Advances in Breast Surgery

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Objectives

- Understand the surgical treatment of breast cancer
- Be able to determine when a lumpectomy or a mastectomy is indicated
- Be able to determine when a sentinel lymph node biopsy or an axillary lymph node dissection is indicated
- No financial relationships to disclose
Breast Cancer Treatment

- Surgery
- Radiation
- Chemotherapy
- Hormonal therapy
Breast Surgery

- Partial mastectomy
  - Lumpectomy
- Mastectomy
  - Followed by breast reconstruction

- Axillary Lymph Nodes
  - Sentinel lymph node biopsy
  - Axillary lymph node dissection
Diagnosing Breast Cancer

- The standard of care is for a needle biopsy to be performed prior to an operation for breast cancer
  - Fine needle aspiration
  - Core needle biopsy

Fine Needle Aspiration

- Involves using a handheld syringe and needle
- The sensitivity of FNA ranges from 65-98%
- Limitations:
  - Insufficient material may make diagnosis difficult
  - Does not capture histologic architecture

Diseases of the Breast, 4th ed. Harris, JR.
Core Needle Biopsy

- Slightly greater discomfort than FNA
- Provides more tissue than FNA and shows histologic architecture
- Can be performed by using:
  - Palpation
  - Mammogram guidance (stereotactic)
  - Ultrasound guidance
  - MRI guidance

Diseases of the Breast, 4th ed. Harris, JR.
Breast Surgery

- Partial mastectomy
  - Lumpectomy
- Mastectomy
  - Followed by breast reconstruction
- Axillary Lymph Nodes
  - Sentinel lymph node biopsy
  - Axillary lymph node dissection
Partial Mastectomy

- Multiple randomized phase III trials have shown that survival after lumpectomy with radiation is equivalent to mastectomy for the treatment of early stage invasive breast cancer.
- NSABP B-06 trial:
  - 1973-1980
  - 349 women underwent radical mastectomy
  - 352 women underwent lumpectomy followed by radiation
  - Conclusion:
    - Local recurrence was higher in the lumpectomy group
    - Long-term survival was similar in both groups

Partial Mastectomy Margins

- Margin status is related to local recurrence rates
  - Negative
  - Close
  - Positive

- The definition of “close” margins has been debated for many years

http://www.breastcancer.org/symptoms/diagnosis/margins
Society of Surgical Oncology–American Society for Radiation Oncology Consensus Guideline on Margins for Breast-Conserving Surgery With Whole-Breast Irradiation in Stages I and II Invasive Breast Cancer

Meena S. Moran, MD¹, Stuart J. Schnitt, MD², Armando E. Giuliano, MD³, Jay R. Harris, MD⁴, Seema A. Khan, MD⁵, Janet Horton, MD⁶, Suzanne Klimberg, MD⁷, Mariana Chavez-MacGregor, MD⁸, Gary Freedman, MD⁹, Nehmat Houssami, MD, PhD¹⁰, Peggy L. Johnson¹¹, and Monica Morrow, MD¹²
SSO/ASTRO Margins Consensus

- A meta-analysis of 33 studies on margin width and ipsilateral breast tumor recurrence
- 28,162 patients
- Results:
  - Positive margins are associated with a two-fold increase in ipsilateral breast tumor recurrence compared to negative margins
  - This increased risk is not improved by favorable biology, endocrine therapy, or a radiation boost
  - Wider margins than no ink on tumor does not significantly decrease the rate of ipsilateral breast tumor recurrence
- Conclusion: The standard for adequate margins in invasive cancer is no ink on tumor

Mastectomy

- Radical mastectomy
- Modified radical mastectomy
- Total or Simple mastectomy
- Skin-sparing mastectomy
- Nipple-sparing mastectomy

- Breast Reconstruction
Radical Mastectomy

- First described by Halsted and Meyer in the 1890s
- Removal of the breast with all overlying skin, levels I/II/III axillary lymph nodes, pectoralis major and minor
- Severe morbidity:
  - Large open wound
  - Lymphedema
  - Overall disability

Diseases of the Breast, 4th ed. Harris, JR.
The Changing Face of Mastectomy, Cancer Control October 2012, Vol. 19, No. 4
Modified Radical Mastectomy

- First introduced in 1948 by Patey and Dyson
- Removal of:
  - Entire breast
  - Levels I/II/III lymph nodes
  - Removal of pectoralis major fascia
  - Enough skin to allow primary closure
    - Includes removal of nipple areolar complex
- No muscles removed

Diseases of the Breast, 4th ed. Harris, JR.
The Changing Face of Mastectomy, Cancer Control October 2012, Vol. 19, No. 4
Total or Simple Mastectomy

- Removal of:
  - The entire breast
  - Enough skin to perform primary closure, including the nipple areolar complex
  - Pectoralis major fascia, but not the muscle itself

- No lymph nodes removed
Total or Simple Mastectomy

• NSABP B-04 trial: Initiated in 1971
  ◦ 1079 women with clinically negative axillary lymph nodes:
    • Radical mastectomy
    • Total mastectomy with radiation
    • Total mastectomy (without radiation)
  ◦ 586 women with clinically positive axillary lymph nodes:
    • Radical mastectomy
    • Total mastectomy with radiation
  ◦ No significant differences were observed among the three groups of women with negative nodes or between the two groups of women with positive nodes with respect to disease-free survival, relapse-free survival, distant-disease-free survival, or overall survival.

Diseases of the Breast, 4th ed. Harris, JR.
NSABP Clinical Trials Overview: http://www.nsabp.pitt.edu/B-04.asp
Skin-Sparing Mastectomy

- First described by Toth and Lappert in 1991
- Requires removing the breast tissue and nipple areolar complex, while maintaining as much of the skin as possible
- The skin envelope allows more options with breast reconstruction

Skin-Sparing Mastectomy

- Multiple studies have compared skin-sparing mastectomy to total mastectomy, and found similar local recurrence and survival rates.

- Emory, 1997
  - Compared 327 SSM and 188 non-SSM
  - Mean follow-up 41.3 months
  - Local recurrence
    - SSM 4.8%
    - Non-SSM 9.5%

Skin-Sparing Mastectomy

- Emory 2003:
  - Retrospective review of 565 SSM cases
  - Mean follow-up of 78.1 months

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<th>Stage</th>
<th>Total</th>
<th>N</th>
<th>%</th>
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<tr>
<td>0</td>
<td>175</td>
<td>1</td>
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<td>I</td>
<td>135</td>
<td>5</td>
<td>3.0</td>
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<td>II</td>
<td>173</td>
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<tr>
<td>III</td>
<td>54</td>
<td>6</td>
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<td>IV</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Recurrent</td>
<td>20</td>
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<tr>
<td>Overall</td>
<td>565</td>
<td>31</td>
<td>5.5</td>
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Fig. 3. LRs stratified by tumor staging.

Nipple-Sparing Mastectomy

- First case report was presented in 1999 at the Southwestern Surgical Congress

- One of the first series was published in the Annals of Surgery in 2003
  - Compared nipple sparing mastectomy to skin sparing mastectomy, to modified radical mastectomy

The Changing Face of Mastectomy, Cancer Control October 2012, Vol. 19, No. 4
Ann Surg 2003;238: 120–127
Nipple-Sparing Mastectomy

- No significant difference in local recurrence, distant metastases, or mortality rates

### TABLE 3. Follow-up Data

<table>
<thead>
<tr>
<th></th>
<th>SSM with NAC Conservation (n = 61)</th>
<th>SSM without NAC Conservation (n = 51)</th>
<th>MRM (n = 134)</th>
<th>P</th>
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<tbody>
<tr>
<td>Local recurrences</td>
<td>3 (5%)</td>
<td>3 (6%)</td>
<td>11 (8%)</td>
<td>0.666</td>
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<tr>
<td>Distant metastases</td>
<td>14 (23%)</td>
<td>10 (20%)</td>
<td>28 (21%)</td>
<td>0.906</td>
</tr>
<tr>
<td>Death</td>
<td>9 (15%)</td>
<td>5 (10%)</td>
<td>17 (13%)</td>
<td>0.733</td>
</tr>
</tbody>
</table>

*Ann Surg 2003;238: 120–127*
Nipple-Sparing Mastectomy

- Selective patient population:
  - Tumor/calcifications located >2cm from nipple areolar complex
  - Tumors <3cm in size
  - Negative intraoperative biopsy of the nipple areolar tissue
  - Post-operative radiation is unlikely
  - Patient determined to be a candidate based on plastic surgery evaluation

- Great prophylactic option for BRCA1/2 positive patients
- Usually followed by implant reconstruction
- Possible complications:
  - Loss of nipple sensation
  - Nipple necrosis

Diseases of the Breast, 4th ed. Harris, JR.
The Changing Face of Mastectomy, Cancer Control October 2012, Vol. 19, No. 4
Breast Reconstruction

- Women’s Health and Cancer Rights Act of 1998
  - Requires all insurance providers to provide benefits covering:
    - Breast reconstruction after mastectomy
    - Surgery for the other breast to produce a symmetrical appearance

Breast Reconstruction

- **Implant Reconstruction**
  - Tissue expanders often placed at initial operation
  - Saline implants
  - Silicone implants

- **Autologous Tissue Flaps**
  - Transverse rectus abdominis myocutaneous (TRAM) flap
  - Deep inferior epigastric perforator (DIEP) flap
  - Latissimus dorsi myocutaneous flap
    - With or without implant

Diseases of the Breast, 4th ed. Harris, JR.
Implant Reconstruction

American Society of Plastic Surgeons: http://www.plasticsurgery.org/reconstructive-procedures/breast-reconstruction-procedural-steps#content
Autologous Tissue Flaps

TRAM or DIEP flaps

Latissimus dorsi flap

American Society of Plastic Surgeons: http://www.plasticsurgery.org/reconstructive-procedures/breast-reconstruction.html?sub=Breast+reconstruction+procedural+steps#content
Lumpectomy vs. Mastectomy

- How do we decide which patients should have a lumpectomy and which should have a mastectomy?
Reasons for Lumpectomy

- Early stage breast cancer
- Tumor that is small in relation to breast size
  - There should be minimal change in the shape of the breast after a lumpectomy
- Patient agrees to radiation treatment
- Patient has completed neoadjuvant chemotherapy with a good tumor response
- Patient agrees to future imaging of the involved breast, often occurring every 6 months.
- Lumpectomy maintains mostly normal breast sensation

Diseases of the Breast, 4th ed. Harris, JR.
Reasons for Mastectomy

- BRCA1 or BRCA2 positive
- Tumor is large in size, and would result in an abnormally-shaped breast if a lumpectomy would be performed
- Multicentric breast cancer
- Multiple attempts at breast conservation result in persistently positive margins
- Patient is unable to have radiation
  - Prior radiation to the breast region
  - Mantle radiation for Hodgkin’s lymphoma
  - Pregnancy
- Patient does not desire radiation, which can often be avoided with mastectomy
- Patient does not desire future imaging of the involved breast
- Patient preference

Diseases of the Breast, 4th ed. Harris, JR.
Management of the Axilla

- The status of the axilla is an important prognostic indicator for overall survival
- Axillary lymph node dissection
- Sentinel lymph node biopsy
Axillary Lymph Node Dissection

- Removal of all level 1 and level II lymph nodes
- Indications:
  - Preoperative diagnosis of axillary node metastasis by FNA or core biopsy
  - Positive SLN in a patient undergoing a mastectomy
  - Failed SLN biopsy
  - Clinically suspicious lymph nodes found at surgery
  - Neoadjuvant chemotherapy
- Side effects:
  - Lymphedema in ~13% of patients
  - Axillary sensory loss in 31% of patients

Diseases of the Breast, 4th ed. Harris, JR.
Sentinel Lymph Node Biopsy

- Used for patients that are clinically node negative
- Lymphatic mapping was introduced at the John Wayne Cancer Institute in 1991
- Locates the first lymph nodes in the chain by using technitium, lymphazurin, or methylene blue
- Multiple validation studies
- NEJM 1998: 443 patients received an injection of technetium-99m sulfur colloid
  - All patients underwent a complete axillary dissection
  - 93% sentinel lymph node was identified
  - 97% sentinel lymph node accuracy with respect to the positive or negative status of the axillary lymph nodes

Diseases of the Breast, 4th ed. Harris, JR.  
NSABP B-32 Trial

Clinically Negative Axillary Nodes

Stratification
- Age
- Clinical Tumor Size
- Type of Surgery

Randomization

Group 1
Sentinel Node Resection* Followed by Axillary Dissection

Group 2
Sentinel Node Resection*

Pathologically Positive Sentinel Node
Axillary Dissection

Pathologically Negative Sentinel Node
No Axillary Dissection

http://www.nsabp.pitt.edu/B-32.asp
NSABP B-32 Trial

- Overall survival, disease-free survival, and regional control were statistically equivalent between groups.

ACOSOG Z0011 Trial

- Inclusion criteria:
  - Clinical T1-T2 invasive breast cancer
  - No palpable axillary lymphadenopathy
  - 1-2 sentinel lymph nodes containing metastases on pathology evaluation
- All patients underwent lumpectomy followed by radiation
- Those with sentinel lymph node metastases were randomized to undergo axillary lymph node dissection or no further axillary treatment
- Trial closed early because mortality rate was lower than expected

*JAMA* 2011; 305(6):569–575.
ACOSOG Z0011 Trial

Figure 2. Survival of the ALND Group Compared With SLND-Alone Group

ALND indicates axillary lymph node dissection; SLND, sentinel lymph node dissection.

JAMA 2011; 305(6):569–575.
Summary

- The standard of care for diagnosing breast cancer is with a needle biopsy prior to an operation.
- The operations for breast cancer include lumpectomy, mastectomy, sentinel lymph node biopsy, and axillary lymph node dissection.
  - The type of operation is chosen by considering the patient’s tumor characteristics, and their own desires.
- The SSO/ASTRO consensus statement supports no ink on tumor as an adequate margin for invasive breast cancer after a lumpectomy.
- The Z0011 trial supports that axillary lymph node dissection is not necessary in early stage breast cancer for patients undergoing a lumpectomy followed by radiation.