2 D Plan post BCS

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EPIDEMIOLOGY

• Incidence:
  • Most common lethal neoplasm in women
  • Incidence different among different populations.
  • 1 out of 8 will develop BC in lifetime.
  • 25 % women with cancer have BC
  • Incidence of BC in males is 1 %
• Increasing incidence in India
• Multimodality approach
• Radiotherapy – Major role
• Adjuvant Radiotherapy – Post operative
• External Beam Radiotherapy, Brachytherapy
• Newer Concepts – IMRT, Partial Breast Irradiation, Mammosite, Internal Mammary Brachytherapy
Role of radiation in the management of breast cancer

• Has been in continual evolution since its inception, a century ago.
• Initially used for only palliating distressing symptoms
• As a routine post-op adjuvant therapy for all mastectomy patients
• Currently RT is used as adjuvant treatment and to palliate symptoms
Role of RT in Breast Cancer

- Preoperative RT.
- Post-mastectomy RT.
- Conservative surgery + RT.
- Palliative RT.
Conservative breast therapy (CBT)

Surgery (?) Lumpectomy + ? axillary LN
+ Radical RT.
± Adjuvant Systemic therapy.
Breast Surgery - History

- Amputation, Renaissance
- Radical mastectomy, 1882
  Halsted
- Modified Radical Mastectomy (MRM), 1932 - Patey
- Breast conservation/Lumpectomy, 1980s
- Reconstruction, 1980-90s
Breast Surgery - Options

Breast-Conserving Surgery

Wide Excision

Lumpectomy
Breast Conservation

- Excise tumor and surrounding margin
- Cosmetic result variable
- Radiation therapy post-operatively
Breast Conservation Versus Mastectomy

For most women, breast conservation therapy is as good as mastectomy.

- Contraindications remain
- Multicentric disease
- Inability to obtain negative margins
- Breast lesion and breast size
- Contraindication to radiation therapy
- Patients' preference
- Compliance
Breast Conservation/Radiation

Overview Analysis of 9 Randomized Controlled Trials with 2400 patients per arm confirms equivalent survival with Mastectomy

NEJM 1995;333,1444
In 1992, the Journal of the National Cancer Institute published a monograph that stated that breast conservation treatment is an appropriate method of primary therapy for most women with stage I or II breast cancer and is preferable because it provides survival equivalent to that of total mastectomy and axillary dissection while preserving the breast.
Skin Sparing Mastectomy

- Breast Conservation not available to all patients (approx 30%)

- Aesthetic Considerations:
  - Smaller Incisions
  - Skin Envelope Retained
  - Symmetry with opposite breast
What to do with the lymph nodes ????
Sentinel Lymph Node Biopsy (SLNB)

Definition
- "gate-keeper" or first echelon node to drain a tumor, i.e. primary breast cancer

Focuses on
- Identify node-negative patients
  - Avoid unnecessary node dissection
  - Complete node dissection
- Identify node-positive patients
  - Systemic therapy
  - XRT
Sentinel Node Biopsy

- Conservative surgical procedure
- Remove one or few LNs (sentinel node)
- If cancer-free, other nodes left intact
- If sentinel node is +, other nodes removed mostly
Breast Reconstruction

- Options based on patient preference and available tissue
- Implants (Saline and Silicone)
- Autogenous Tissue (Rectus Muscle and Latissimus Dorsi Muscle)
Pre and Post Expander and Implant
TRAM Flap
Gluteal Free Flap

• If not candidate for TRAM

• Use tissue from upper or lower buttock

• Recommended for
  ✓ < 45 years old
  ✓ Flat abdomen
  ✓ Scars

• Not candidate for implants
Gluteal Free Flap

- Limited ability to create breast that is large
- Soft and natural slope
- Mild flattening at buttock donor site
- Gluteal muscle completely detached
- Microsurgery needed
Gluteal Free Flap
Latissimus Dorsi Flap

- Alternative to TRAM flap
- Borrows skin and muscle from upper back
- While tissue partially attached, it is slid underneath the skin from back to front
- Provides much of the needed skin but not tissue volume
- Need tissue expander
Skin from back for new breast

Latissimus Dorsi Muscle
Whole Breast Radiotherapy

• Whole breast RT following lumpectomy has an important role in the treatment of early stage breast cancer

• Potential side effects:
  – Acute: painful erythema & desquamation
  – Chronic: hyper-pigmentation, fibrosis, fat necrosis, pain

• The incidence and severity of side effects is managed by minimizing “hot spots”
TECHNIQUES OF IRRADIATION

• Breast or Chest wall: Two tangential fields to prevent RT to lungs. Not > 2.5 cms
• Newer techniques like IMRT can spare lung
• Use of Breast Wedge Boards
• Wedge filters needed to decrease dose to nipple and for homogenous dose distribution
• Lower axilla included in tangential fields
Basic necessity...

• Accurate Positioning

• Proper Immobilization
POSITION

- Supine position
- Arm (involved side) elevated
- Face turned away
- Symmetrical & straight
- Elevate both arms
- Head straight
Problems

1. Ability to raise ARM
2. Skin folds
3. CT aperture
Breast Board

Breast Wedge Board

Different Electron Applicators
Steps of Planning

- Marker Placement
- Simulation
- Contour
- 2 D Plan Generation
- Verification
- Execution of Treatment Plan
MARKER PLACEMENT
Marker Alignment
Collimation
WIRE FOR CONTOURING
TPS Planning
Beam Placement
Verification of Plan
Lateral Decubitus Position
Prospective trial of individual optimal positioning (prone vs supine) for whole breast radiotherapy: results of 224 patients
Abstract # 4082 Formenti, et al.
Prone Position
Prospective trial of individual optimal positioning (prone vs supine) for whole breast radiotherapy: results of 224 patients

Abstract # 4082 Formenti, et al.

CONCLUSIONS:
Prone enables best sparing of heart and lung in most patients (204/224)
Most patients best treated supine (17/20) had left-sided lesions

When prone, heart is displaced anteriorly 5-19 mm (Duke)
May limit utility of prone technique
BCT
Role of RT

I- Is RT essential?
II- The RT volume.
III- The RT dose.
IV- The RT boost.
BCT
RT (cont.)

I- Is RT essential?

Cumulative incidence of noninvasive and invasive ipsilateral breast cancers in women treated by lumpectomy (open circles) or lumpectomy and radiation therapy (solid circles).
Overall survival in EORTC trial comparing breast-conserving with MRM in early stage

Overall log-rank test: $P = 0.1119$

<table>
<thead>
<tr>
<th>Year</th>
<th>Treatment</th>
<th>number of patients at risk</th>
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</table>
| 1 | Mastectomy | 401
| 2 | Mastectomy | 366
| 3 | Mastectomy | 329
| 4 | Mastectomy | 289
| 5 | Mastectomy | 266
| 6 | Mastectomy | 194
| 7 | Mastectomy | 82
| 8 | BCT | 14
| 9 | BCT | 17
| 10 | BCT | 14
| 11 | BCT | 14
| 12 | BCT | 14
| 13 | BCT | 14
| 14 | BCT | 14
| 15 | BCT | 14
| 16 | BCT | 14
| 17 | BCT | 14
| 18 | BCT | 14

(years)
The RT volume:
The treatment portal for the breast only, in patients with $\leq 3 + ve$ LN who receive adjuvant chemotherapy.
BCT
RT (cont.)
II- The RT volume (cont.)
(A and B) Examples of localization films of tangential breast portals demonstrating the amount of lung to be included in the field.
Irradiation of the breast. Field configurations and isodose lines for 6-MV photons. (A) "Standard tangents" technique. (B) Deep tangents technique. (C) En face internal mammary field (IMF) technique. (D) Twenty-degree IMF technique.
BCT
RT (cont.)

III- The RT dose.

Whole breast ± Peripheral lymphatics:
5000 cGy / 25 fractions / 5 weeks
Or its biological equivalent dose.
BCT
RT (cont.)
IV- The RT boost.

- Patients after Bt RT (n = 5318) were randomised between a boost of 15-16 Gy or no boost.

- Age: The most important prognostic factor.
  - Patients < 41: Local failure rate was reduced at 5 years from 19.5 to 10.2%.
  - Patients > 50: limited benefit of boost.
Brachytherapy as a boost

- Interstitial implant
- Plastic tubes or steel needles
- Two fractions per day with 6 hours gap in between
- 250 – 300 cGy X 5 – 6 fractions
- Iridium 192, Microselectron HDR
Electron Boost Field
TO SUMMARISE

TECHNIQUES OF IRRADIATION

• Chest wall or Breast: Two tangential fields to prevent RT to lungs. Not > 2.5 cms.
• Wedge filters needed to decrease dose to nipple and for homogenous dose distribution
• Lower axilla included in tangential fields
DOSES

- Post operative RT 50 Gray in 25 fractions is sufficient to eradicate microscopic disease
- Boost RT over recurrent disease or primary disease in conservative surgery is given 10 – 20 Gy
- Inoperable breast cancers 60 – 70 Gy
Peripheral Lymphatic Irradiation

- Axillary, supraclavicular and internal mammary
- Not needed in outer quadrant disease & negative nodes in axilla
- With inner or central disease, RT to supraclavicular and internal mammary region is needed
- RT to all fields with +ve axillary nodes