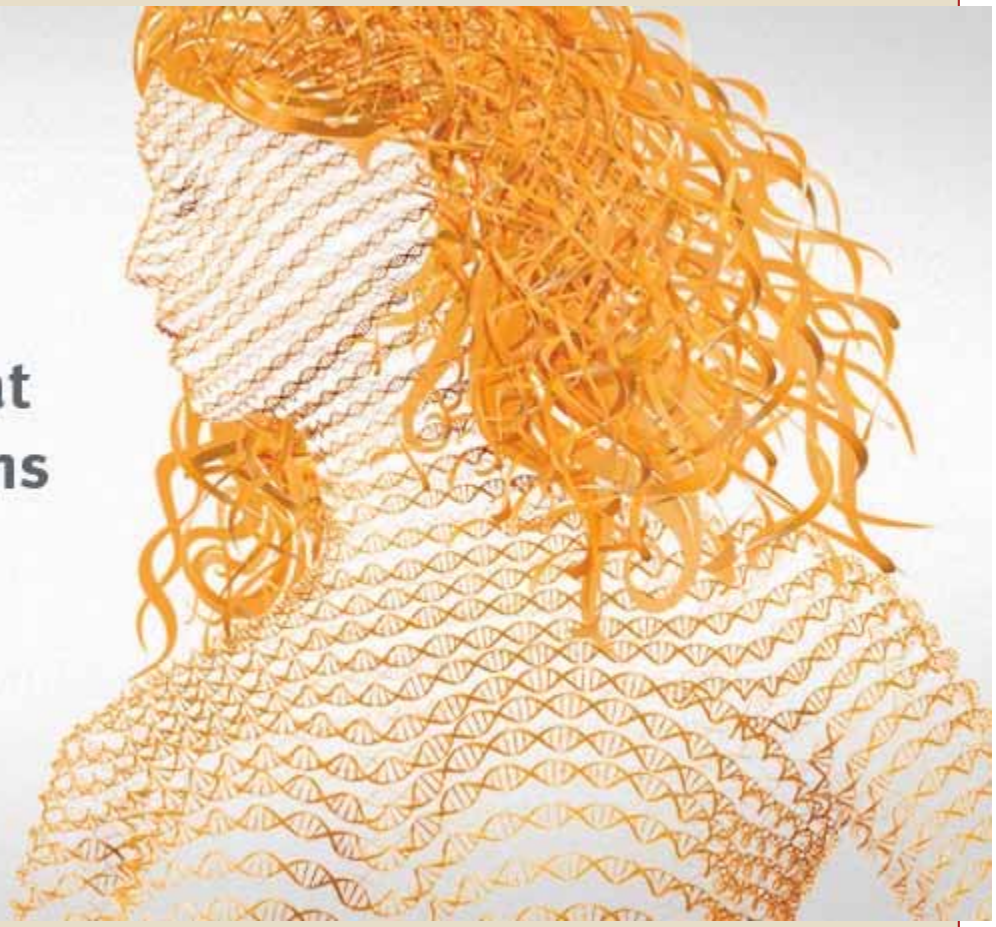



2D Mammogram
3D Mammogram:
Cancer Detected

Oncotype DX

Oncotype DX® reveals the underlying biology that changes treatment decisions 37% of the time

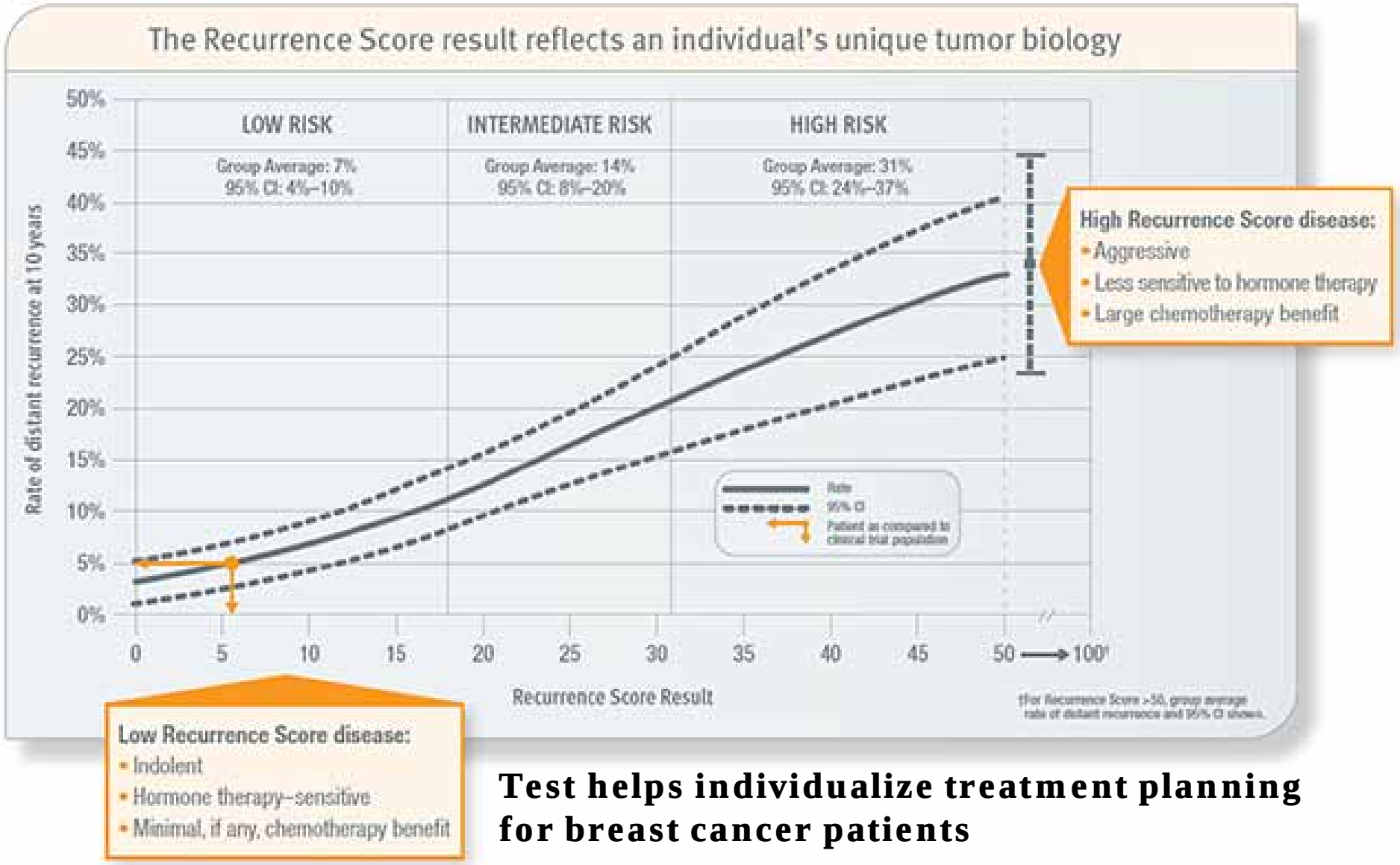
Uncover the Unexpected™



Oncotype DX

- Looks at the presence and activity of a group of genes within a woman's breast tumour to determine the likelihood of breast recurrence
- Predict the likelihood of chemotherapy benefit as well as recurrence in early-stage breast cancer.
- **Recurrence Score** of 0 to 100 points. A low score indicates a low risk of recurrence and a high score indicates a high risk of recurrence

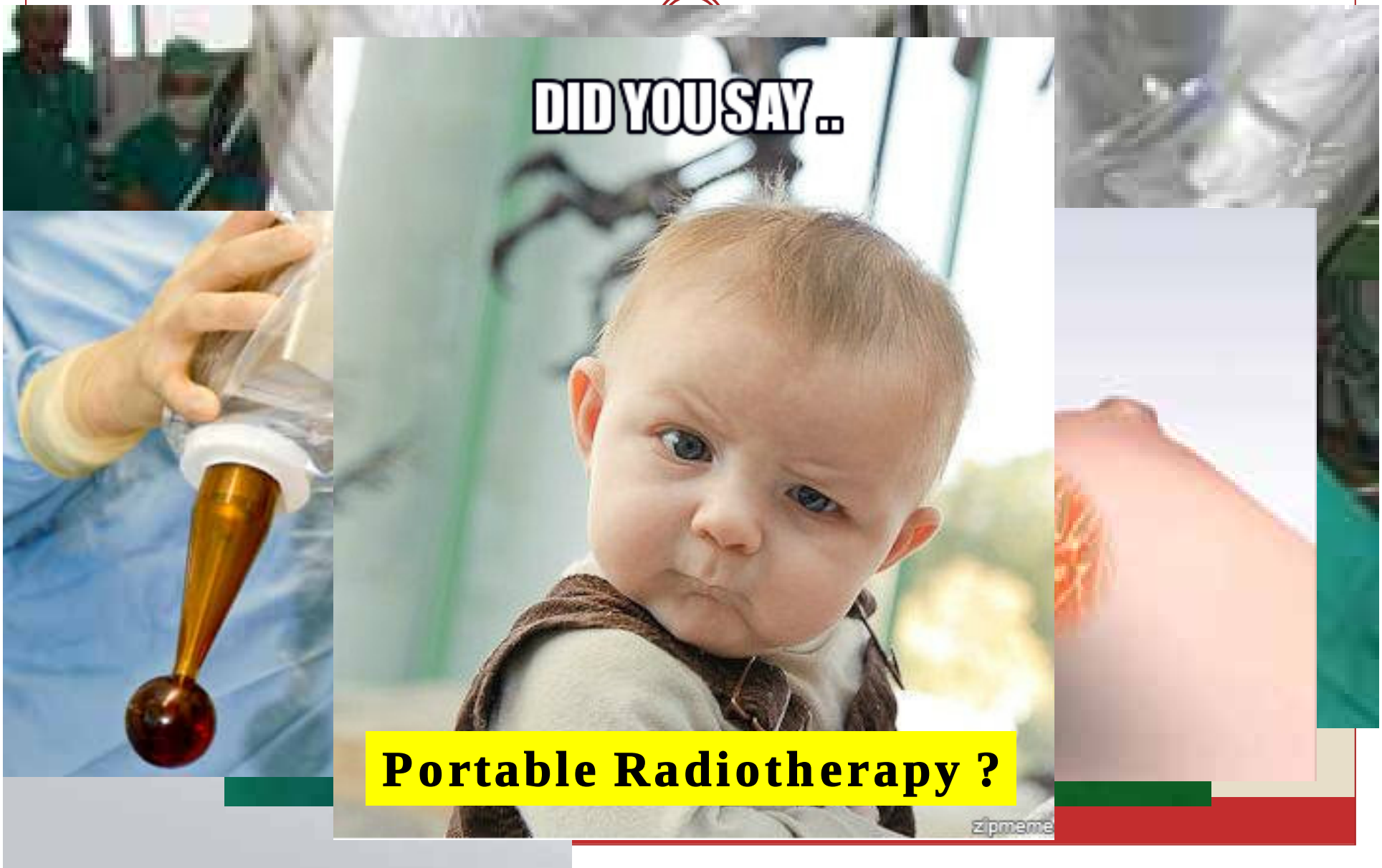
Oncotype DX



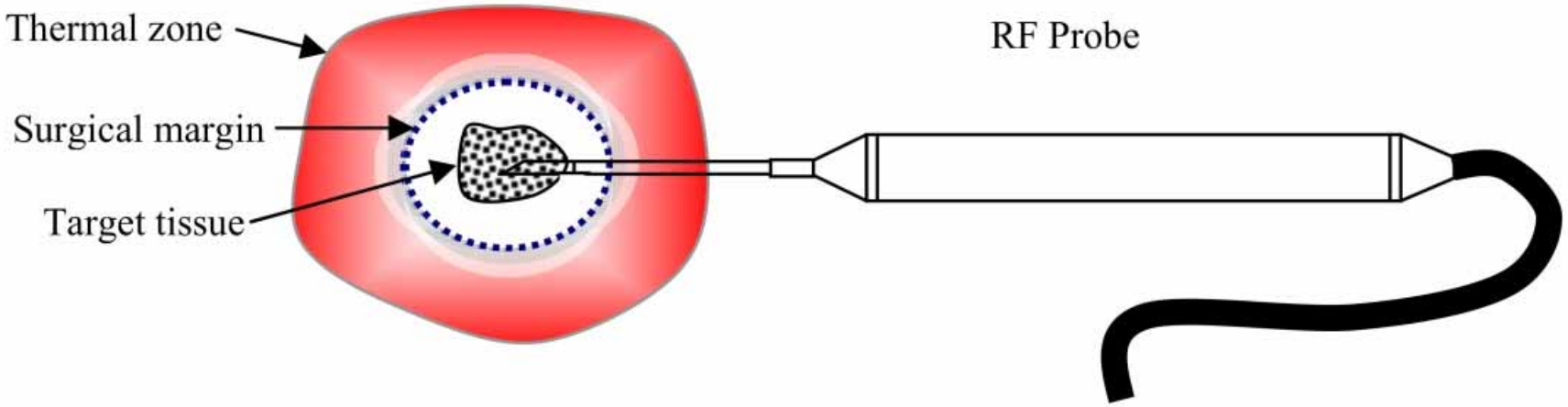
Test helps individualize treatment planning for breast cancer patients

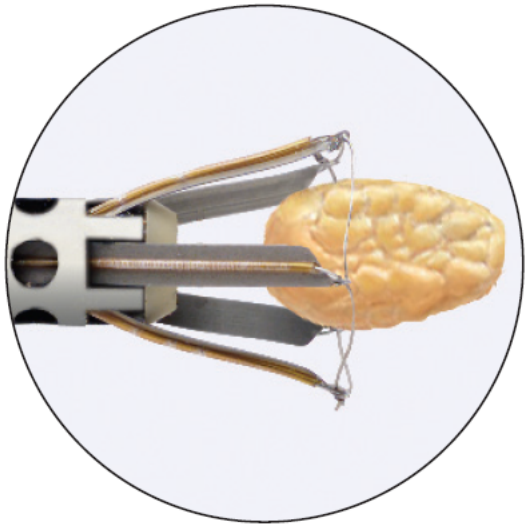
Intra-operative Radiotherapy

Intra-operative Radiotherapy



Radiofrequency ablation

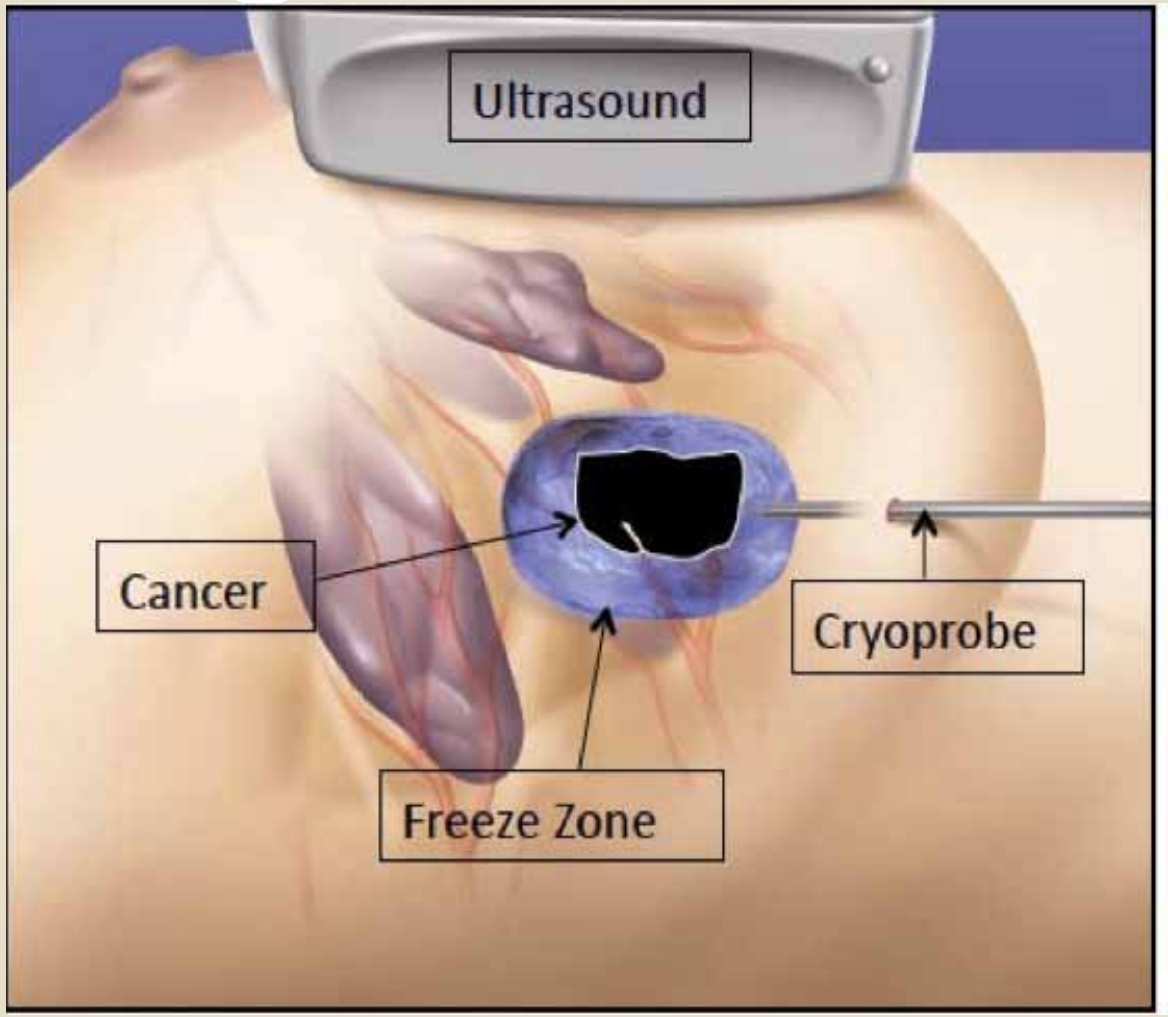




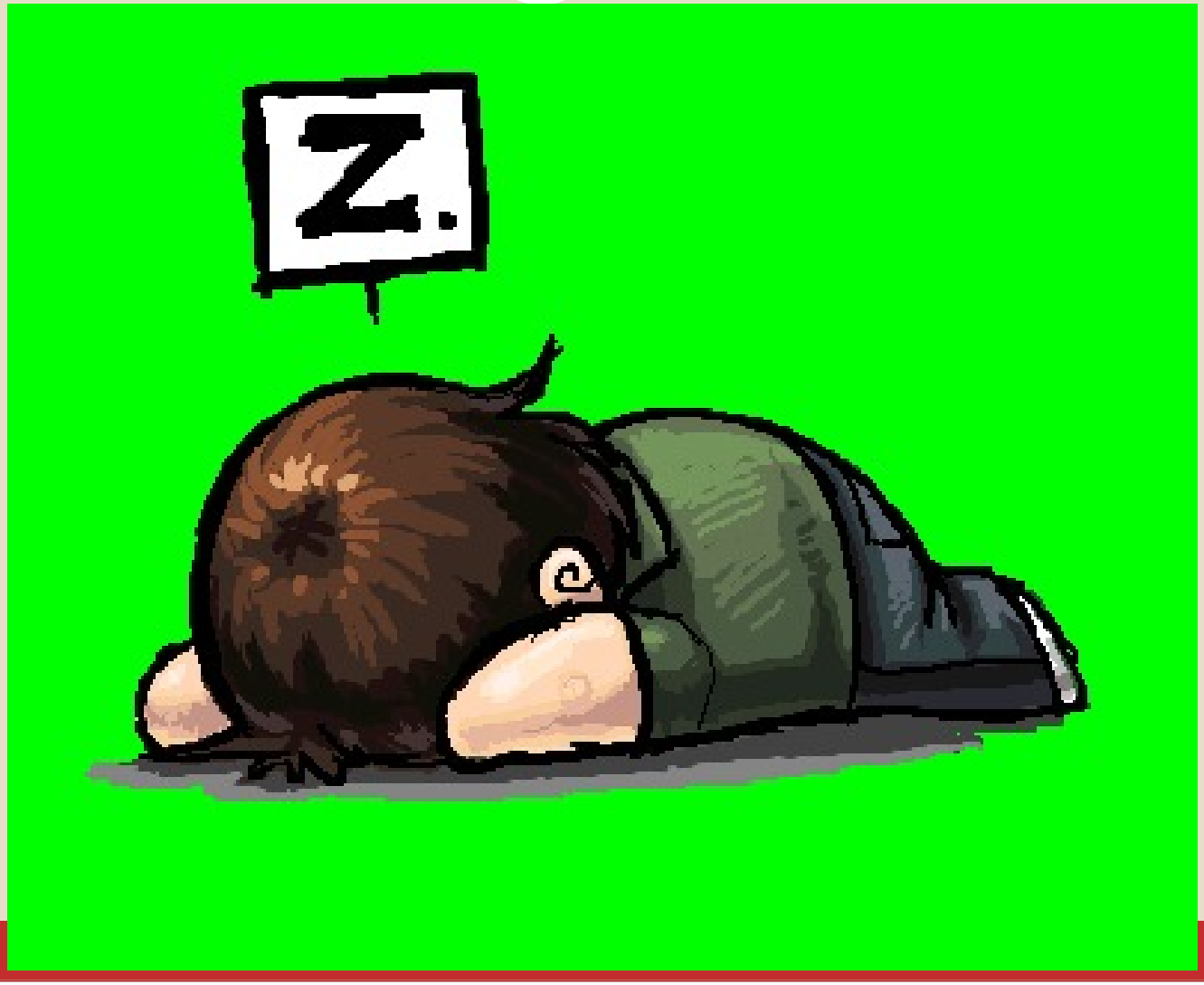
Intact *Advance*

Capture basket—Five small RF-enabled wires deploy from the wand to circumscribe the lesion. As they proceed, they draw out five supporting elements which support and cradle the sample for withdrawal.

Cryoablation



Thank You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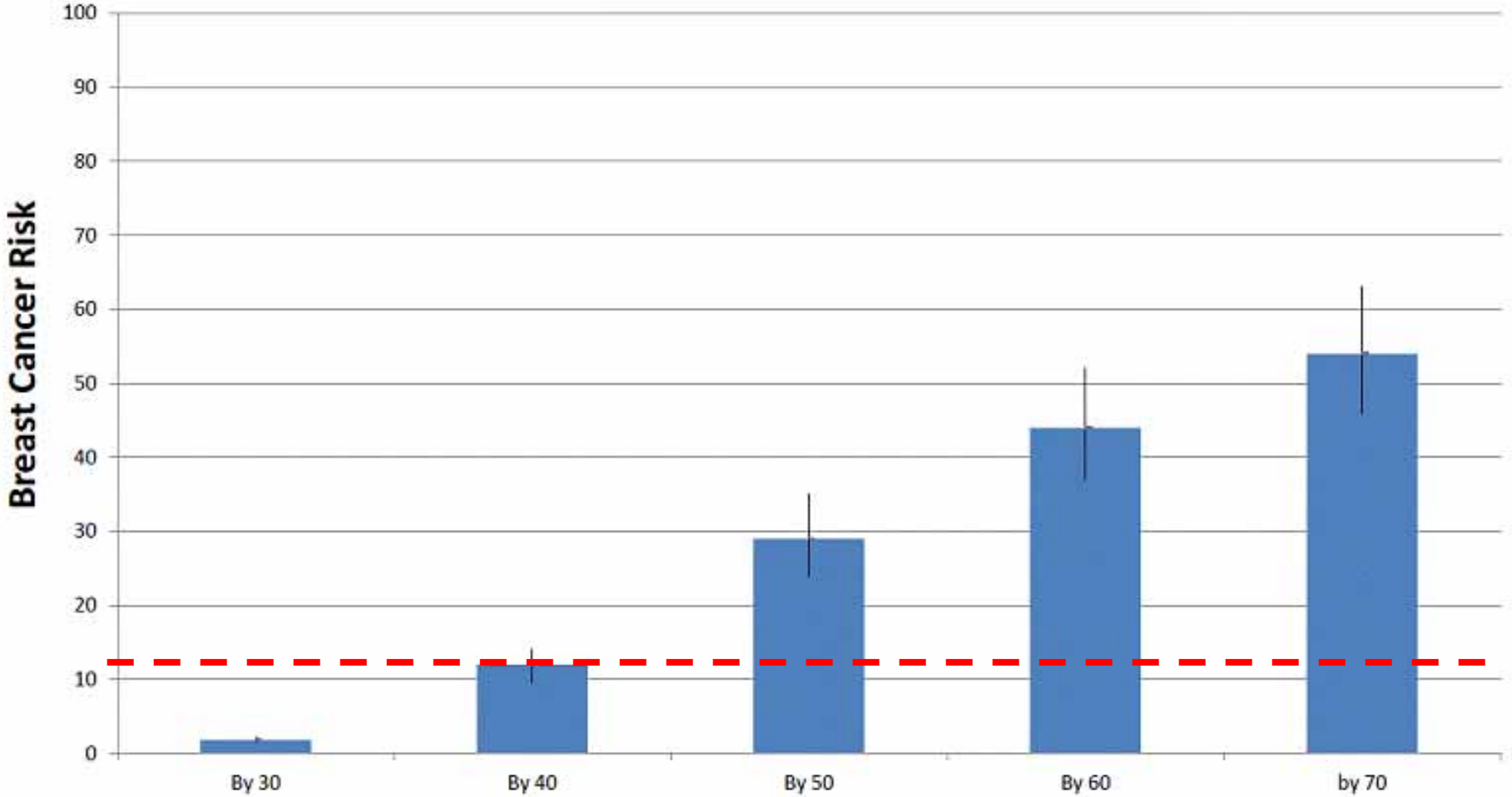
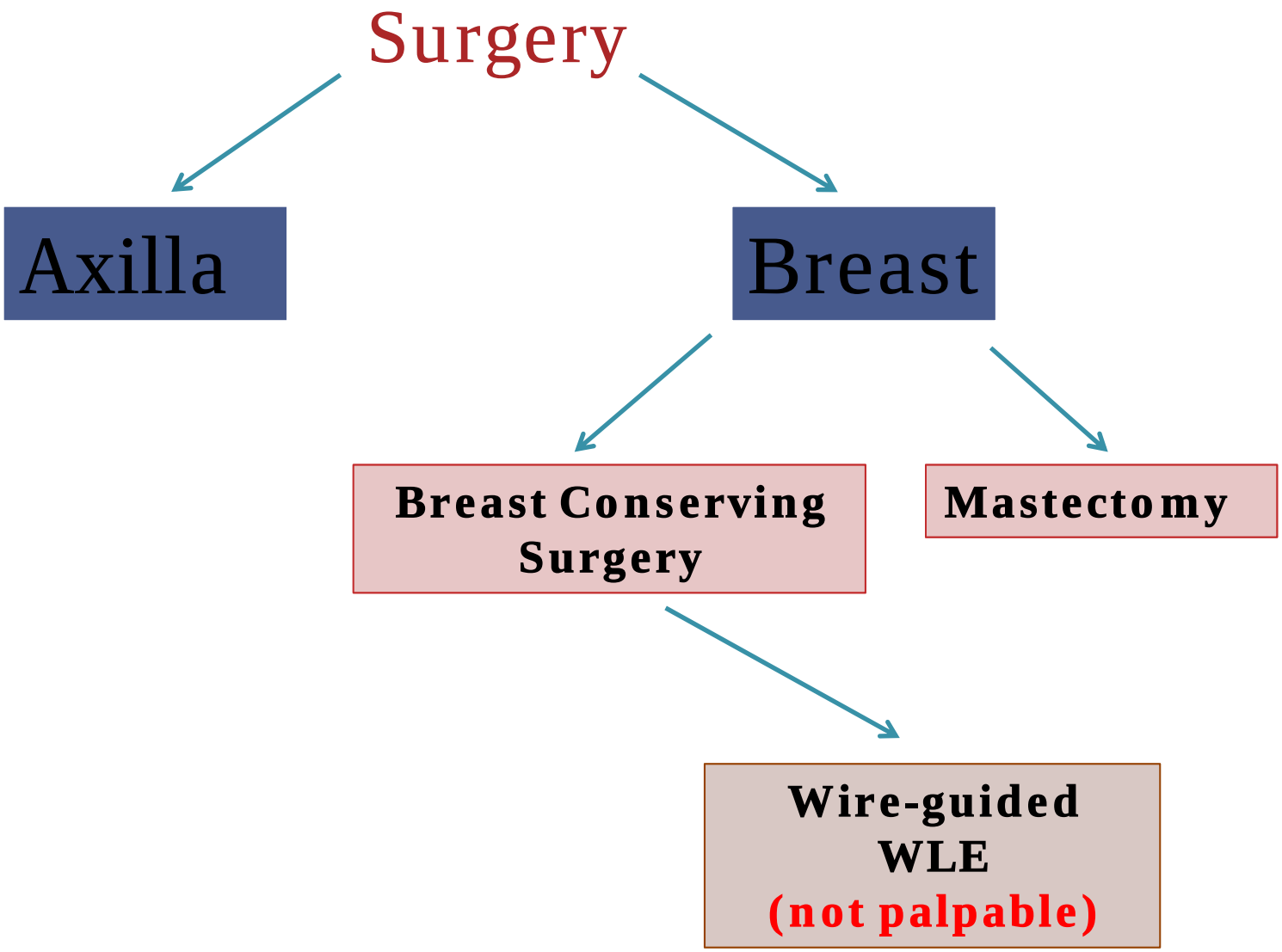
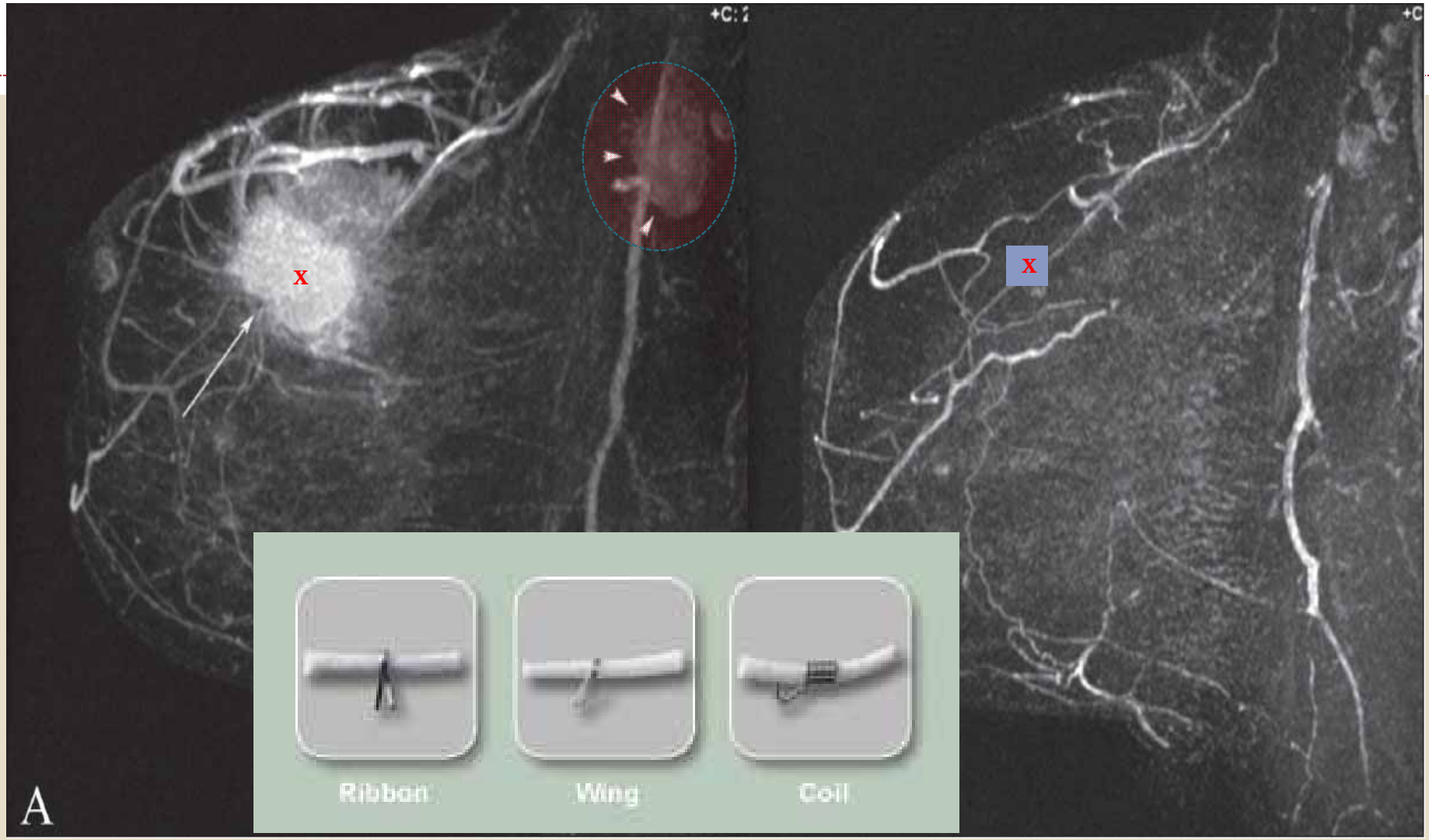
Questions ?

BRCA1 Breast Cancer Risk by Age

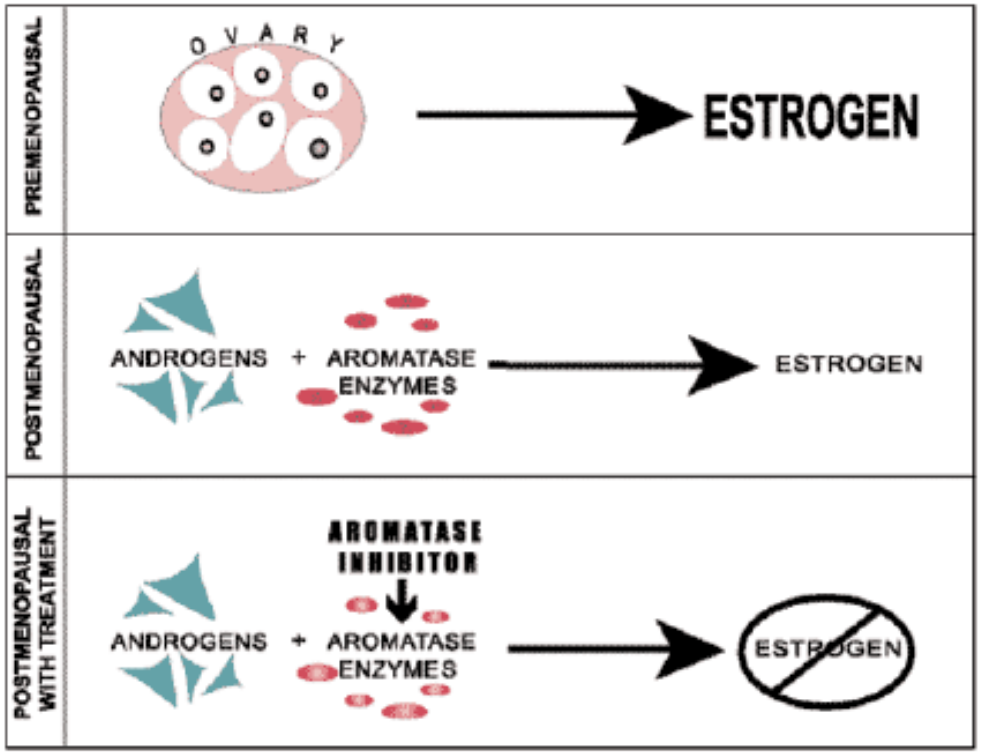


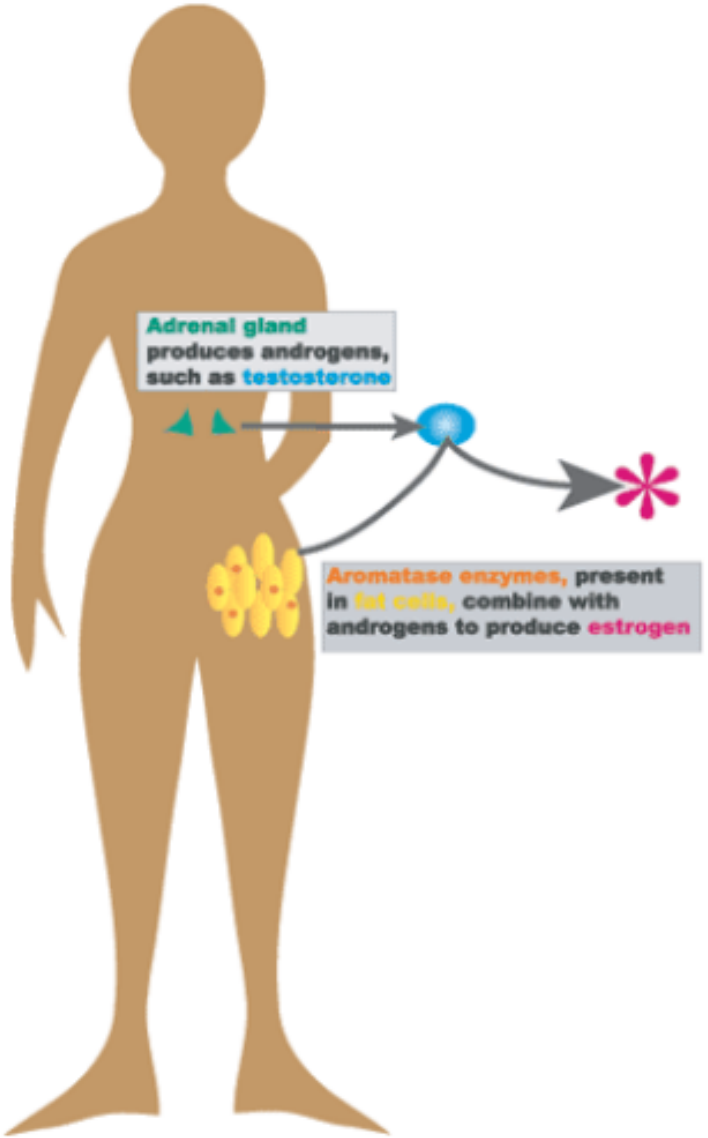
Graph 1. Blue bar indicates the average risk (percent chance) that a woman with a *BRCA1* mutation will develop breast cancer by each age noted across the bottom. The vertical line on each bar indicates a portion of the range of risks seen in different studies and is called the 95% confidence interval (Chan & Parmigiani 2007).

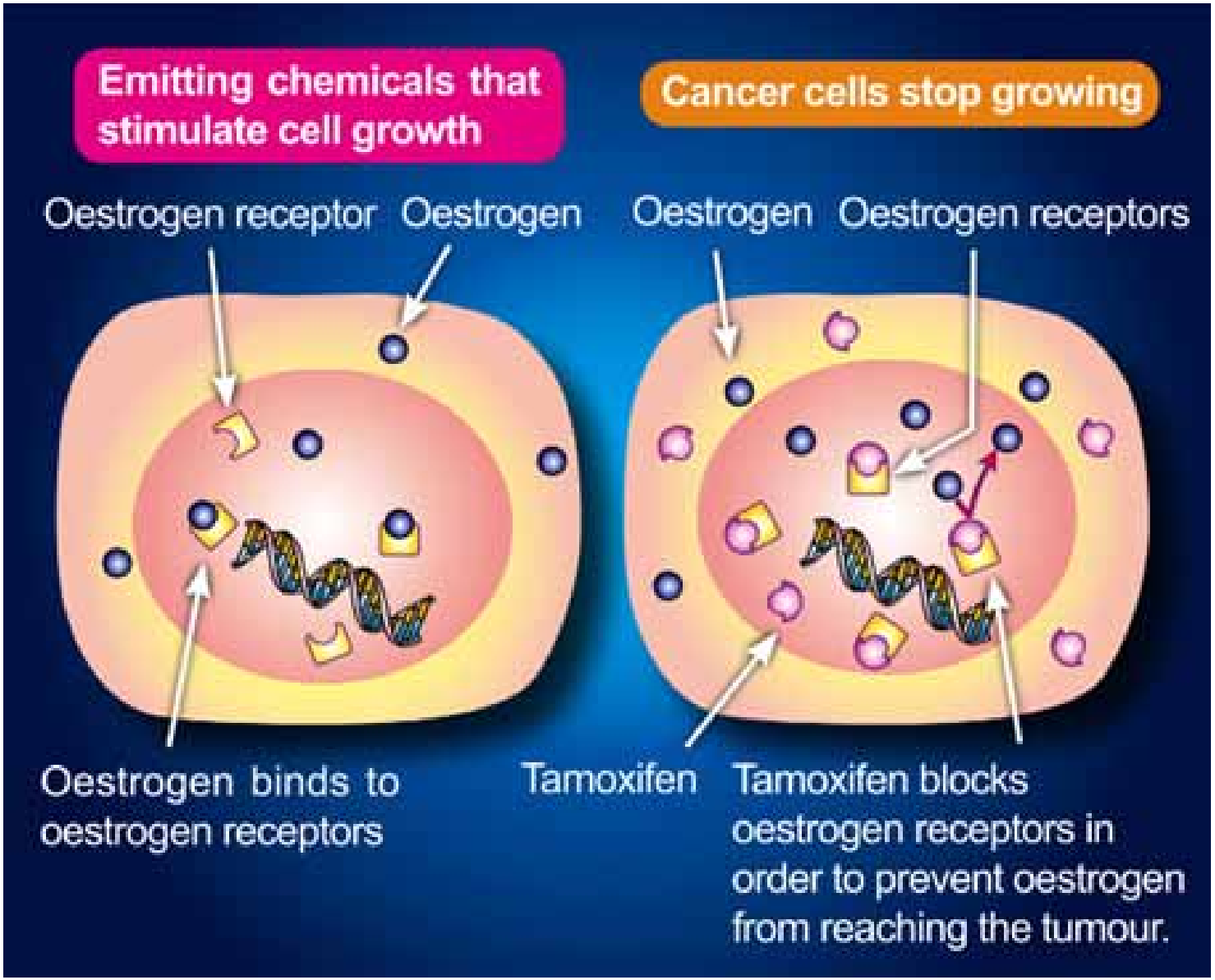

Surgery
Axilla
Breast
Breast Conserving Surgery
Mastectomy
Wire-guided WLE
(not palpable)

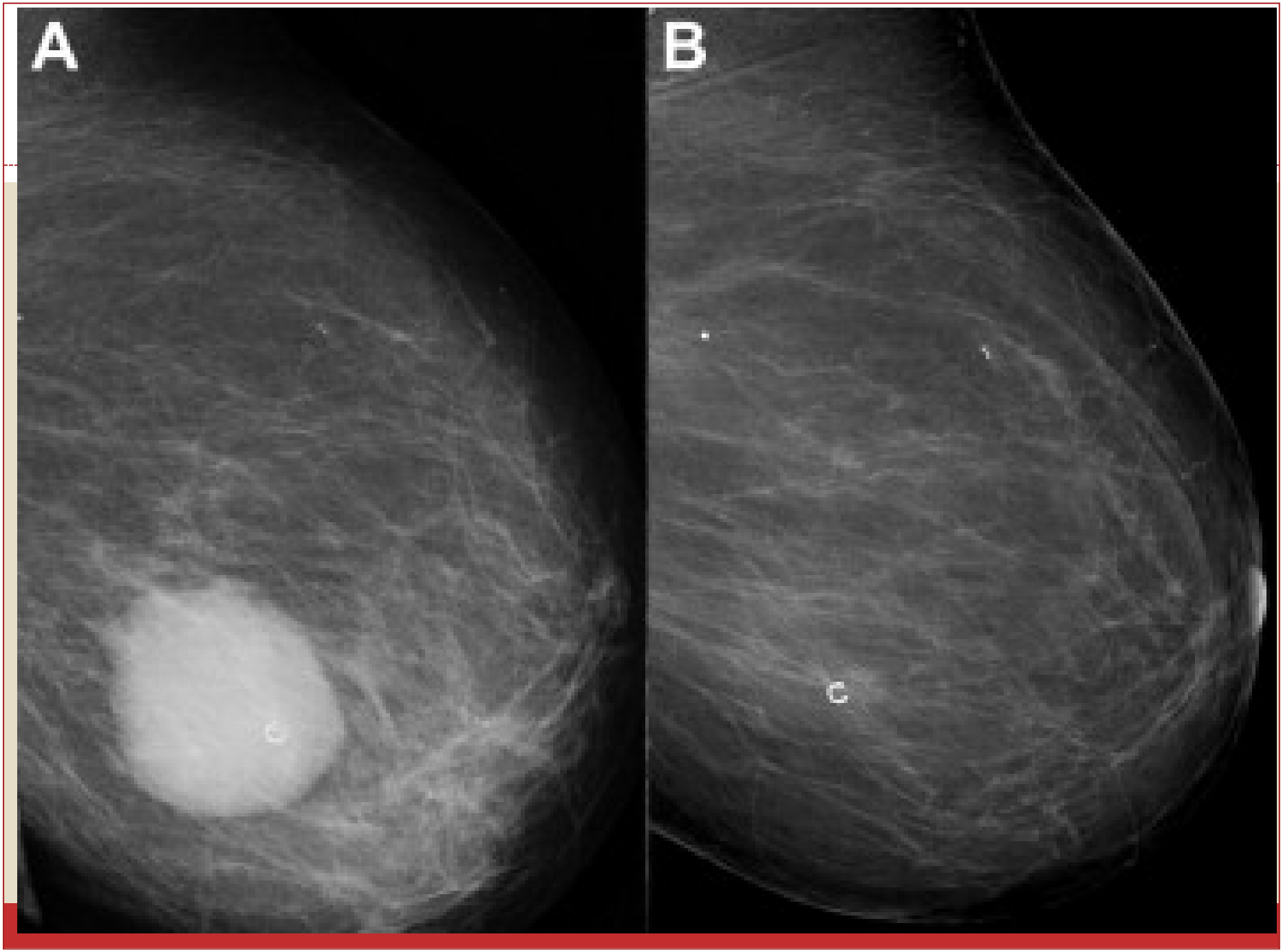

x
x
Ribbon
Wing
Coil
A

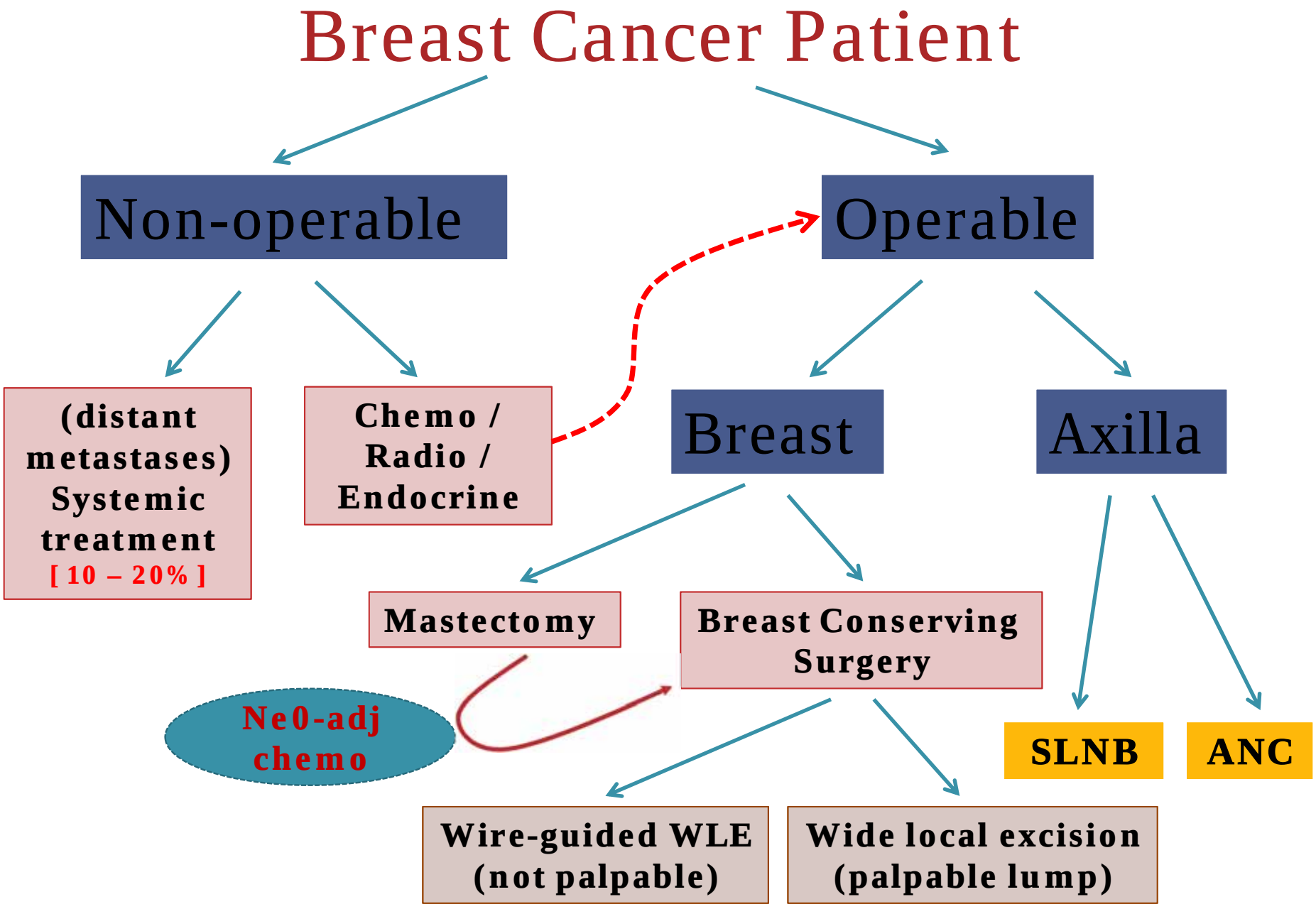
Endocrine Therapy in Postmenopausal Patients






Emitting chemicals that stimulate cell growth
Cancer cells stop growing
Oestrogen receptor
Oestrogen
Oestrogen
Oestrogen receptors
Oestrogen binds to oestrogen receptors
Tamoxifen
Tamoxifen blocks oestrogen receptors in order to prevent oestrogen from reaching the tumour.


A
B


Breast Cancer Patient
Non-operable
Operable
(distant metastases) Systemic treatment
[10 – 20%]
Chemo / Radio / Endocrine
Breast
Axilla
Mastectomy
Breast Conserving Surgery
Ne0-adj chemo
SLNB
ANC
Wire-guided WLE (not palpable)
Wide local excision (palpable lump)