Interventional Procedures: Local & Systemic Options for Optimal Breast Cancer Treatment

Terry L Lehmann, B.S.,R.T.,(R)(M)

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Biopsy Results

- If the biopsy is malignant (cancerous) it is given a grade of 1 to 3 (not stage)
- Cancers that look more like normal tissue have a lower number
- Generally lower numbers are slower-growing
- The grade helps predict the outcome or prognosis for the patient

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Biopsy Results

- Biopsy samples can also be tested for hormone receptors like estrogen & progesterone
- Such cancers have a better outlook as they are likely to respond to hormone treatment
- About 2 out of 3 cancers have these receptors
- Other specific stains are done to assess growth rate and treatment options

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After the Tests: Staging

- Staging is the process of finding out how widespread the cancer is
- Stage is <u>most</u> important factor in choosing among treatment options
- Based upon physical exam, biopsy results & all other tests

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Breast Cancer Workup

- Once invasive breast cancer has been found, a complete metastatic work up may include:
- Chest X-ray
- Bone Scan
- CAT scan, typically chest, abdomen & pelvis
- MRI
- PET

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Staging: TNM System

- Most common system description of breast
- cancer
- Takes into account the tumor (T)
- Whether the cancer has spread to nodes (N) & whether it has spread to distant organs
- (M for metastasis)
- Numbers after each letter give information about the cancer

Gress D.,Edge S., Greene F.,Washington M., et al Principles of Cancer Staging. AJCC, 2017.

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Staging: TNM System

- Stage grouping; All of this information (T,N,M) is combined.
- After Stage 0, *in situ cancer,* the other stages are I-IV
- Some stages are sub-divided using A,B,C
- A higher number means a more advanced cancer
- The lower the stage, the better the prognosis

Gress D.,Edge S., Greene F.,Washington M., et al Principles of Cancer Staging. AJCC, 2017.

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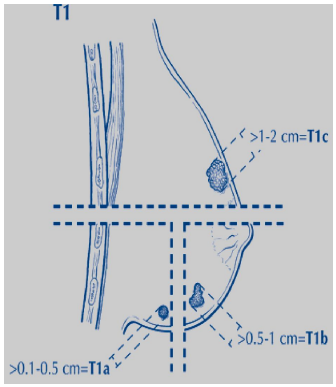
T1 lesions



American Joint Committee on Cancer Staging 2011

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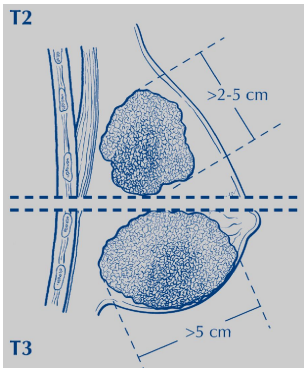
T2 & 3 lesions



American Joint Committee on Cancer Staging 2011

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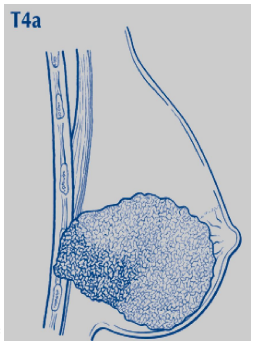
T4 lesions



Direct extension to chest wall not including pectoralis muscle or extension to the skin

American Joint Committee on Cancer Staging 2011

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Breast Cancer Survival by Stage

Stage	5-yr. Relative survival rate
O	100%
I	95%
IIA	92%
IIB	81%
IIIA	67%
IIIB	54%
IV	20%

Cancer.org, 2018

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Breast Cancer Survival

5-year relative survival rates for breast cancer

(Based on women diagnosed with breast cancer between 2008 and 2014.)

SEER Stage	5-year Relative Survival Rate
Localized	99%
Regional	85%
Distant	27%
All SEER stages combined	90%

Cancer.org, 2018

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Breast Cancer Treatment

Local vs. Systemic Treatment

- *LOCAL :* the purpose of the treatment is to treat the tumor <u>without</u> affecting the rest of the body.
  - Examples are:
    - *Surgery*
    - *Radiation*

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Breast Cancer Treatment

SYSTEMIC TREATMENT:

Given into the bloodstream or by mouth to reach cancer cells that may have reached beyond the breast. Examples are:

- *Chemotherapy*
- *Hormone therapy*
- *Immunotherapy*

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Breast Cancer Treatment

- Adjuvant therapy- this is when people appear to have no cancer left after surgery, yet are given treatment
- Adjuvant= *alongside*
- Goal of adjuvant therapy is to kill hidden cancer cells that may have broken away from main tumor
- Primarily for node positive cancers

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Neo-Adjuvant Therapy

- Neo-adjuvant therapy is when treatment is given to shrink a tumor <u>before</u> surgery
- This allows many women to have breast conservation who have a large tumor or extensive disease initially
- Tumor is down-sized after treatment

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Surgical Options for Breast Cancer

- Surgery is done to treat the main tumor & remove as much cancer as possible
- May also be done to assess the lymph nodes
- May be done to restore breast's appearance (reconstruction) or
- To relieve symptoms of advanced cancer (palliative)

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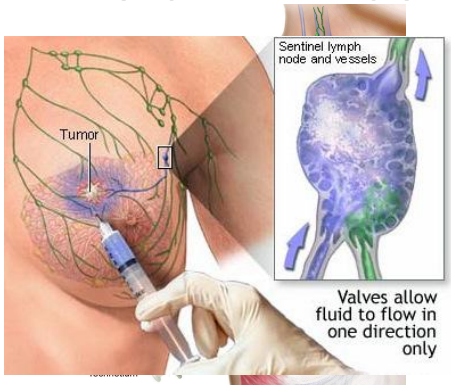
Sentinel Lymph Node Biopsy



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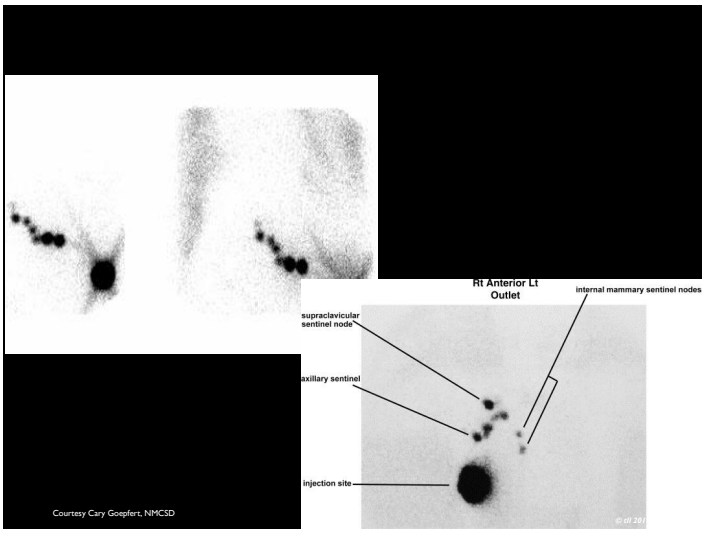
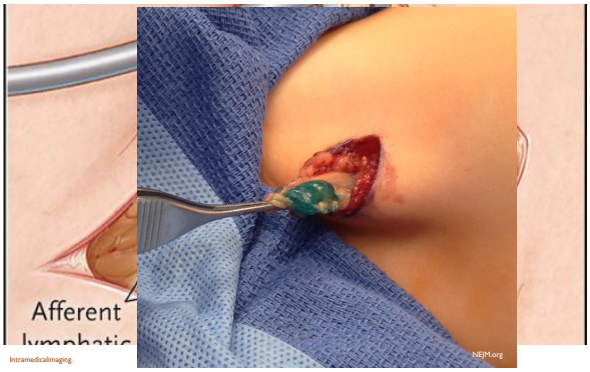
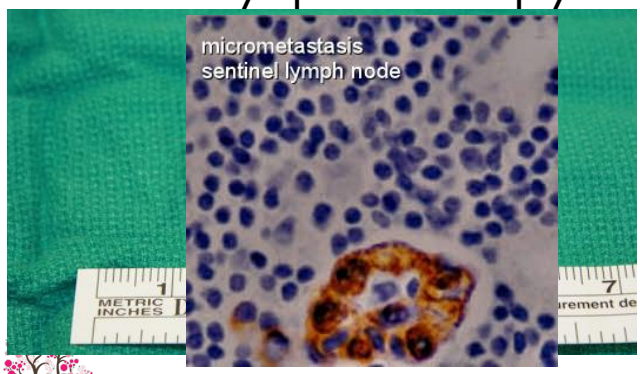


Sentinel Lymph Node Biopsy



Sentinel Lymph Node Biopsy



Courtesy Angela Bachman, NMCSD

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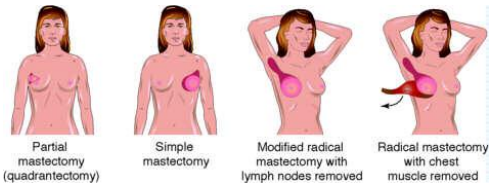
Breast Cancer Surgery options



Cancer.org 2011

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Surgical Options for Breast Cancer

- Lumpectomy: also called breast conservation, removes only breast lump & some normal tissue around it
- Radiation is given for approximately
- 6 weeks after this type of surgery
- If chemotherapy is indicated, XRT is usually postponed until after chemo is finished

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Lumpectomy or Mastectomy?

- One advantage of lumpectomy is that it preserves the look of the breast
- A downside is that weeks of radiation are required. (newer techniques only 1 week-partial breast irradiation)
- Some mastectomy pts. will need XRT as well to chest wall or axilla
- Survival rates are equivalent
- Lumpectomy not an option for all women

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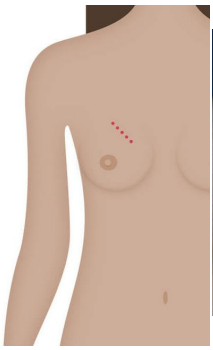
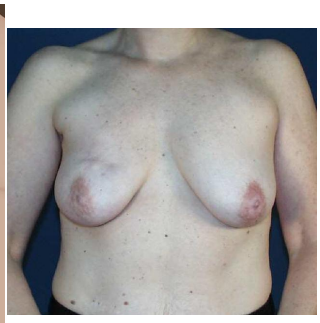
Lumpectomy





Courtesy Cary Goepfert, NMCSD

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Lumpectomy

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Relative contraindications to breast conservation

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Tumor Location

- Retroareolar
- Chest wall involvement or pectoral fixation

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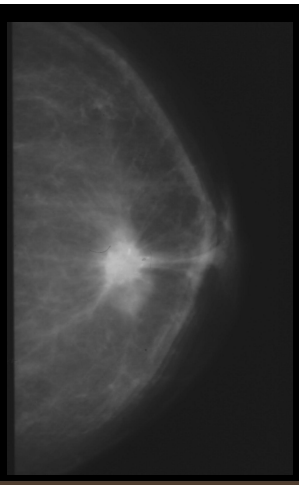

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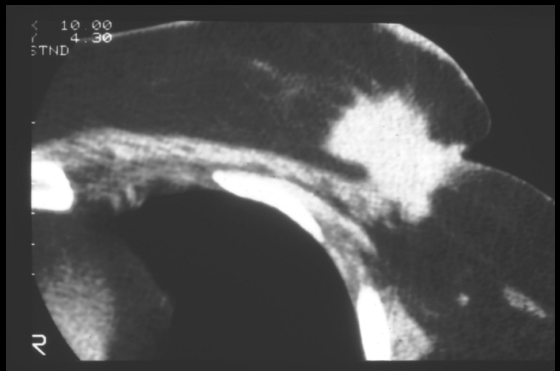

Invasive cancer with fixation to pectoral fascia

Courtesy Cary Goepfert, NMCSD

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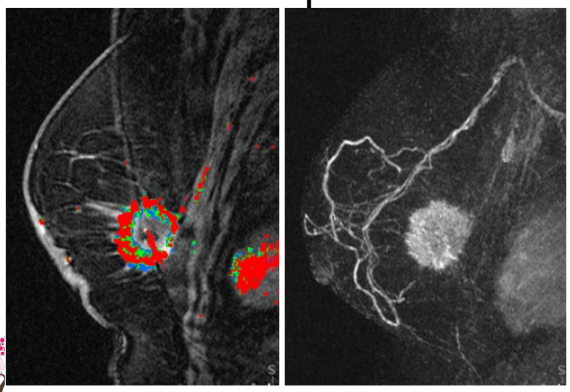
Invasion Deep to Fascia



Sag T1 post contrast with Kinetics

MIP

Courtesy Cary Goepfert, NMCSD

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Surgical Options for Breast Cancer

- Partial (segmental) mastectomy
- This involves removing more tissue than
- with a lumpectomy and is followed by
- radiation &/or chemotherapy
- Simple or total mastectomy; removes entire breast but not the nodes or muscle under the breast

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Surgical Options for Breast Cancer

- Modified radical mastectomy; removes entire breast & some axillary nodes
- Radical mastectomy; extensive removal of breast, nodes and chest wall muscle. Rarely done because modified has proven effective with less disfigurement & side effects

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Simple Mastectomy

Courtesy Cary Goepfert NMCSD

Entire breast is removed, but not lymph nodes

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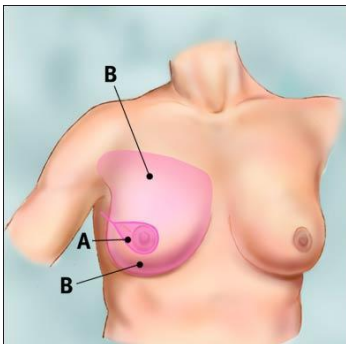
Skin sparing mastectomy



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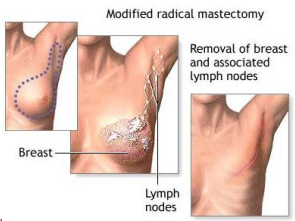
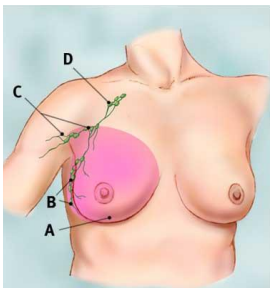
Modified Radical Mastectomy





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Modified Radical Mastectomy

Courtesy Cary Goepfert, NMCSD

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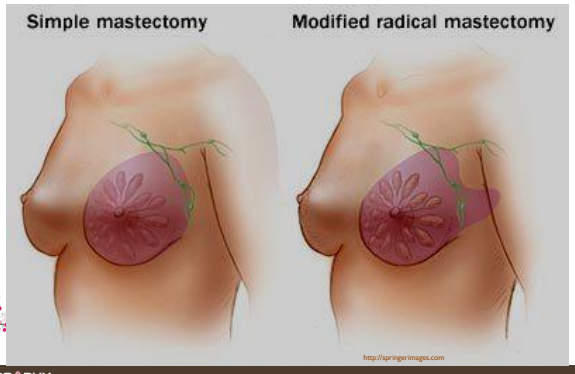
Simple vs. Modified



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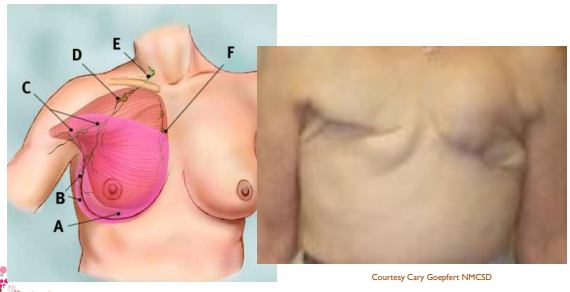
Radical mastectomy



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Courtesy Cary Goepfert NMCSD

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Radical mastectomy

Courtesy Cary Goepfert, NMCSD

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Male Breast Cancer Surgery

- Male breast cancer patients always undergo mastectomy. May be simple or radical dependent upon disease process.
- Breast conservation is unimportant & typically the tumor size is larger upon discovery & often the chest wall is involved.
- Axillary sampling done as indicated.

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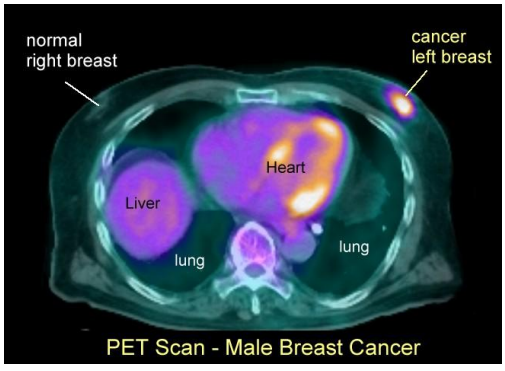
Male Staging work-up identical



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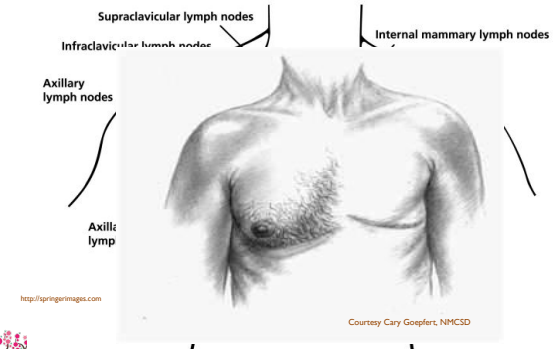
Male mastectomy



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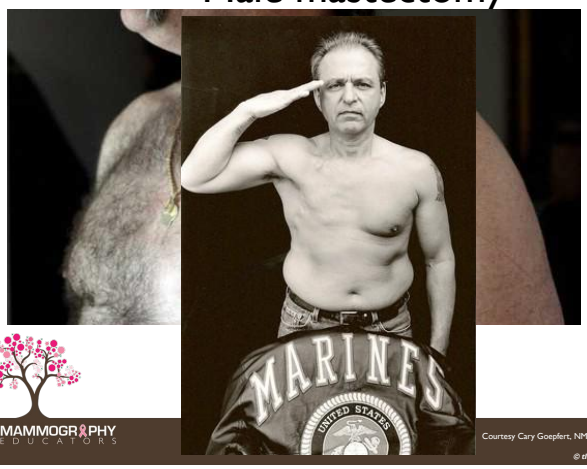
Male mastectomy



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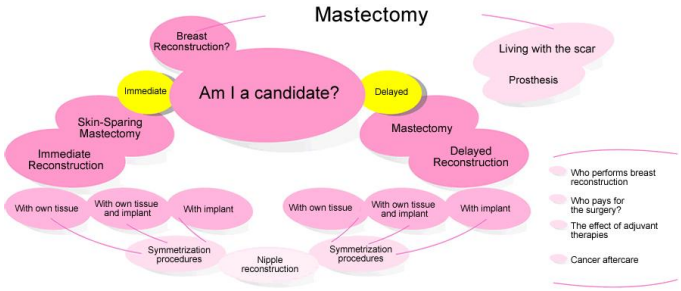
Mastectomy options



Cancer.org, 2017.

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Surgical side effects

- Infection or blood & fluid collecting at the incision site are possible side effects for both lumpectomy & mastectomy
- If nodes are removed, other effect such as swelling of the arm (lymphedema) could occur
- There is also the possibility that not all the cancer has been removed & additional surgery will be required

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Breast Reconstruction

- Many options for women today
- Immediate or delayed (1 or 2-stage)
- Implant: Saline or silicone
- Autologous flaps
- Most common is TRAM, followed by Latissimus dorsi, then Gluteal flap

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Good Candidates for Implant Reconstruction

- Thinner women with smaller breasts
- Women who already have implants
- Probability of radiation need low
- Patients who opt for bilateral
- ablative surgery (prophylaxis)
- Women who want adjustment made to opposite breast

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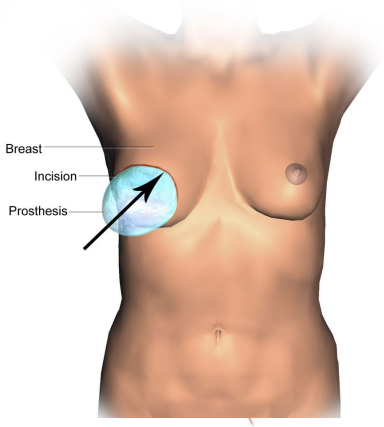

Blausen.com staff (2014). "Medical gallery of Blausen Medical 2014". https://commons.wikimedia.org/w/index.php?curid=30462641

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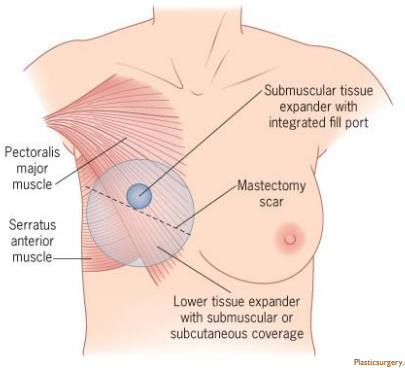
Breast reconstruction: Tissue expander placement in 2-stage implant procedure



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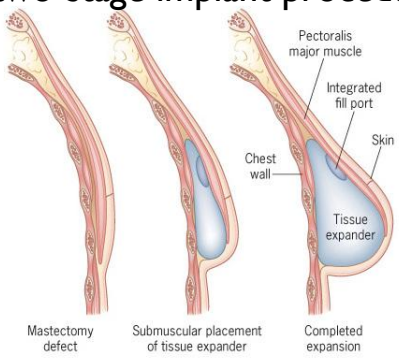
Breast reconstruction: tissue expansion in two-stage implant procedure



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Breast reconstruction: clinical appearance before two-stage implant procedure

Courtesy Cary Goepfert,NMCSD.

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Breast reconstruction: clinical appearance after two-stage implant procedure

Courtesy Cary Goepfert,NMCSD.

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Tram Flap

- Abdominal ellipse of skin/fat removed with underlying rectus muscle as blood supply
- "tummy tuck" operation
- Flap tunneled under skin to mastectomy defect or transferred as "free flap" with microvascular anastomosis, or done as perforator (DIEP) flap

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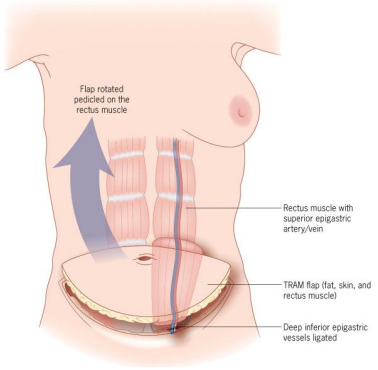
Breast reconstruction: transverse rectus abdominus myocutaneous flap procedure



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Courtesy Cary Goepfert,NMCSD.

Mastectomy with delayed TRAM flap reconstruction

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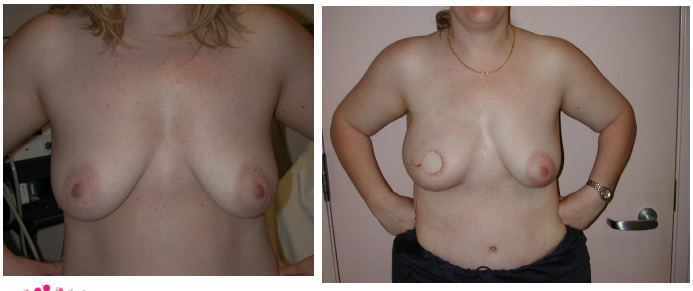
Immediate TRAM After Skin Sparing Mastectomy



Courtesy Cary Goepfert,NMCSD.

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Bilateral TRAM Flap

Courtesy Cary Goepfert,NMCSD.

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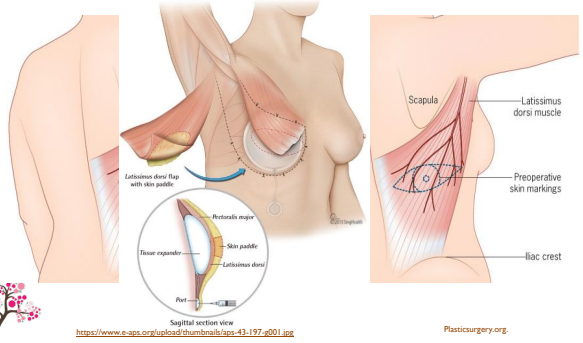
Breast reconstruction: latissimus dorsi myocutaneous flap procedure



Sagittal section view
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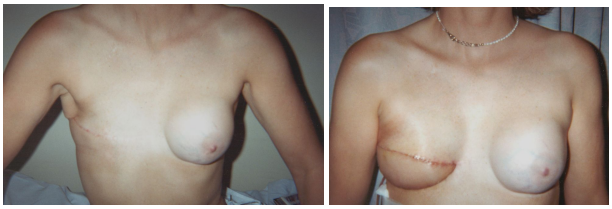

Delayed skin sparing mastectomy with Latissimus flap, right breast

Courtesy Cary Goepfert,NMCSD.

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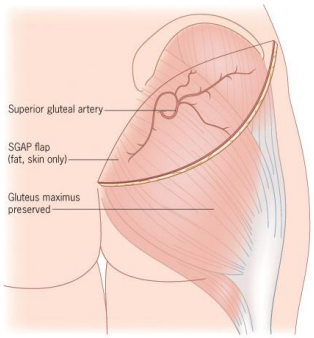
Breast reconstruction: superior gluteal artery flap procedure



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Breast reconstruction: superior gluteal artery flap procedure

Courtesy Cary Goepfert,NMCSD.

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Breast reconstruction: superior gluteal artery flap procedure

Courtesy Cary Goepfert,NMCSD.

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Flap Reconstruction

- When imaging surveillance is desired, standard mammographic views performed along with additional views as needed
- Most mammographic & clinical findings are related to development of dystrophic changes within donor tissue such as oil cysts & fat necrosis

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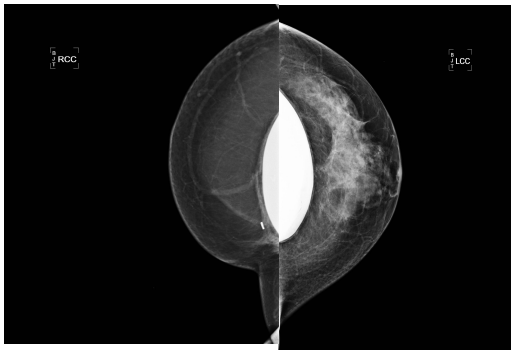
Imaging Reconstructed Breasts



RCC TRAM/augmented & left augmented for symmetry

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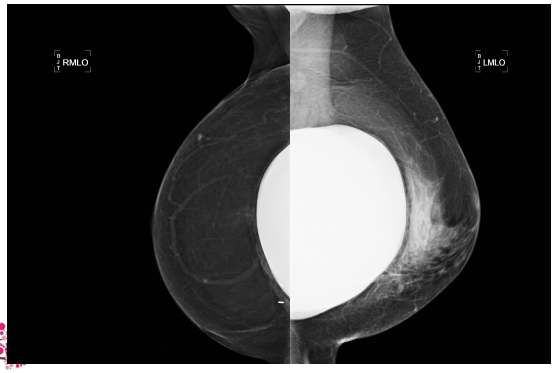
Imaging Reconstructed Breasts



RCC TRAM/augmented & left augmented for symmetry

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Radiation Therapy

- XRT is treatment with high-energy x-rays to kill or shrink cancer cells
- May be external radiation or from radioactive materials placed directly into the tumor
- External radiation used most often for treating breast CA. It destroys cancer cells remaining in the breast, chest wall & axilla

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Radiation Therapy

Patient positioned in Linear Accelerator for treatment

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https://www.oncologysystems.com/wp-content/uploads/2019/09/1-95.png
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Radiation Therapy

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Radiation Therapy

- Treatment is usually given 5 x week for about 6 weeks
- Main side effects are swelling & heaviness to the breast & fatigue
- There may be skin changes as well similar to sunburn
- The breast may become smaller & firmer due to fibrosis after radiation treatment

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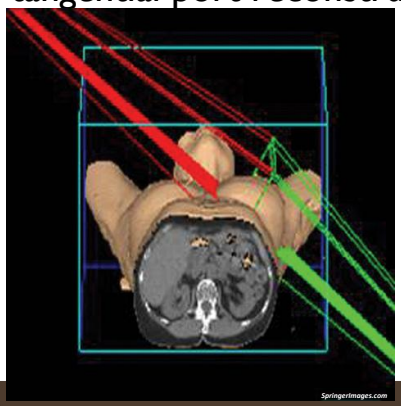
Radiation therapy for breast cancer: digital tangential port reconstruction



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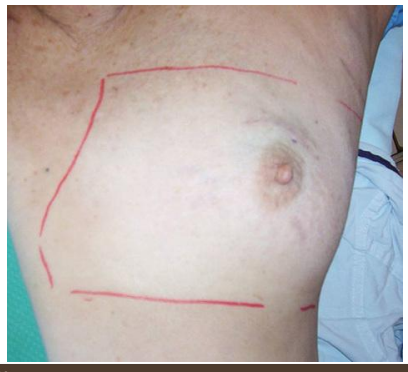
Radiation therapy for breast cancer: treatment field outlined



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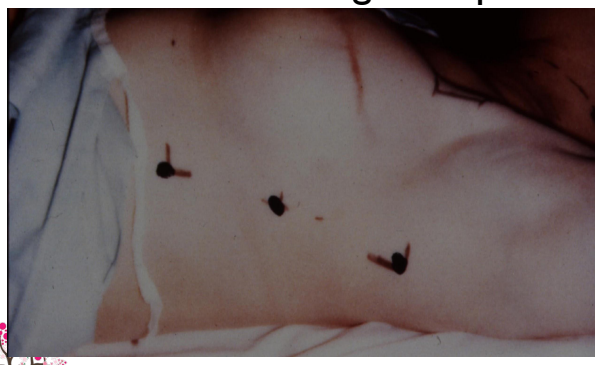
Courtesy QL Lehmann

Lateromedial tangential port



Lateral treatment field margin

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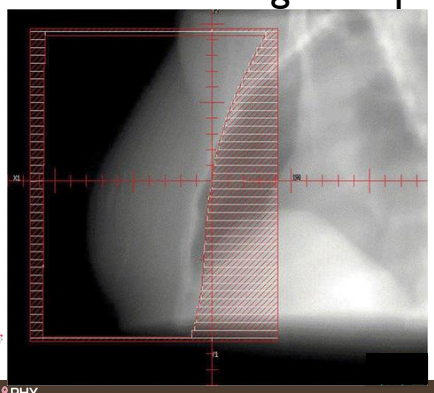
Radiation therapy for breast cancer: latero medial tangential port



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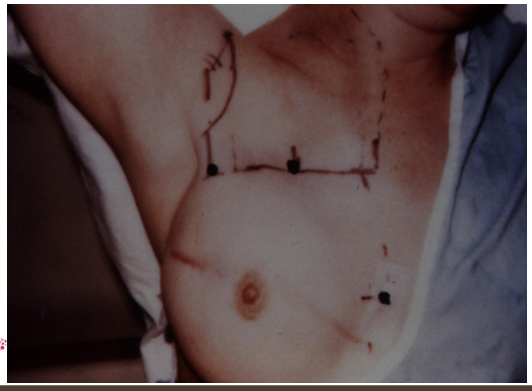
Supraclavicular fossa treatment field



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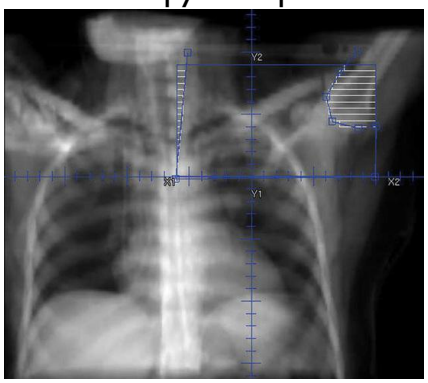
Radiation therapy for breast cancer: regional nodal therapy to supraclavicular fossa



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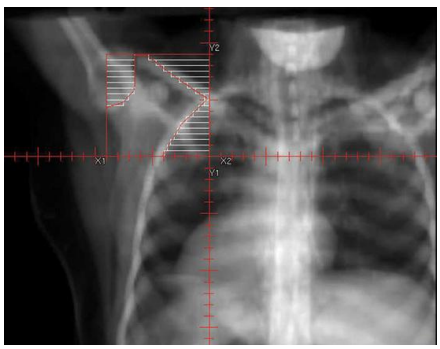
Regional nodal therapy to Axillary basin



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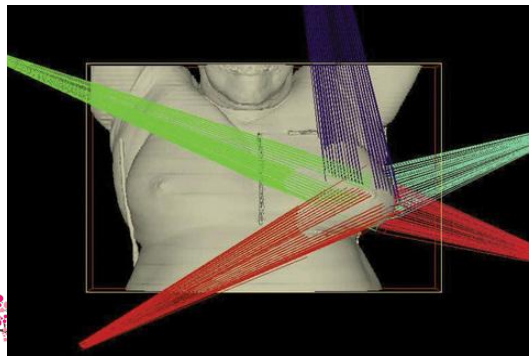
Breast Radiation: 3-dimensional conformal technique



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Radiation Therapy

- Radiation therapy is NOT given during pregnancy because such high doses can be harmful to the fetus
- Another way to deliver radiation is to place radioactive pellets into the breast tissue in the tumor bed. It may be added to standard treatment as a "boost dose"
- It is also being utilized as the only means of giving radiation. More study needed before this can replace standard treatment. Many clinical trails ongoing currently

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Partial Breast Radiation: Brachytherapy

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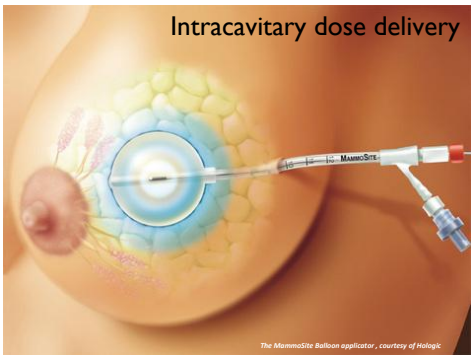
Partial Breast Radiation: MammoSite



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SAVI partial breast device

- Strut Assisted Volume Implant
- Multichannel catheter system
- After treatment, catheter is collapsed and removed from cavity

https://www.ciannamedical.com/savi/

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Chemotherapy

- Use of anti-cancer drugs injected into a vein or taken as a pill
- This is systemic therapy & can kill cancer cells that have spread
- Because normal cells are also damaged, side effects occur
- Given after surgery cancer to reduce the chance of the cancer recurring

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Chemotherapy

- May be main treatment for patient whose cancer has already spread outside the breast & axillary area
- May be given before surgery to shrink tumor to make it easier to remove
- Allows MDs to monitor response to the drugs. If it does not shrink different drugs can be used

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Chemotherapy

- Given in cycles, with each period of treatment followed by a break
- This allows normal cells to recover
- Total course of treatment is usually 3-6 months
- Most often a combination of drugs are given rather than a single drug

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Chemotherapy Side Effects

- Fatigue, caused by shortage of RBCs
- Nausea & vomiting
- Loss of appetite
- Epilation or hair loss
- Mouth sores
- Changes in menses; can be permanent
- Risk of infection, shortage of WBCs
- Bruising or bleeding after minor injury, due to reduced platelet count

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Chemotherapy Side effects

- Most side effects cease when treatment ends.
- Permanent effect may include early menopause & sterility
- Cardiac damage can occur with long-term use of *Adriamycin*
- Many women notice a decrease in concentration & memory; "*chemo brain*"
- Many women don't feel as healthy after chemo. There can be pain & a mild loss of physical functioning

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Hormone Therapy

- Estrogen promotes the growth of breast cancer cells in some women
- Several methods to block the effect of estrogen or to lower its levels are used to treat breast cancer
- *Tamoxifen,* is one such drug. It blocks the effects of estrogen & is taken for 5 years after surgery to reduce the risk of recurrence

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Hormone Therapy

- *Tamoxifen* has been shown to be helpful in women of all ages with early breast cancer if their cancer has estrogen receptors.
- Also used for women at high breast cancer risk (BRCA1 & BRCA2 or prior biopsy with high-risk pathology)
- *Raloxifene* is another such drug

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Hormone Therapy

- *Aromatase inhibitors* are a family of drug that stops or suppresses the body from making estrogen
- Used only for post-menopausal women
- Can be used after or instead of *Tamoxifen*

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Hormone Therapy Side Effects

- *Tamoxifen* can cause hot flashes and mood swings
- May also cause early endometrial cancer.
- This can be controlled by surgical means
- Blood clots are another possible side effect
- *Aromotase Inhibitors* can cause bone thinning & fractures because they remove estrogens from the body

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Other Treatments

- *Herceptin (Trastuzumab)* is a drug that attaches to a growth-promoting oncoprotein called Her2neu that is found in small amounts on the surface of normal breast cells & in some breast cancers
- Some breast cancers have too much of this protein which causes it to grow & spread faster

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Other Treatments

- *Herceptin* can stop this protein from causing breast cancer cell growth
- It may also help the immune system to better attack the cancer cells
- Recent studies show that the drug's use in addition to chemo lowers the rate of cancer coming back
- Lowers death rate over standard chemotherapy alone

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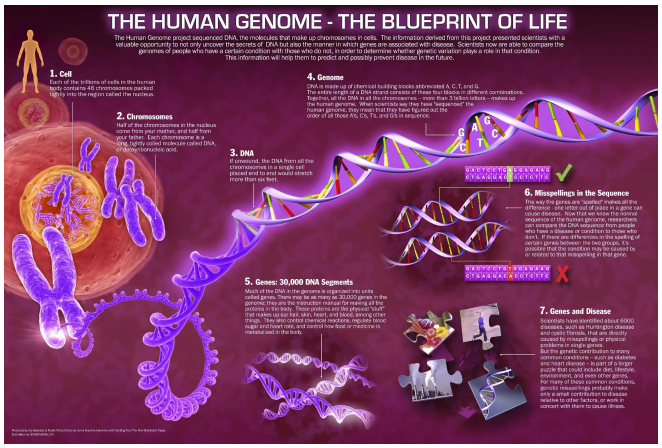

Genetics & Public Policy Center, Johns Hopkins University

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Molecular assay

Oncotypeiq.com

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Molecular assay tests

- The Onco*type* DX assay may be used in newly diagnosed ER+, Her2Neu-, N- invasive breast cancer patients
- Results assess the potential benefit of chemotherapy & the likelihood of distant breast cancer recurrence
- Can also be used to identify patients who may be successfully treated with tamoxifen & may not require adjuvant chemotherapy

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Optimum Treatment for Breast CA

- Mastectomy vs Lumpectomy + XRT vs. lumpectomy alone
- Use of systemic treatment as dictated by disease histology & nodal status
- Aggressive therapeutic modalities are yielding better cure rates
- Requires team approach

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Optimum Treatment

- No longer "one size fits all", but rather
- Is personalized treatment
- Selected based on particular disease pathology
- Most importantly yields highest likelihood of success & cure

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