Understanding Radiation Therapy

Tamara A. LaCouture, M.D.
Chief & Chair Department of Radiation Oncology
Cooper University Hospital
Assistant Professor Radiation Oncology Cooper Medical
School of Rowan University
Medical Director South Jersey CyberKnife at Cooper
Why is Radiation Even Necessary after Surgery?
Breast Conservation Therapy

- Radiation following lumpectomy
- Standard fractionation requires 6 to 7 weeks of therapy
- Initial radiation field includes the entire breast for first 5 to 5½ weeks
- “Boost” radiation field includes the tissue immediately surrounding the site of the initial tumor for the last 1 to 1½ weeks
- Therapy begins 3 to 6 weeks following surgery if no chemotherapy planned
- If chemotherapy planned, radiation begins 4 weeks following completion of chemotherapy
- Partial Breast Radiation shorter course and altered fields
Why Is Radiation Necessary Following Lumpectomy?

Invasive Carcinoma

- Reduces risk of local recurrence in the breast
- Studied in randomized trials of > 1200 women (NSABP B-06)
- Compared to prior standard of mastectomy has been determined to provide equal local tumor control
- 20yr FU: Local recurrence 40-50% vs. 14%
- Reduces risk in all tumor sizes
- No change in overall survival
- Ability to omit radiation in certain patient populations has been studied
Why Is Radiation Necessary Following Lumpectomy?  
Non-invasive Carcinoma

- Reduces risk of local recurrence in the breast by more than 50%
- Studied in randomized trials of > 800 women (NSABP B-17)
- Most significantly reduces the risk of an invasive local recurrence (12 yr actuarial 31% vs. 15%)
- No change in overall survival
- Ability to omit radiation in specific patient groups is controversial (Grade 1, < 1cm tumor, >1cm resection margin)
Post-mastectomy Therapy

- Requires 5 to 6½ weeks of daily therapy
- If chemotherapy delivered, begins 4 weeks following chemotherapy completion
- Therapy begins 3 to 6 weeks following surgery without chemotherapy
- Radiation field includes chest wall tissues and draining lymph nodes
- The need for a ”boost” field within chest wall tissues is determined by tumor factors and presence/absence of reconstruction
- Treatment position the same as that for breast conservation therapy
Post-Mastectomy Therapy Reconstruction

- Safety well documented in the setting of breast reconstruction
- With immediate reconstruction using tissue expanders, commences after full expansion complete
- Placement of permanent implant can occur as little as 2 months following completion of radiation but usually occurs 6 months or more following completion
- Flap reconstruction can tolerate exposure to radiation
- Flap reconstruction is the option for delayed reconstruction in the setting of post-mastectomy radiation
Special Consideration: BRCA Mutation Carriers

- Considerable controversy in the use of BCT and XRT
- These genetic mutations account for 5% of all breast cancers
- Appear to have similar survival to age and stage matched patients with sporadic disease
- Pierce et al published a 10 year review of 160 mutation carriers and 445 controls (JCO 2006)
- No statistically significant increase in ipsilateral breast tumor recurrence (IBTR) in mutation positive pts
Role of Radiation Therapy Following Modified Radical Mastectomy

• Traditionally recommended to patients with:
  ~ Four or more axillary lymph nodes involved
  ~ Locally invasive tumor characteristics & inflammatory cancer (T3 or T4)
  ~ Tumor cells within the deep margin of resection

• New data suggests consideration in patients with 1-3 positive lymph nodes
Role of Post-mastectomy Radiation (Continued)

• Reduces the risk of local recurrence in the chest wall tissues
• Reduces the risk of local recurrence within the lymph nodes
• Studied in randomized trials
• Possible improvement in overall survival in patients with 1-3 positive lymph nodes has now expanded the use in this patient population
Radiation Techniques

- Three Dimensional Conformal therapy
- Intensity Modulated Radiation Therapy
- Accelerated Partial Breast Irradiation (APBI)
  1. Brachytherapy
  2. External Beam technique (3D or IMRT)
Three Dimensional Conformal Therapy/IMRT Therapy

- Treatment planning performed with CAT Scan
- Pre-op mammograms referenced
- Surgical clips placed in tumor bed by surgeon at the time of lumpectomy
- Doses precisely calculated to target volume
- Dose and volume of normal tissue can be precisely calculated and limited in the treatment planning process
- With IMRT, the radiation beam itself is varied in strength throughout each treatment field to produce a distribution optimized for maximal tumor dose and minimal normal tissue dose
“Partial” Breast Irradiation

- Prospective randomized clinical trials using both external beam therapy and brachytherapy (Mammosite, Savi, etc)
- Results of randomized trial remain pending
- Retrospective reviews have suggested certain subsets of patients for which this may be appropriate with local control suggested to be equivalent to lumpectomy+XRT

Required criteria:
1. Small ($\leq$ 3cm) lesions
2. Non-lobular invasive histology
3. $\leq$ 3 lymph nodes involved without extracapsular extension (node positive patients on clinical trial only)
4. Tumor bed that can be adequately visualized for planning
5. Single focus of disease
6. Negative surgical margins
“Partial” Breast Irradiation

Advantages:
1. Shorter Course
2. Treatment of a smaller volume of breast tissue
3. Reduced treatment toxicity
4. Reduced exposure of surrounding normal tissue
5. Early randomized reports suggesting similar tumor control compared to long course radiation

Disadvantages:
1. Lack of long-term randomized data in US
2. Strict requirements for consideration based on tumor characteristics and patient anatomy
MammoSite

https://www.beaumonthospitals.com/radiation-therapy-breast-cancer-treatment
SAVI – Strut Adjusted Volume Implant
More flexible to tailor the dose to the shape of tumor bed
SAVI applicator in breast
SAVI Expands options for treatment planning
SAVI Expands options for treatment planning
Side Effects During Radiation

- Only involve tissue where radiation is delivered
- Skin irritation
- Mild swelling of the breast or chest wall tissues
- Possible minimal decrease in blood counts
- Mild fatigue
Side Effects During Radiation

Skin reaction:

- Cleansing with moisturizing soap and water is the only recommendation supported by research to reduce the severity of the skin reaction.
- Many skin products commonly used, however, no studies have ever shown that these reduce radiation side effects.
- Avoidance of most deodorant/antiperspirant preparations due to risk of further skin irritation.

Possible reduced blood counts:

- Bloodwork checked routinely.
- No specific dietary or medication changes to increase blood counts.
- Dangerous drop in blood counts very unlikely.
Side Effects During Radiation

Fatigue:

• Not a clear reason why this happens during radiation even if blood counts are normal
• May be related to change in daily schedule for the radiation over 6+ weeks
• Usually mild …can be moderate if a patient has had chemo
• Tell your doctor…..so that blood counts can be checked if not recently performed
• Well-balanced diet is important for ongoing health
• Listen to your body and rest!!
Late Side Effects

Thickening of tissue of breast/chest wall or residual tanning of skin:
• Managed with aggressive skincare (moisturize & massage)

Ipsilateral arm swelling (lymphedema):
• Proactive Physical Therapy consult pre-Radiation with lymphedema specialist in high risk patients (pts undergoing full lymph node surgery and/or inclusion of lymph nodes in radiation fields)
• Education on signs and symptoms of lymphedema as well as risk-reduction strategies

Possibility of severe complications (cardiac, pulmonary, second malignancy) VERY small with modern radiation techniques
Summary

- Radiation therapy is an integral component of the multispecialty management of breast cancer
- Well tolerated

Research is evaluating:
1. New techniques
2. Ability to deliver therapy to smaller volumes of normal tissue with lower doses
3. Ability to possibly avoid radiation therapy entirely in selected populations
Thank You!!


8. www.RTOG.org (active protocols: NSABP B-39/RTOG 0413)

9. www.cancer.gov (extensive patient education materials on diverse topics including lymphedema)