



Update on Breast Radiation

May 19, 2018

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Chief, Breast Radiation Oncology

ORLANDO
HEALTH®

Disclosures

- Employed physician at Orlando Health

Educational Objectives

- Rationale for radiation therapy in DCIS
- Rationale for radiation therapy in invasive breast cancer
 - Who needs radiation and who does not?
- Logistics of radiation therapy
 - Conventional schedules
 - Accelerated schedules
- Proton therapy

Following the evidence



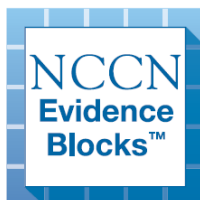
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NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®)

Breast Cancer

NCCN Evidence Blocks™

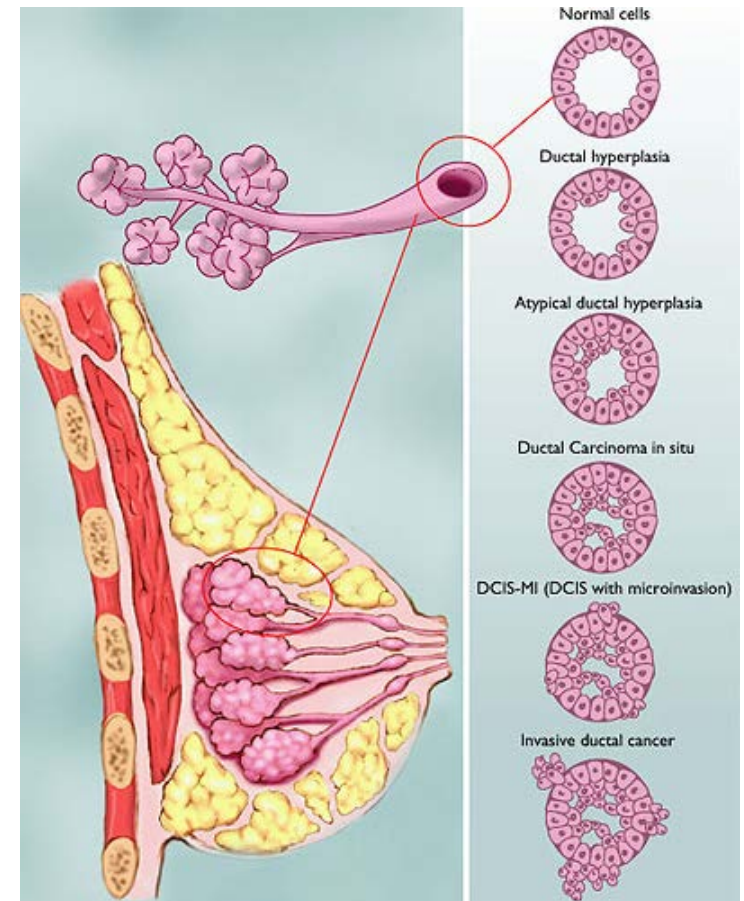
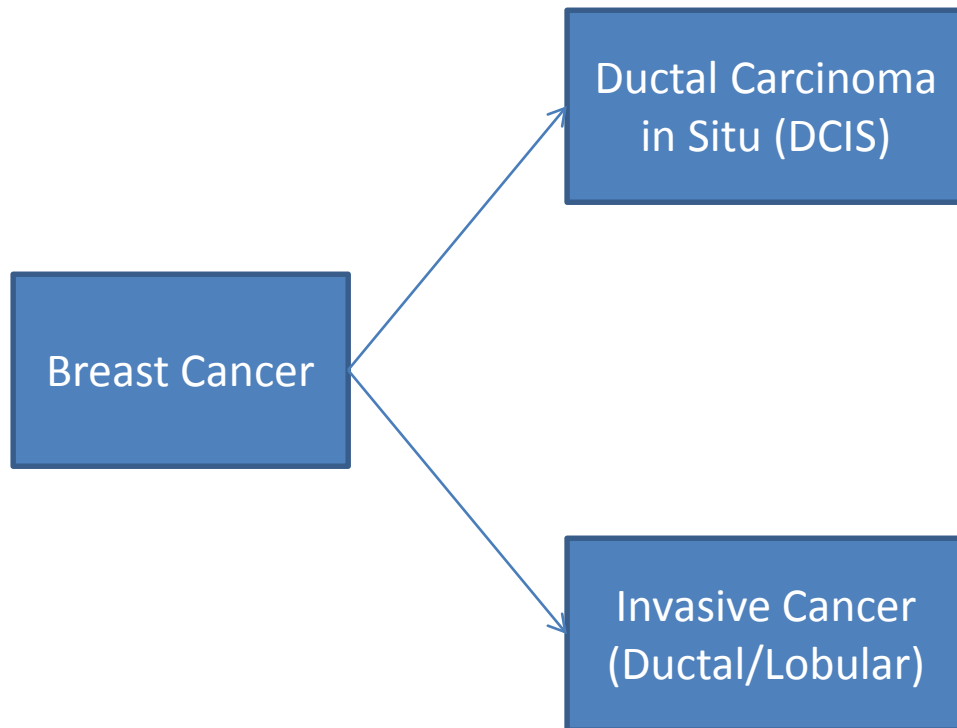
Version 1.2018 — April 23, 2018



NCCN.org

Continue

DCIS vs invasive breast cancer



DCIS treatment



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NCCN Guidelines Version 1.2018 Ductal Carcinoma in Situ (DCIS) NCCN Evidence Blocks™

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DIAGNOSIS

WORKUP

PRIMARY TREATMENT

DCIS
Tis, N0, M0

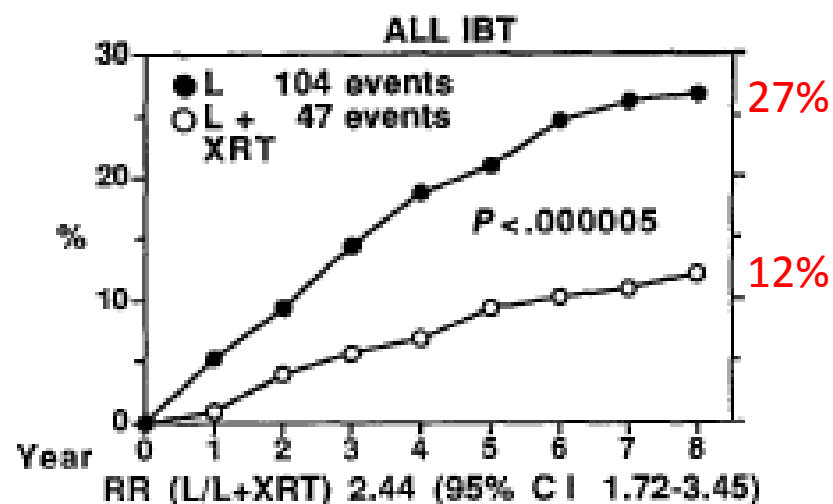
- History and physical exam
- Diagnostic bilateral mammogram
- Pathology review^a
- Determination of tumor estrogen receptor (ER) status
- Genetic counseling if patient is high-risk for hereditary breast cancer^b
- Breast MRI^{c,d} as indicated

Lumpectomy^e without lymph node surgery^f
+ whole breast radiation therapy (category 1) with or
without boost to tumor bed^{g,h,i,j}
or
Total mastectomy with or without sentinel node
biopsy^{f,h} + reconstruction (optional)^k
or
Lumpectomy^e without lymph node surgery^f without
radiation therapy^{g,h,i,j} (category 2B)

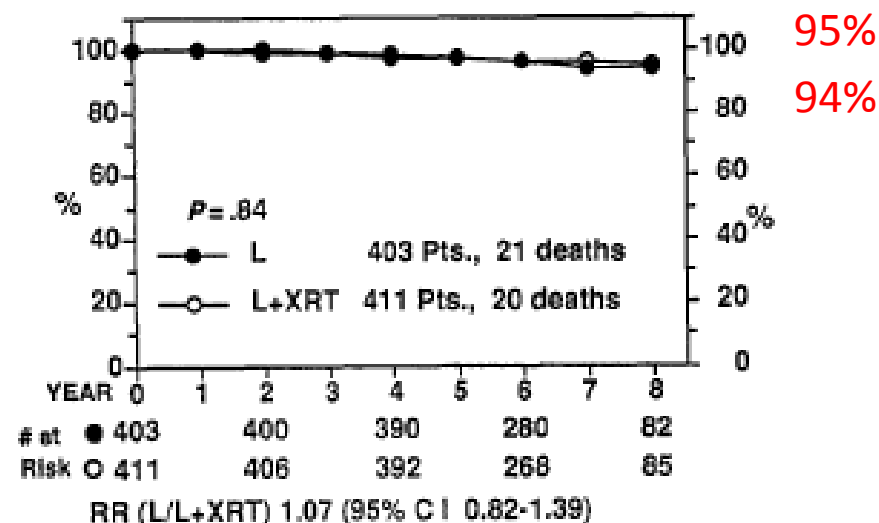
[See
Postsurgical
Treatment
\(DCIS-2\)](#)

NSABP B-17 Trial (lumpectomy)

In-Breast Tumor Recurrence



Overall Survival



DCIS treatment



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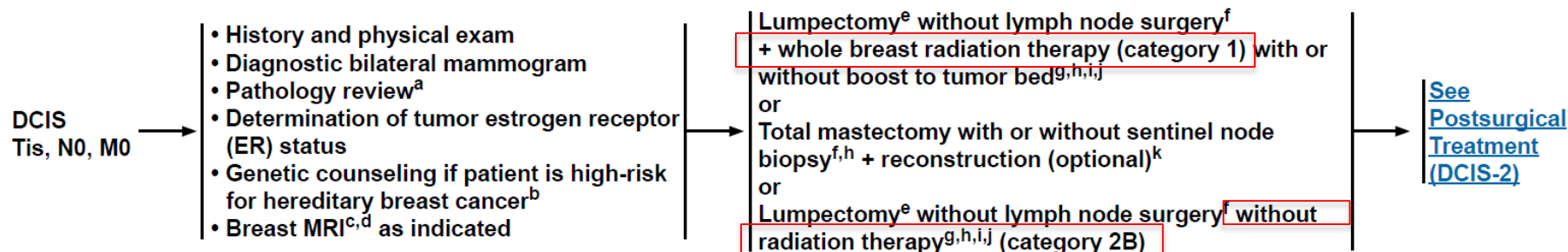
NCCN Guidelines Version 1.2018 Ductal Carcinoma in Situ (DCIS) NCCN Evidence Blocks™

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DIAGNOSIS

WORKUP

PRIMARY TREATMENT




Nomogram prediction



Memorial Sloan-Kettering
Cancer Center

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mskcc.org
PREDICTION TOOLS

TEXT SIZE 

[Prediction Tools](#) | [Breast Cancer Nomograms](#) | [Ductal Carcinoma Recurrence](#)

Breast Cancer Nomogram: Ductal Carcinoma In Situ (DCIS) Recurrence

In consultation with a physician, this tool can be used by patients who have had breast-conserving surgery to treat ductal carcinoma in situ (DCIS) to predict the likelihood that their breast cancer will return in the same breast that was originally treated. Patients can use this information to make decisions regarding various treatment options, such as radiation therapy and anti-estrogen therapy.

Enter Your Information

Clear

Calculate

Age at Diagnosis
Enter age at the time of diagnosis.

65 years old (25 to 90)

Family History?
Select YES if there are first- (e.g., mother or sister) or second-degree (e.g., paternal aunt or grandmother) relatives with breast cancer.

☐ YES

Presentation
Select Clinical if there was an abnormality on physical examination; select Radiologic if an abnormality was seen only on breast imaging studies (e.g., mammography).

Radiologic

Adjuvant Radiation Therapy?
Select YES if radiation therapy is given after breast-conserving surgery.

☐ YES

Adjuvant Endocrine Therapy?
Select YES if anti-estrogen treatment (e.g., tamoxifen, raloxifene).

☐ YES

Nuclear Grade
Select the nuclear grade from the pathology report. (Low = slight or no variation in the size and shape of the cell nuclei; Intermediate/High = moderate to marked variation in the size and shape of the cell nuclei.)

Intermediate or High

Necrosis?
Select YES if the pathology report states that there was necrosis associated with the DCIS.

☒ YES

Surgical Margins
Select "Negative" if there is a margin width of at least 2 mm. Select "Positive or Close" if margin width is 2 mm or less.

Negative

Number of Surgical Excisions
Indicate the number of surgical excisions that were required.

1 excisions (1 to 4)

Year of Surgery
Indicate the year surgery was performed.

2013 year (1991 to present)

Your Results

[Learn more](#) about your results below.


Probability of Recurrence	5 Year	9%
	10 Year	14%


Print These Results

Make an Appointment

Call us to schedule an appointment or contact us online

[Contact Us](#)





+ XRT (5%)
+ AI (7%)

Your Results

[Learn more](#) about your results below.

Probability of Recurrence	5 Year	2%
	10 Year	3%

Print These Results

Genomic prediction

Breast DCIS Score Report

oncotype^{DX}
Breast DCIS Score

PATIENT, SAMPLE

Date of Birth: 01-Jan-1950

Gender: Female

Report Number: OR000123456-01

Report Date: 01-Aug-2017

Ordering Physician: Dr. First-Name I. Ordering-Physician-Last-Name

Breast DCIS ScoreTM Result

10



What does a Breast DCIS Score of 10 mean?

Based on your patient's age, tumor size, and Breast DCIS Score result of 10, your patient's risk of any local recurrence within 10 years is 6%, if treated with breast-conserving surgery alone.

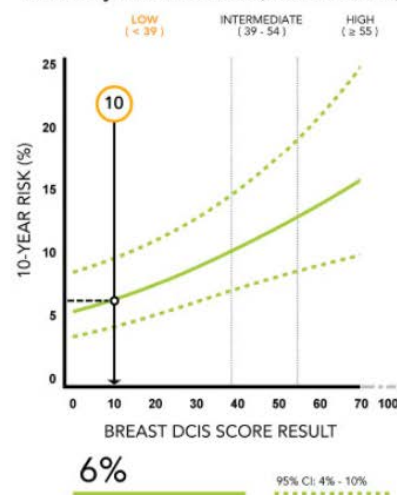
10-Year Risk of Local Recurrence (PROGNOSIS)

E5194 & Ontario Cohort Meta-analysis

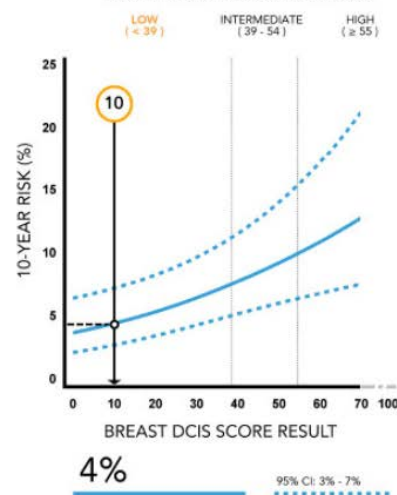
Age Category ≥ 50 years old, Tumor Size ≤ 1.0 cm

The Breast DCIS Score validation was derived from two studies, E5194 with 327 patients and the Ontario DCIS Cohort Study with 571 patients. The studies consisted of diverse DCIS patient populations treated with breast-conserving surgery alone. The results below reflect a meta-analysis with 773 patients of the two studies incorporating patient age and tumor size with the Breast DCIS Score result to estimate 10-year risk. The meta-analysis excluded patients whose tumors were multifocal and/or had positive margins.¹⁻³

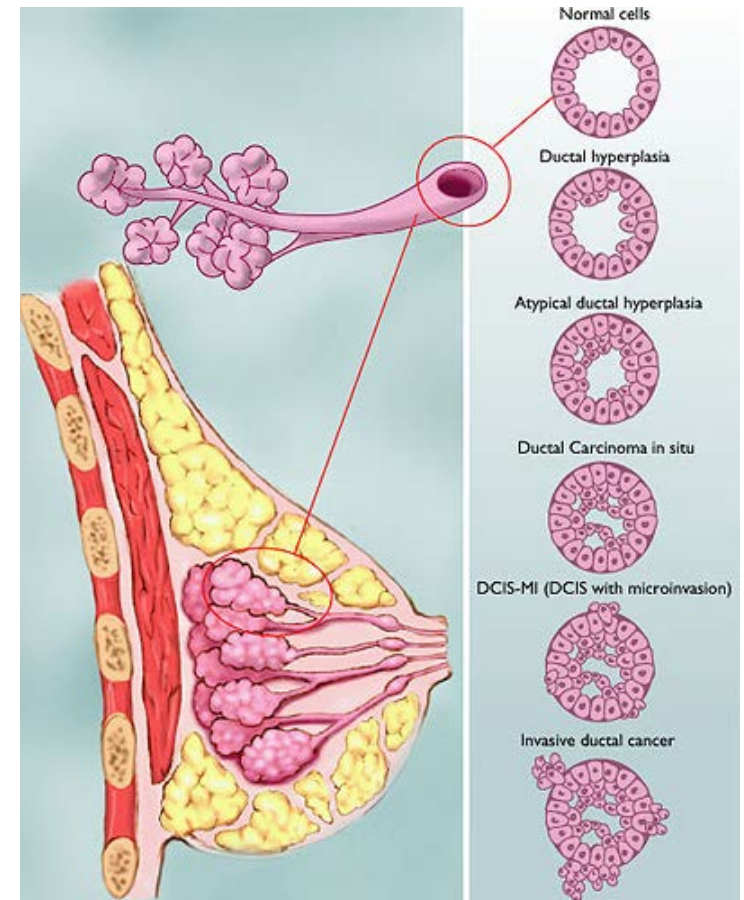
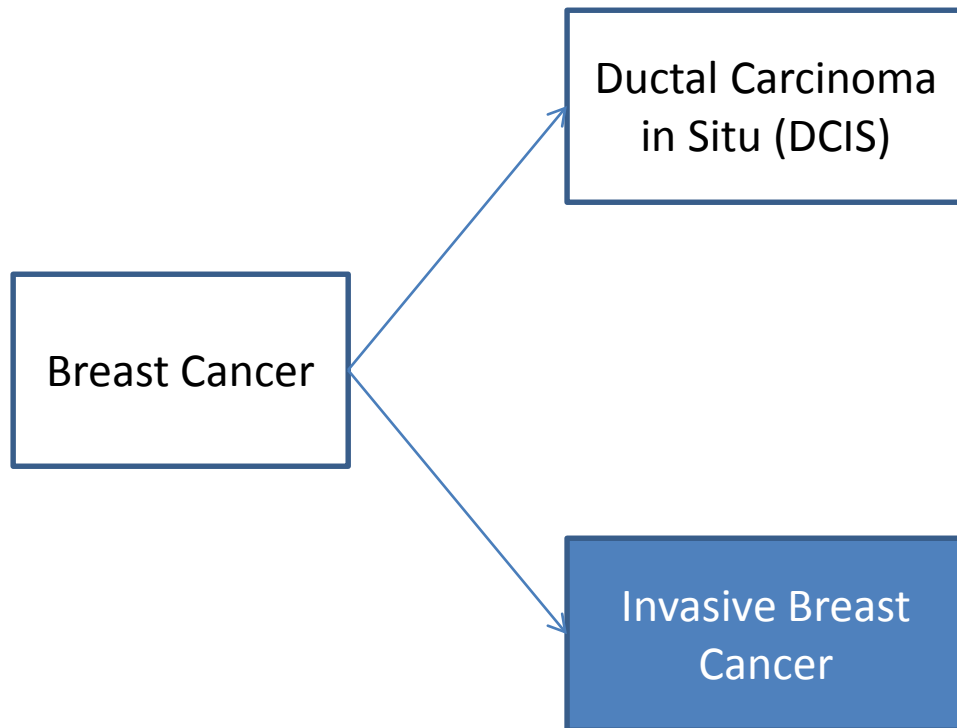
Risk of Any Local Recurrence (DCIS or Invasive)



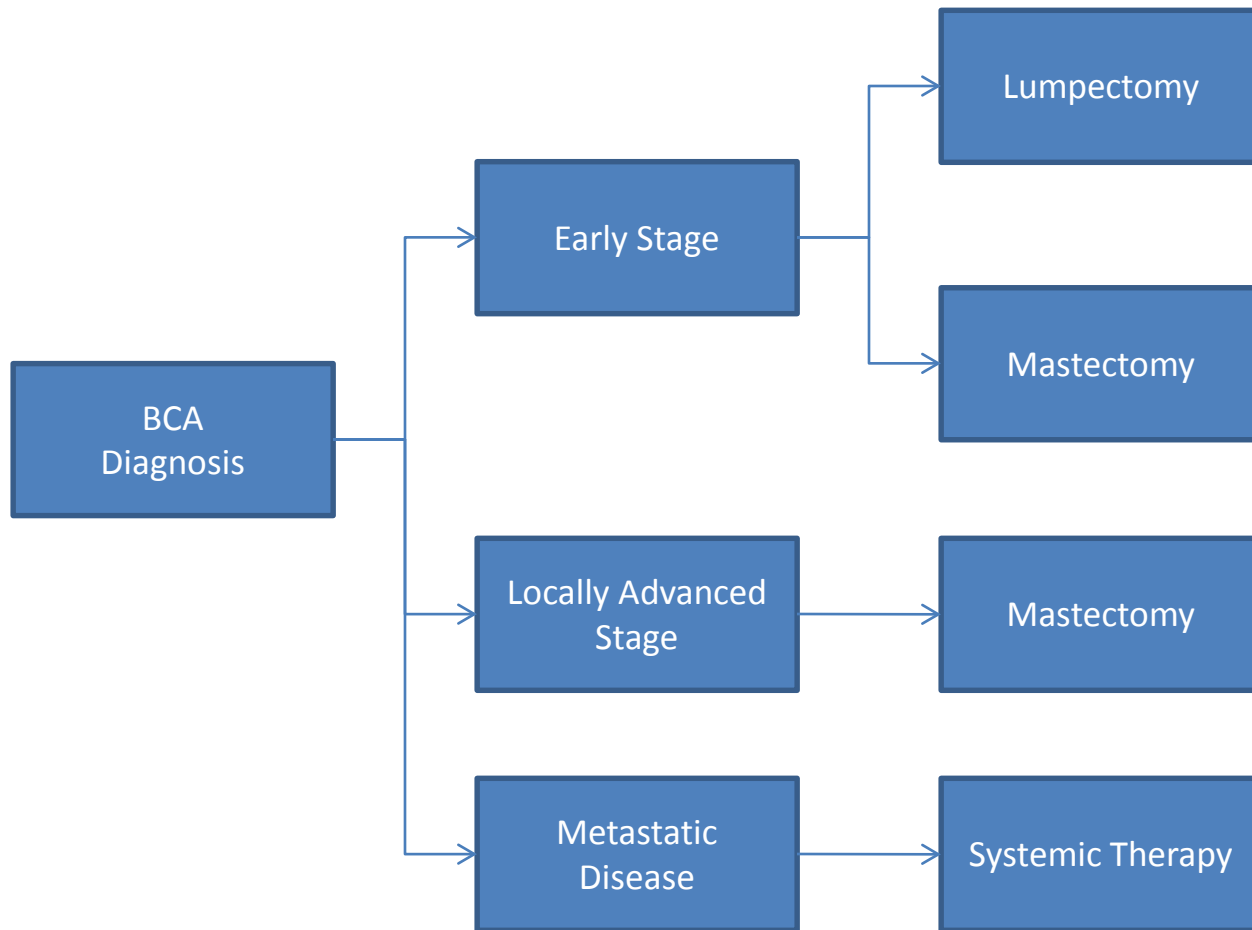
Risk of Invasive Local Recurrence



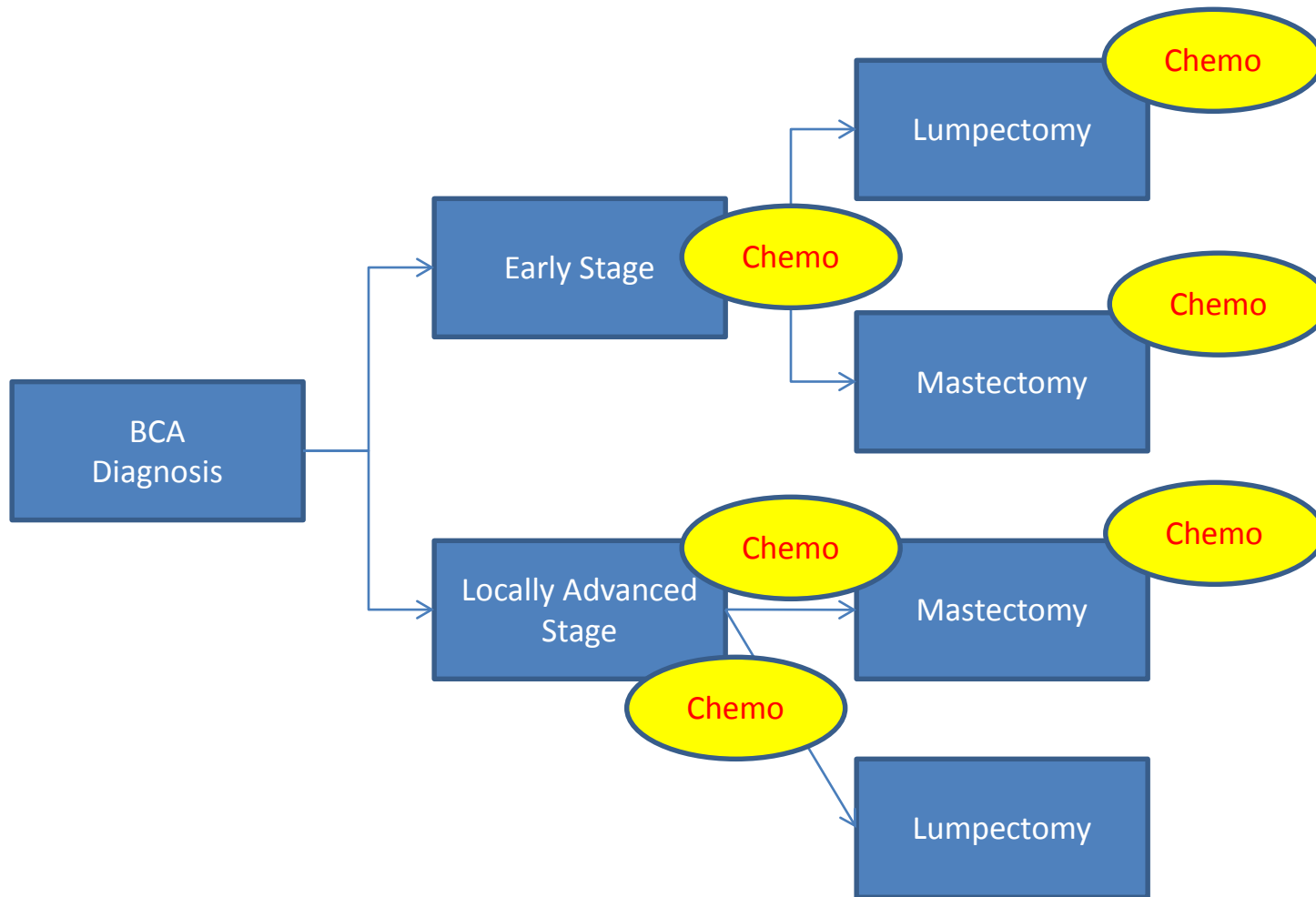
Invasive breast cancer



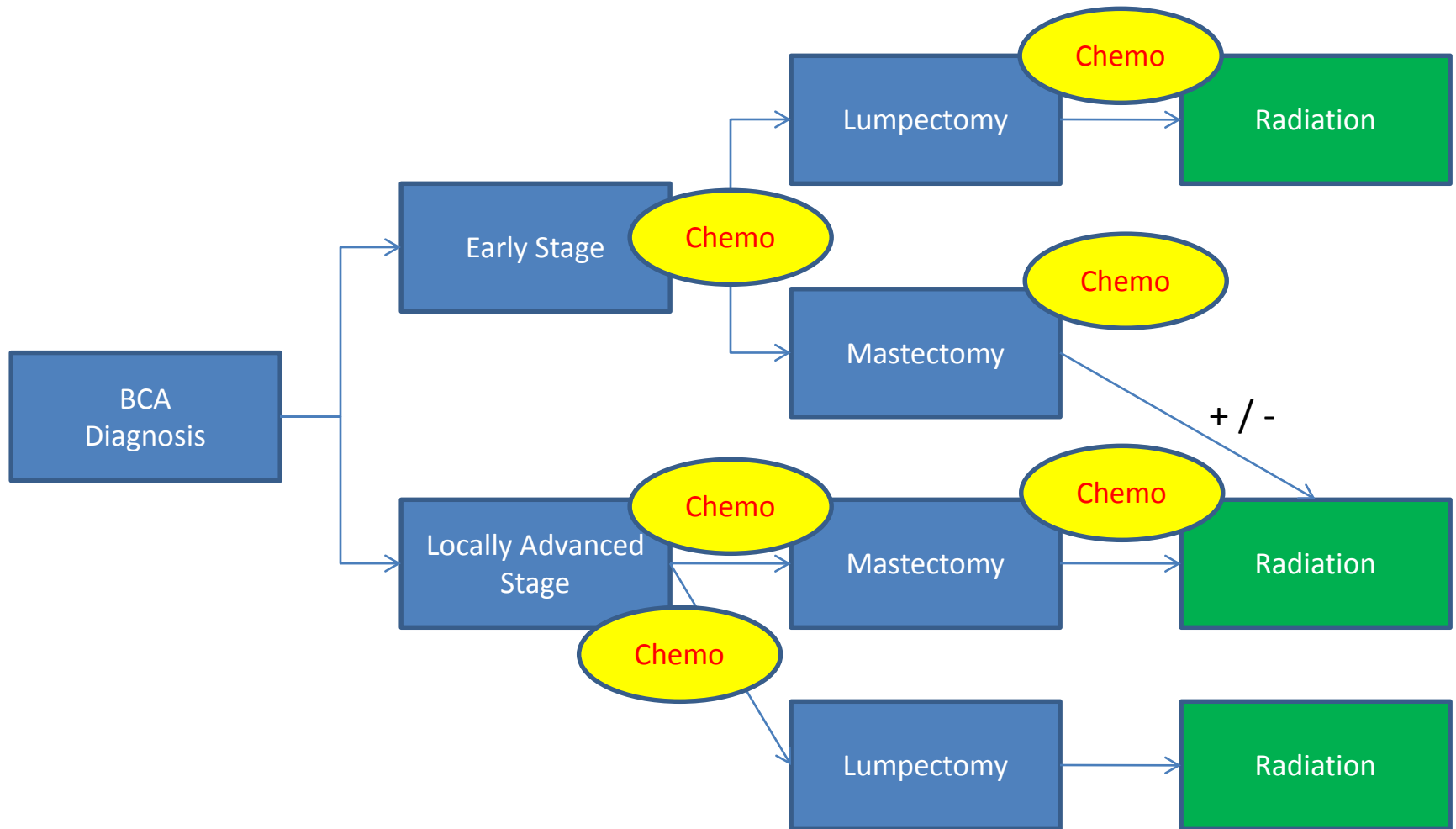
Simplified treatment pathway: radiation oncology perspective



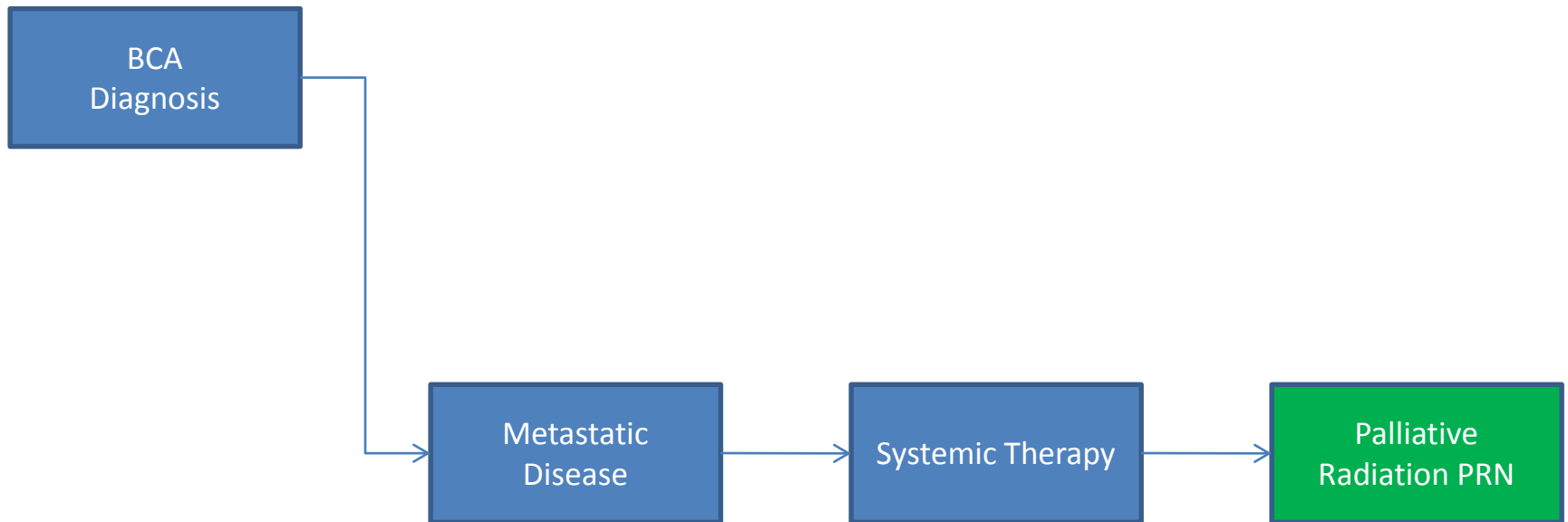
Simplified treatment pathway: radiation oncology perspective



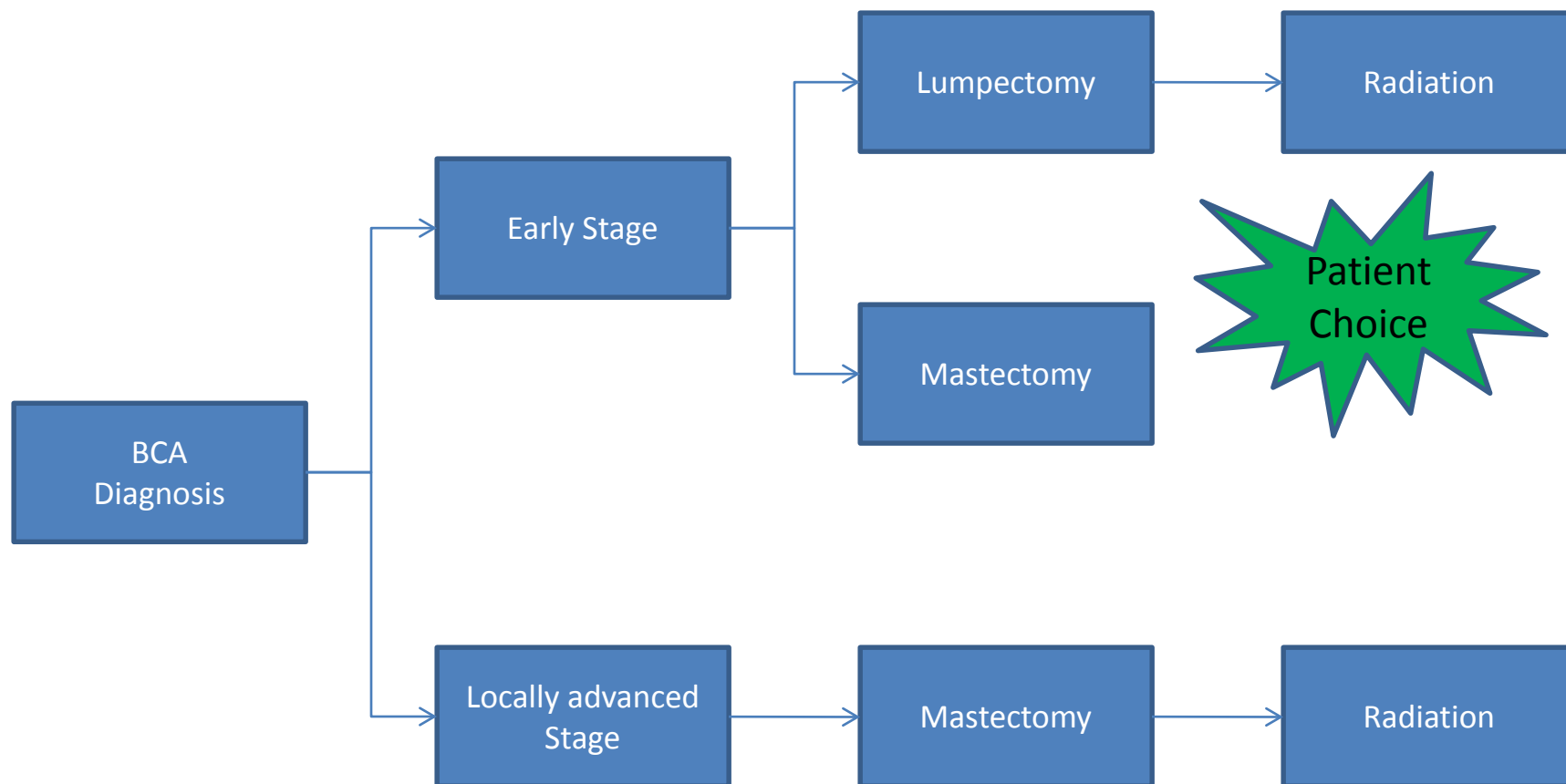
Simplified treatment pathway: radiation oncology perspective



Radiation important in palliative care



Early patient discussion



NIH Consensus Conference (1990)

“Breast conservation therapy is preferable because it provides survival equivalent to those of total mastectomy and axillary dissection while preserving the breast.”

American College of Surgeons (NAPBC certification):

Standard 2.3 Breast Conservation

A proportion of at least fifty percent (50%) of all patients diagnosed with early stage breast cancer (Stage 0, I, II) are treated with breast conserving surgery, and compliance is evaluated annually by the BPL.

Why radiation after lumpectomy?

NSABP B-06

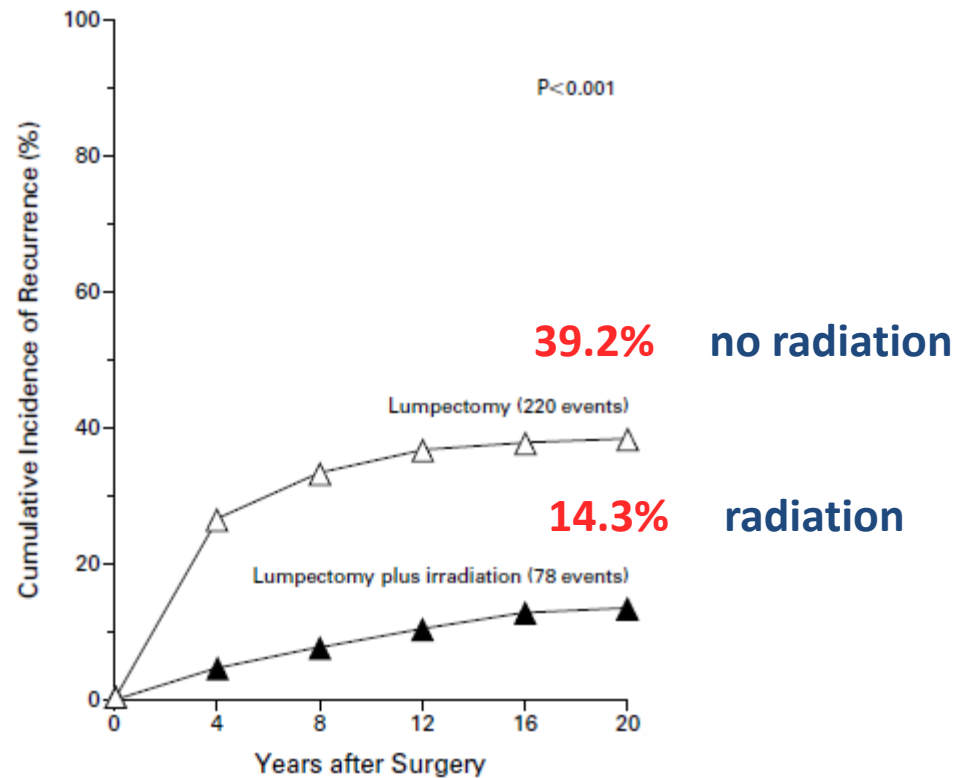


Figure 1. Cumulative Incidence of a First Recurrence of Cancer in the Ipsilateral Breast during 20 Years of Follow-up among 570 Women Treated with Lumpectomy Alone and 567 Treated with Lumpectomy plus Breast Irradiation.

The data are for women whose specimens had tumor-free margins.

Meta-analysis: survival benefit of XRT

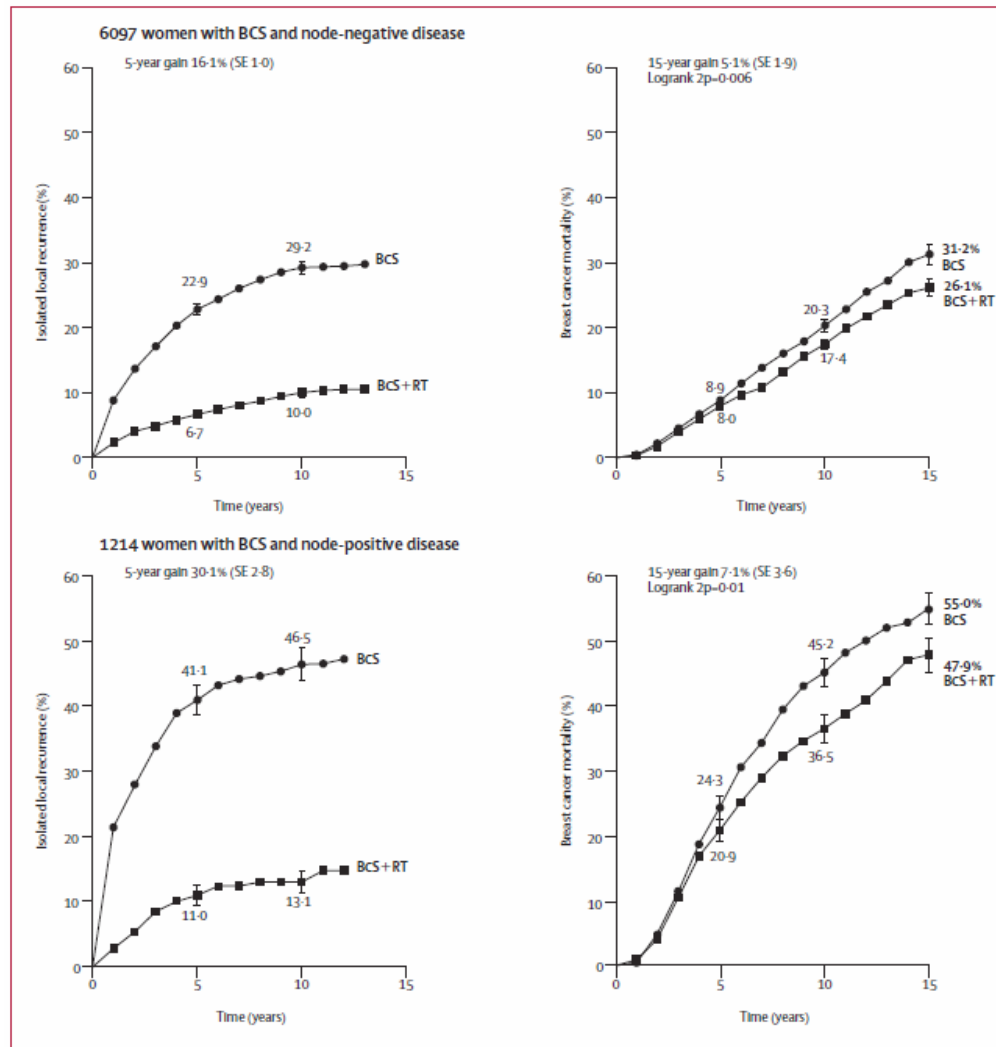


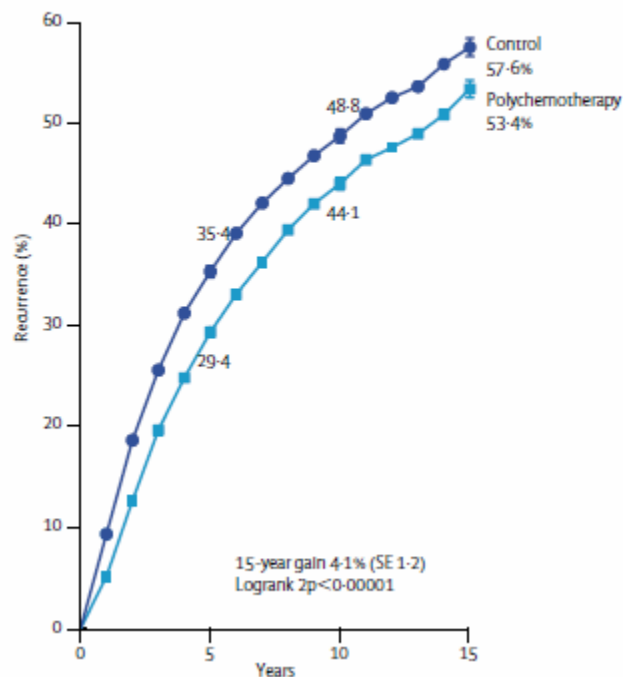
Figure 2: Effect of radiotherapy (RT) after BCS on local recurrence and on breast cancer mortality—15-year probabilities
Data from 10 trials. Vertical lines indicate 1 SE above or below the 5, 10, and 15 year percentages.

4 local recurrences prevented
=
1 breast cancer death prevented
@ 15 years

Comparable to chemotherapy benefit

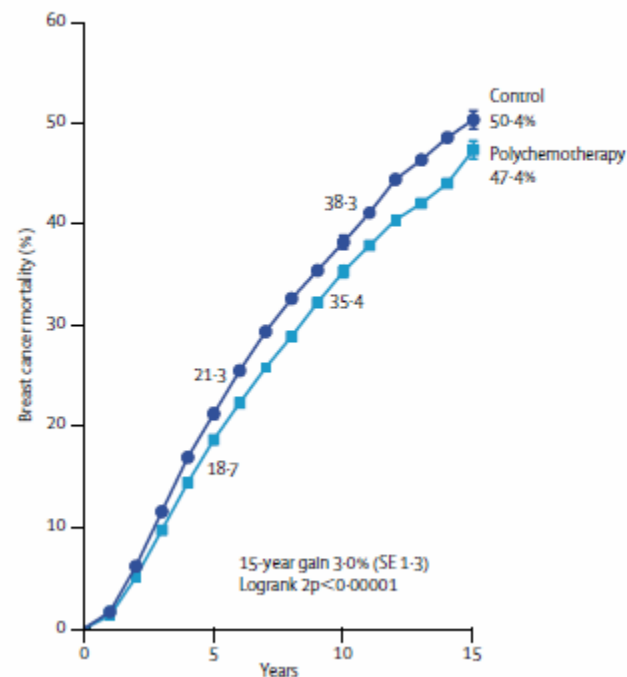
Breast cancer recurrence

Entry age 50–69 years: recurrence



Breast cancer survival

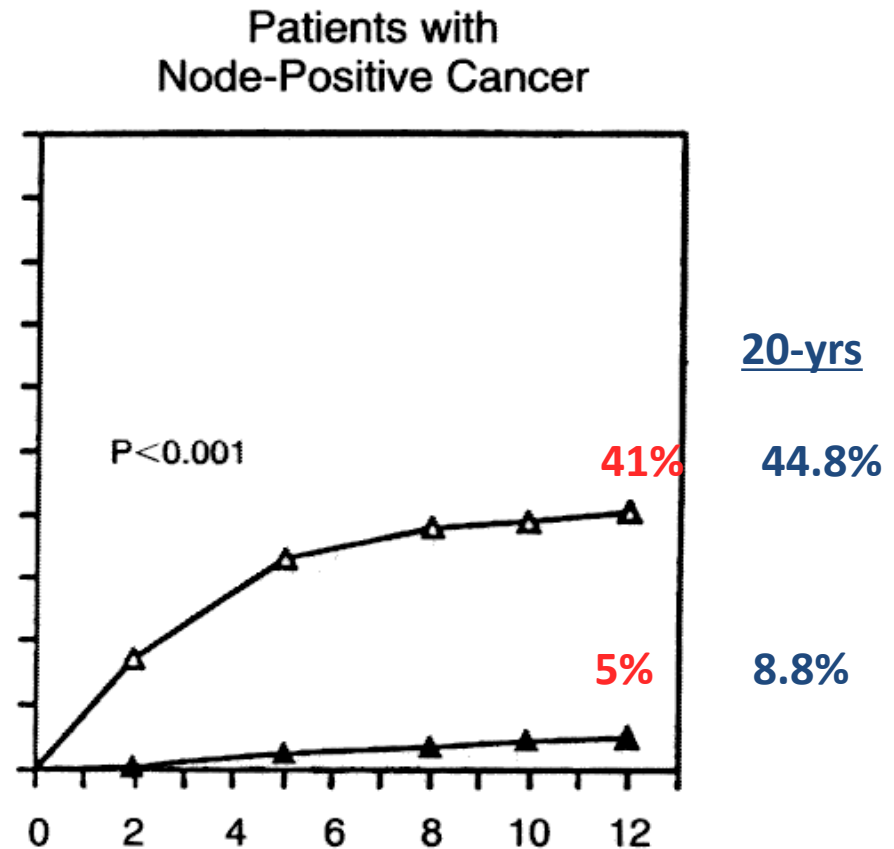
Entry age 50–69 years: breast cancer mortality



Can chemo substitute for radiation?

NSABP B-06

- LN+ patients
- All treated with chemotherapy

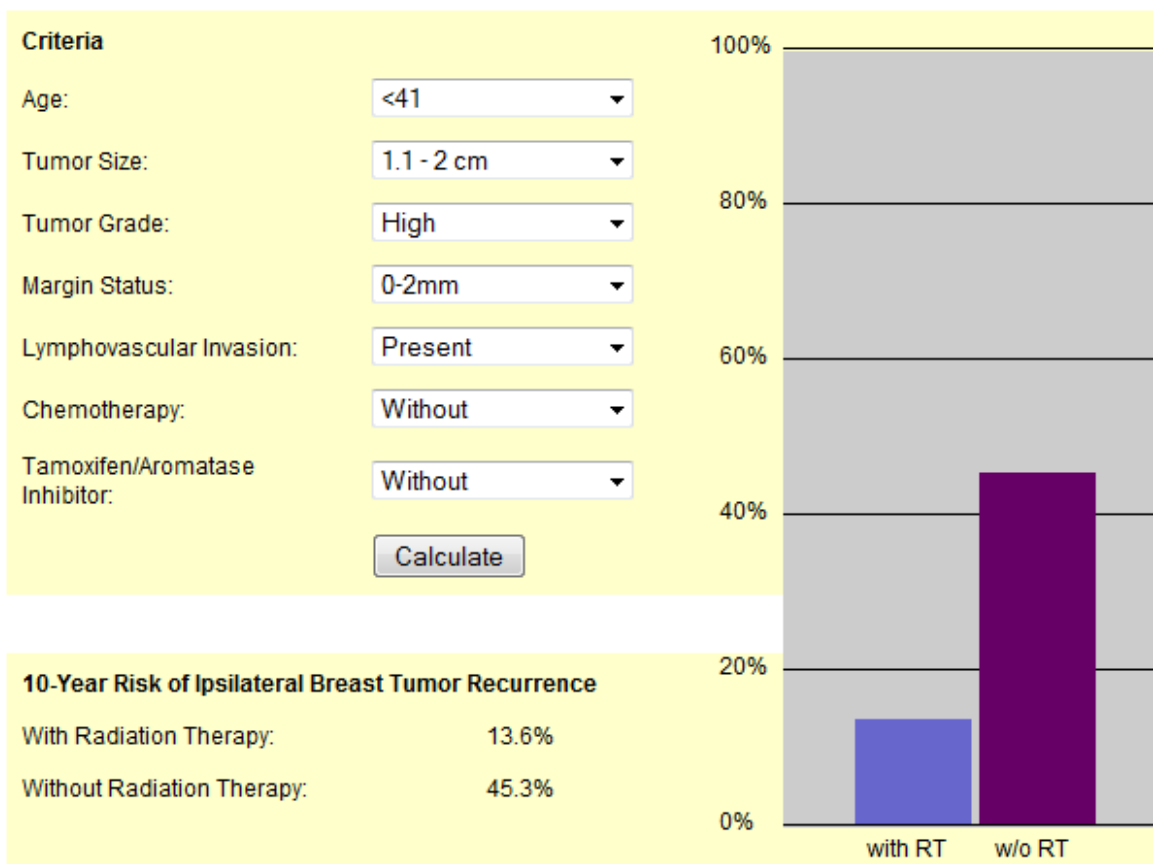


Fisher, NEJM 1995

Nomogram prediction: high risk

IBTR! Version 2.0

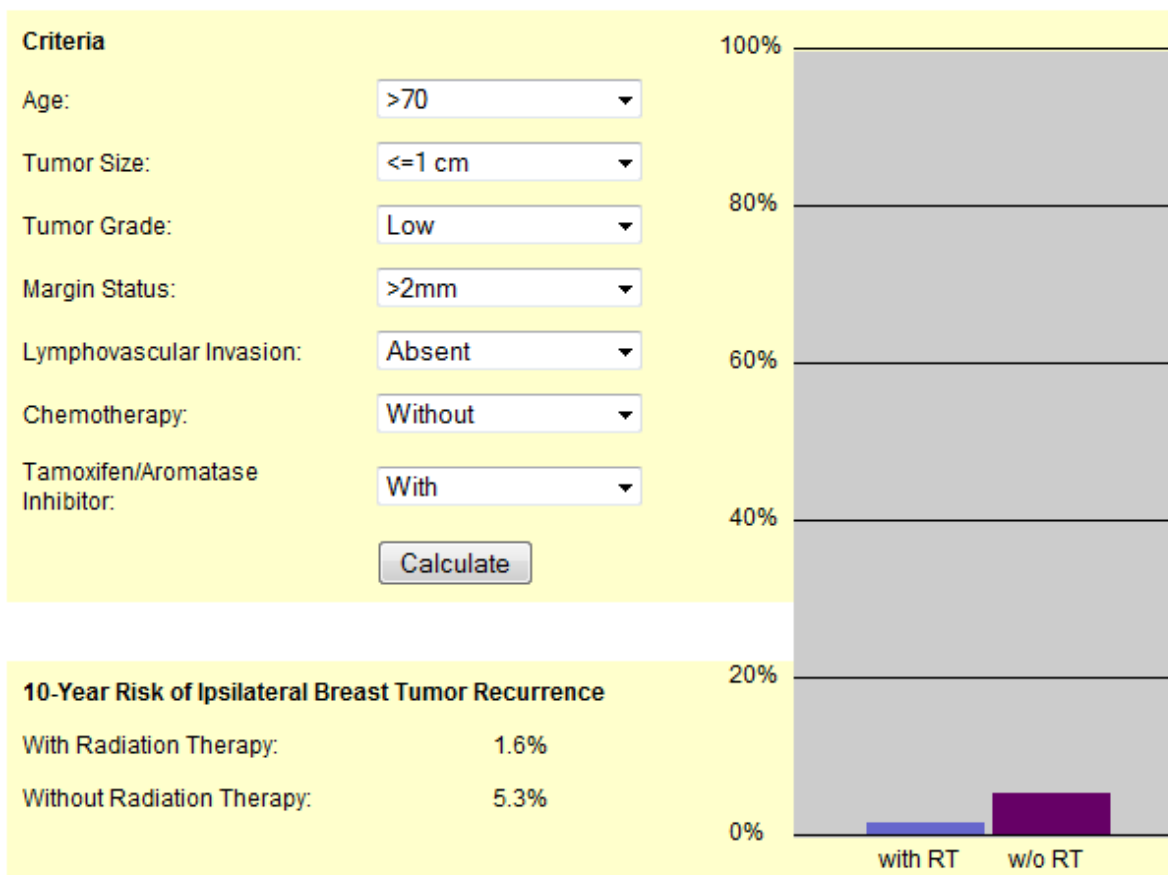
Breast Cancer Model



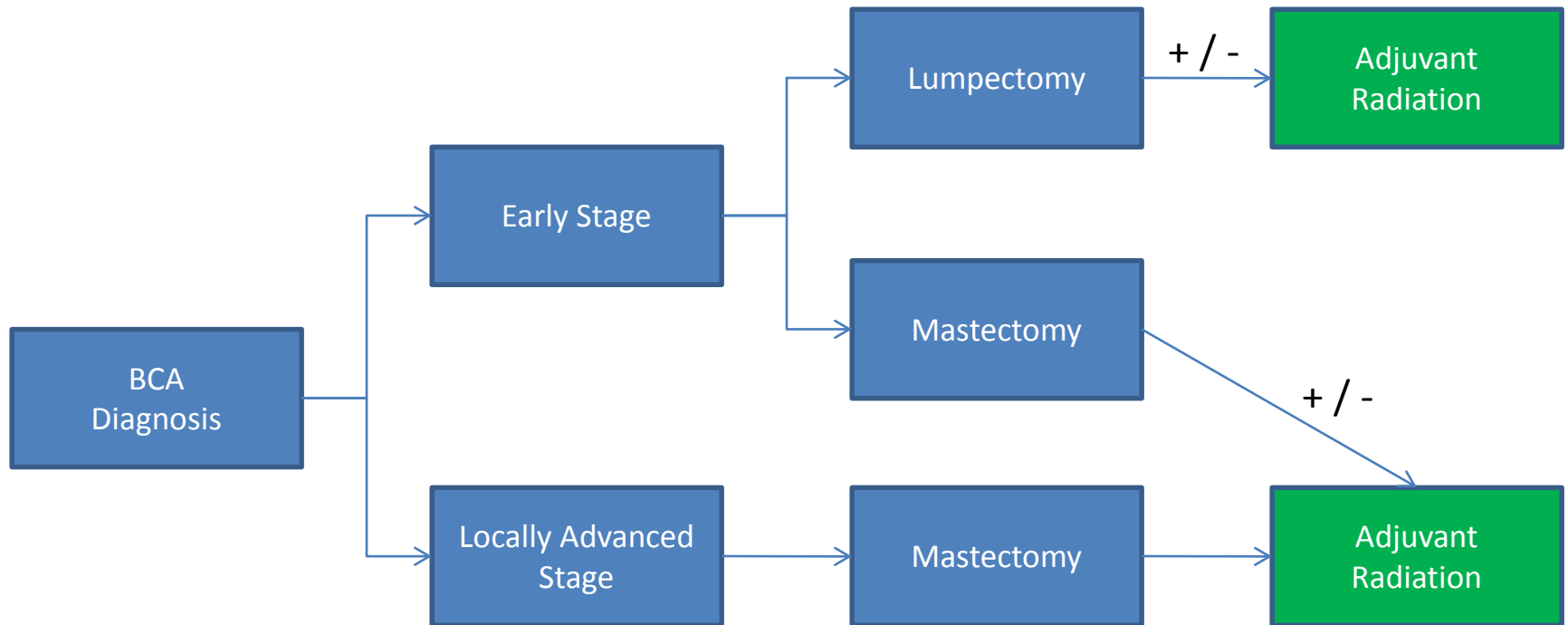
Nomogram prediction: low risk

IBTR! Version 2.0

Breast Cancer Model

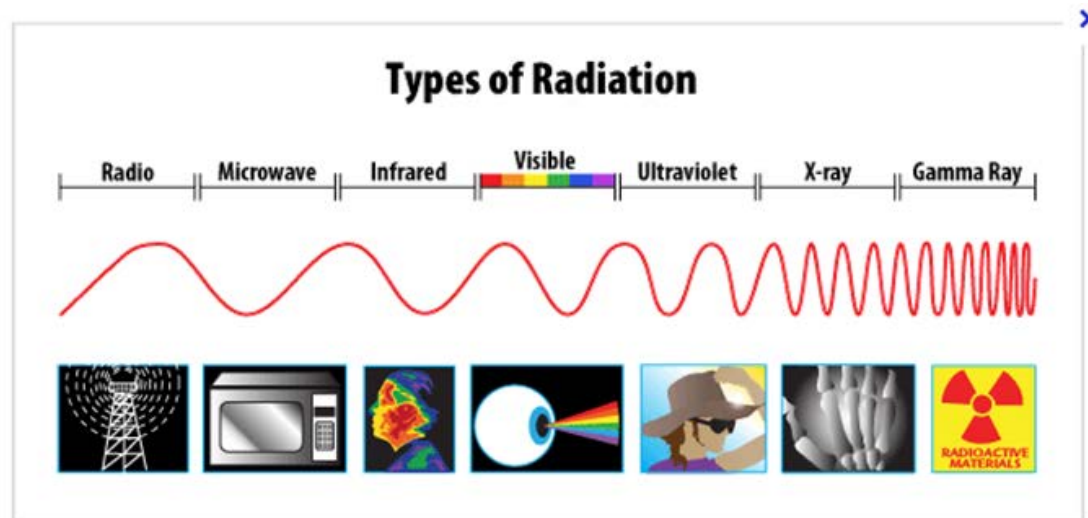


Simplified treatment pathway: radiation oncology perspective

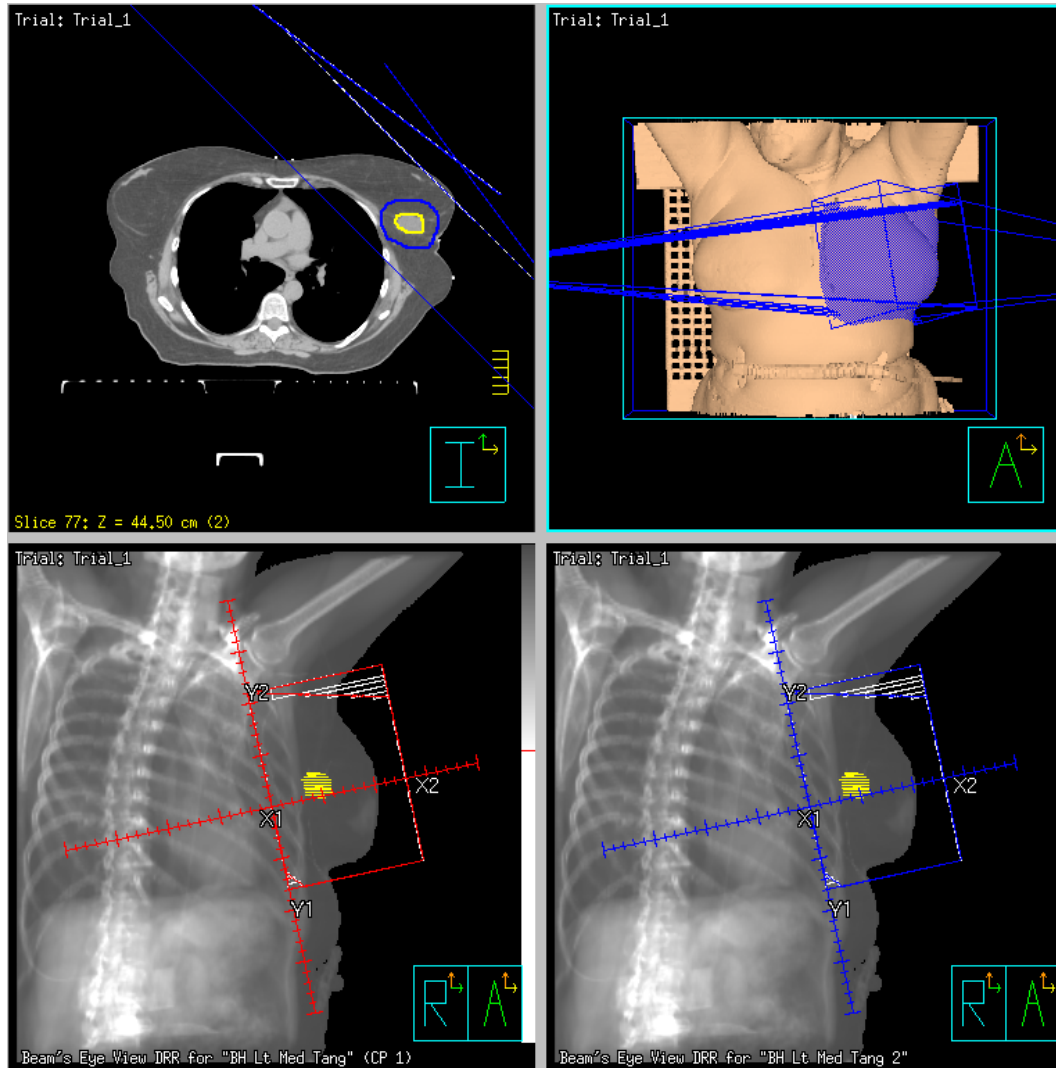


How does this actually work?

- What is radiation?
- What area do we treat?
- How many treatments (fractions)?
- What type of radiation?

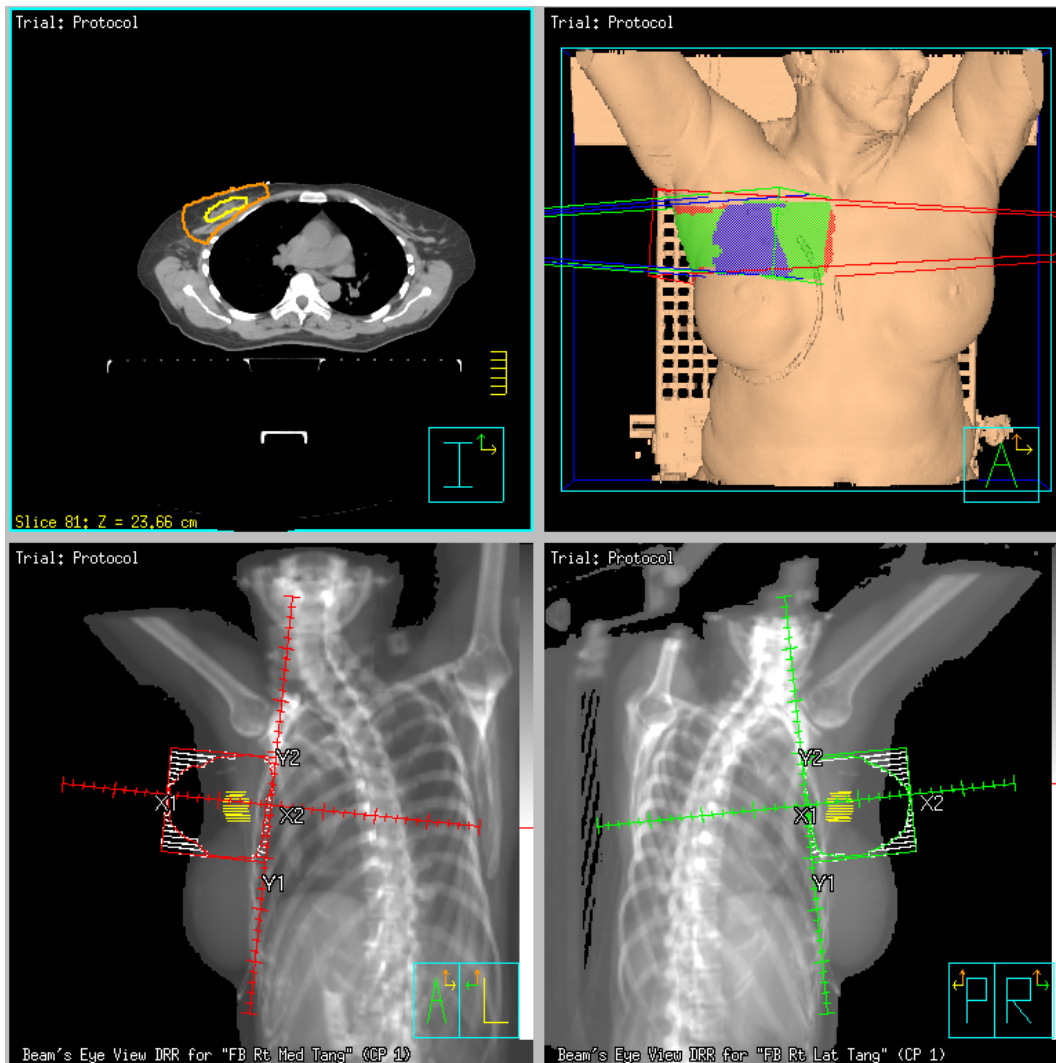


“Whole breast” radiation



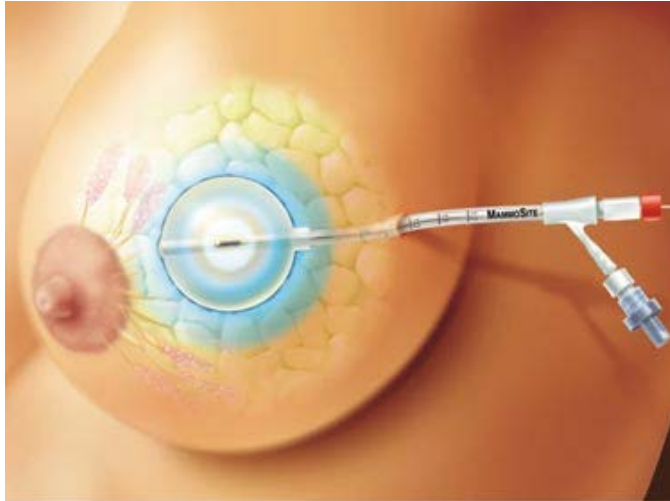
- After lumpectomy
- Treatment duration:
 - 2-3 minutes
- Conventional:
 - 25x
(5 weeks)
 - $25 + 5 = 30x$
(6 weeks)
- Accelerated:
 - 16x
(3 weeks)
 - $16 + 4 = 20x$
(4 weeks)

“Partial breast” radiation



- After lumpectomy
- Treatment duration:
 - 2-3 minutes
- Schema:
 - 15x, 1x/day (3 weeks)
 - 10x, 2x/day (1 week)

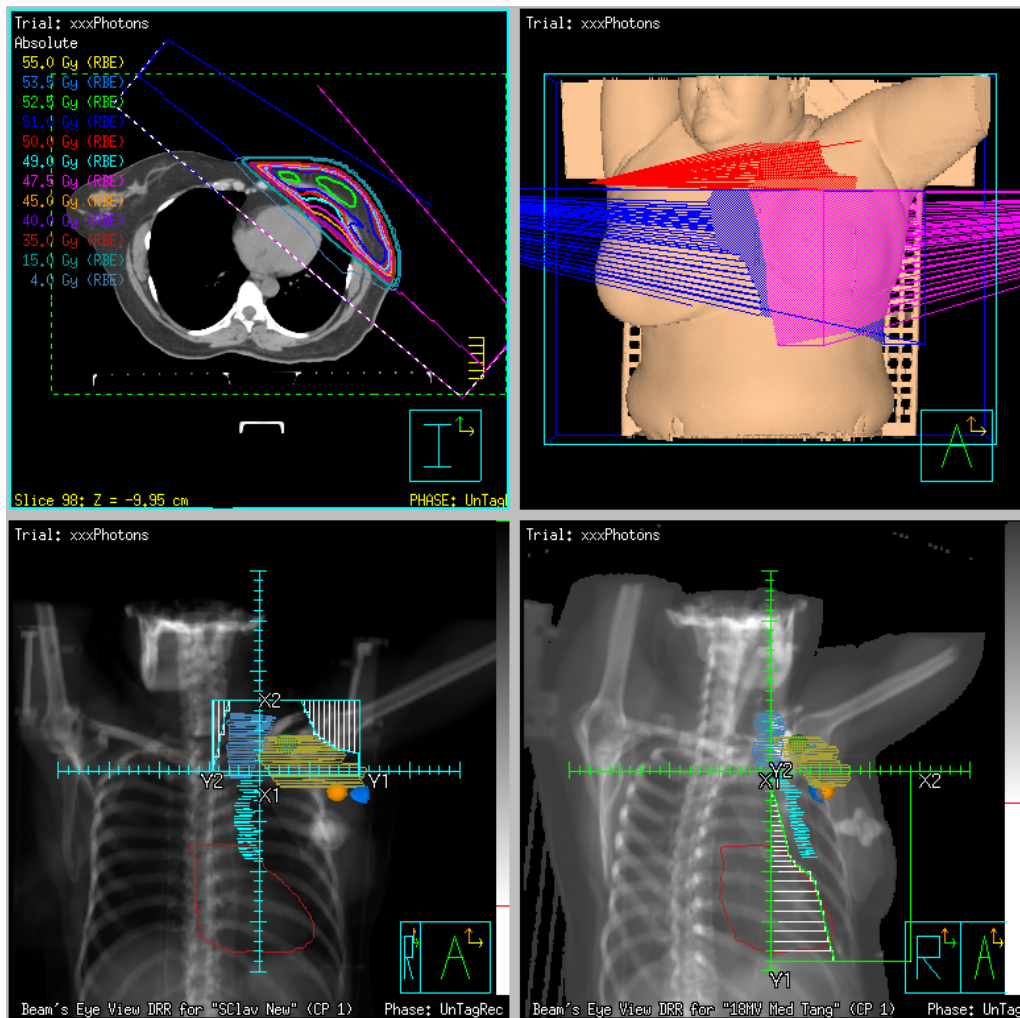
“Balloon” radiation (brachytherapy)



10x, 2x/day (1 week)

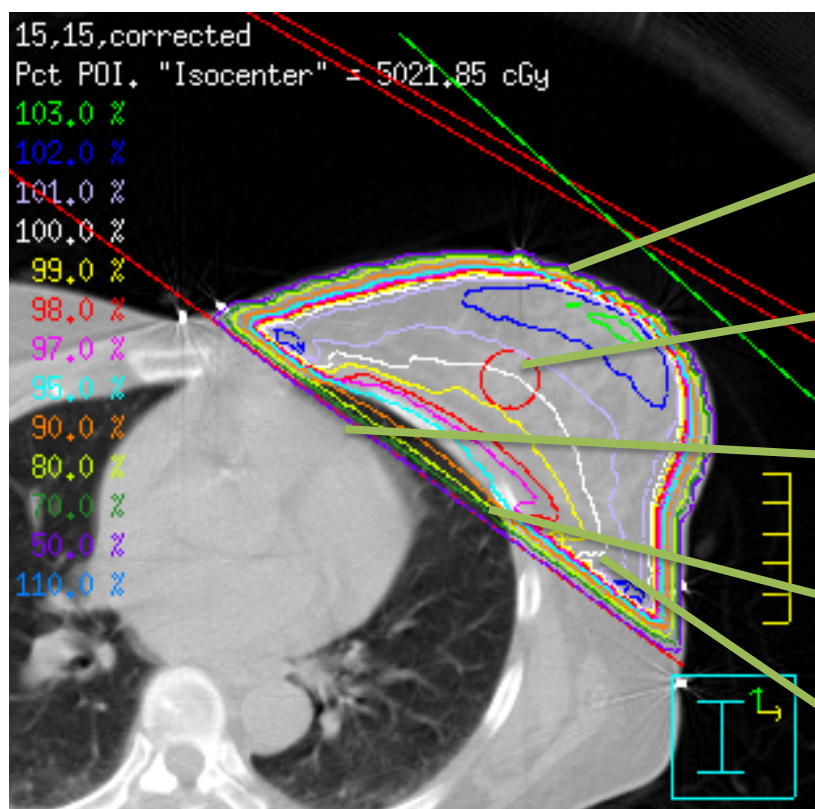


“Postmastectomy” radiation



- After mastectomy
- Treatment duration:
 - 4-5 minutes
- Schema:
 - 25x / 28x
(5 / 5.5 weeks)
 - 33x
(6.5 week)

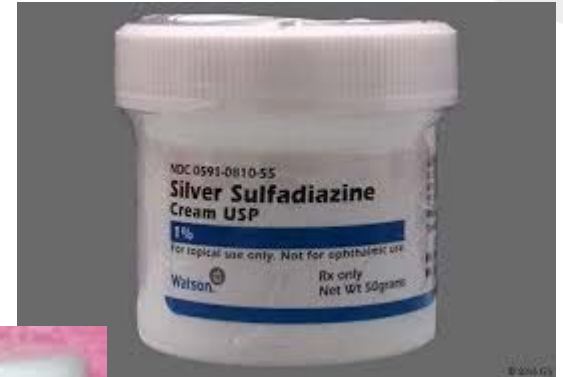
Radiation toxicity



“Under treatment” management

- We see patients once/week routinely
- More often as needed (rare for breast radiation)
- Acute toxicities we look to assess:
 - Fatigue – very common
 - Radiation dermatitis (“radiation burn”) – everyone!
 - Breast soreness/pain – somewhat common
 - Cough/shortness of breath - uncommon
 - Dysphagia – somewhat common, if we treat neck lymph nodes
 - Hoarseness - uncommon

Acute radiation dermatitis



Late cardiac toxicity

March 14, 2013

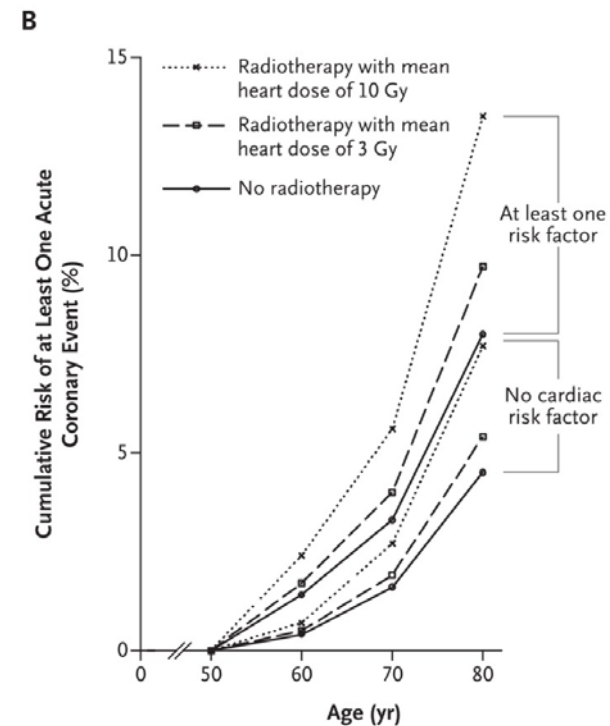
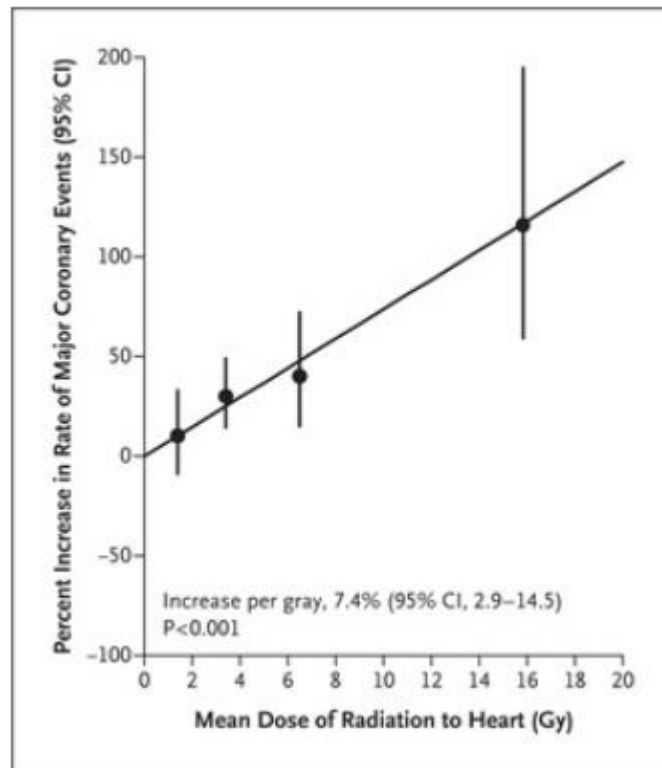
N Engl J Med 2013; 368:987-998

DOI: 10.1056/NEJMoa1209825

ORIGINAL ARTICLE

Risk of Ischemic Heart Disease in Women after Radiotherapy for Breast Cancer

Sarah C. Darby, Ph.D., Marianne Ewertz, D.M.Sc., Paul McGale, Ph.D., Anna M. Bennet, Ph.D., Ulla Blom-Goldman, M.D., Dorthe Brønnum, R.N., Candace Correa, M.D., David Cutter, F.R.C.R., Giovanna Gagliardi, Ph.D., Bruna Gigante, Ph.D., Maj-Britt Jensen, M.Sc., Andrew Nisbet, Ph.D., [et al.](#)



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Cardio-Oncology Program - Physicians

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Maria Carolina Demori, MD
Cardiovascular Disease



Orlando Health Heart Institute Cardiology Group

Address: 1222 South Orange Ave
Orlando, FL 32806

Phone: [321.841.6444](tel:321.841.6444)

Fax: 407.650.1307

Hours:

Monday - Friday 8:00 am - 5:00 pm

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Swathy Kolli, MD
Cardiovascular Disease



Orlando Health Heart Institute Cardiology Group

Address: 7236 Stonerock Cir
Orlando, FL 32819

Phone: [321.841.6444](tel:321.841.6444)

Fax: 407.650.1307

Hours:

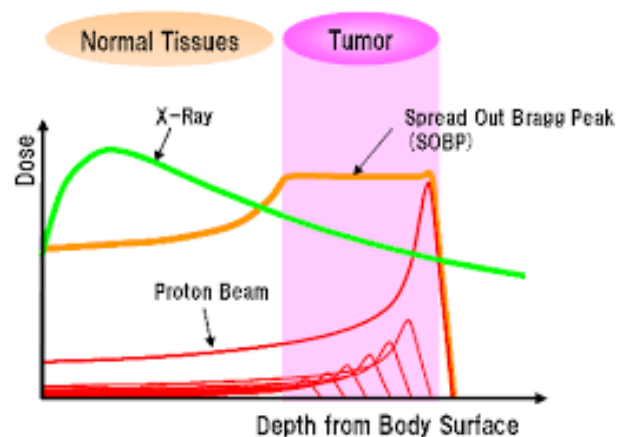
Monday-Friday 8:00 am - 5:00 pm

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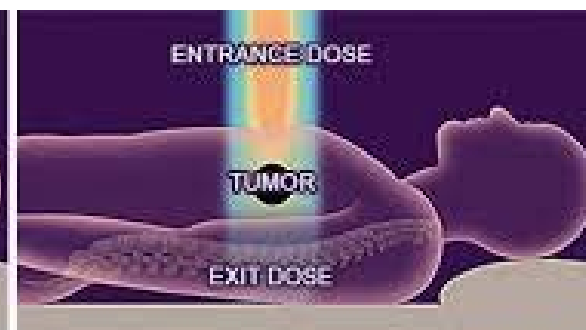
[View Physician](#)



Proton therapy = a form of radiation



TARGETED PROTON THERAPY:
Deposits most energy on target



CONVENTIONAL RADIATION THERAPY:
Deposits most energy before target

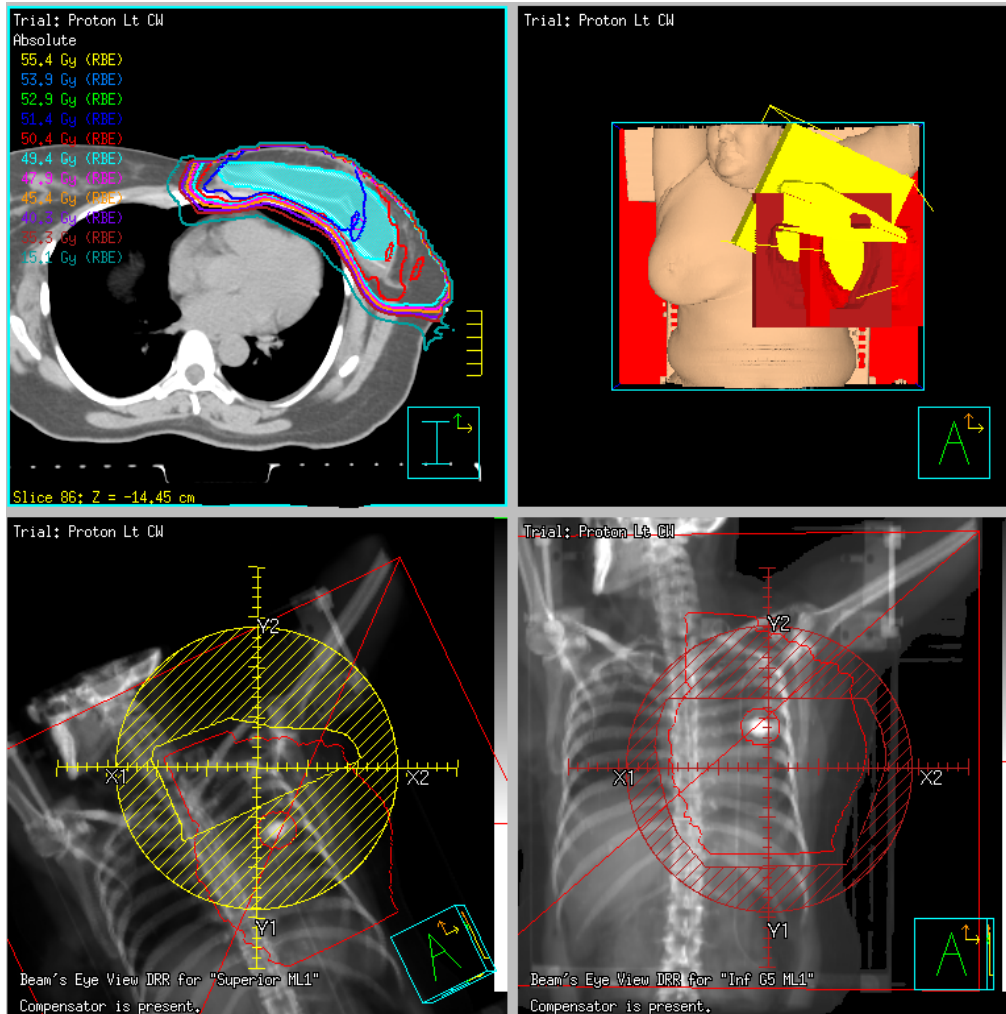
Proton therapy at Orlando Health



Proton therapy at Orlando Health

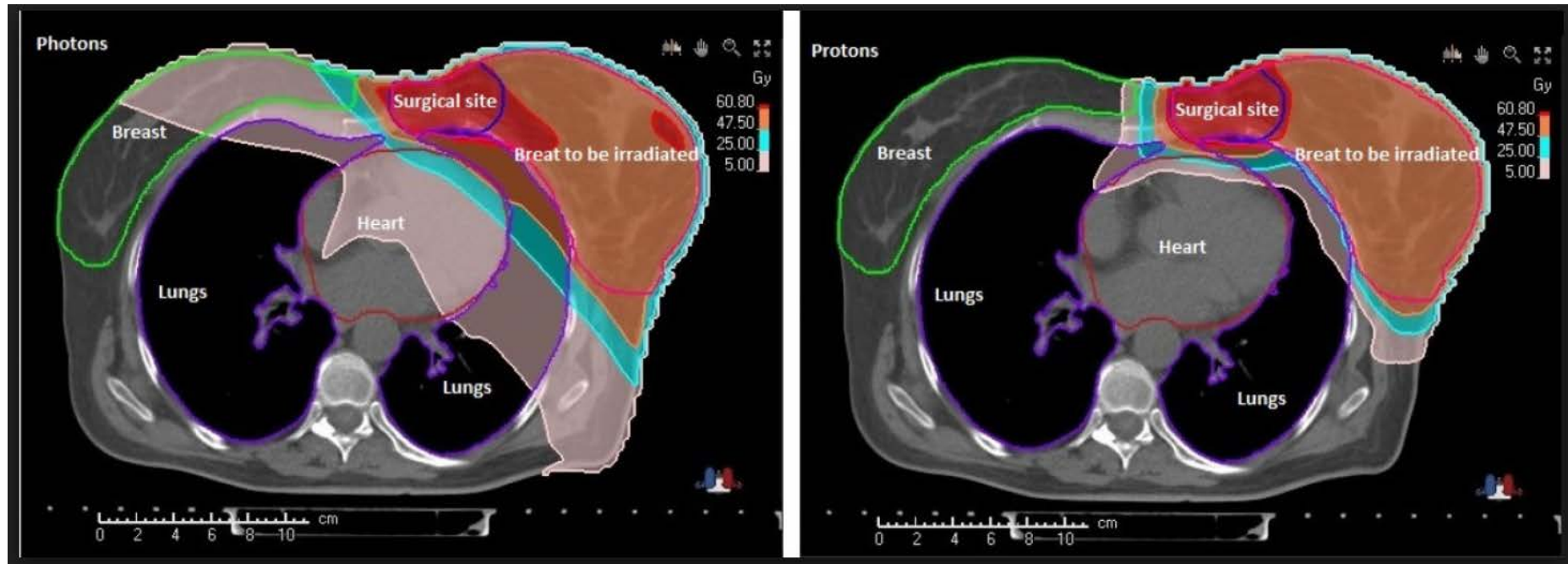


Proton “postmastectomy” radiation

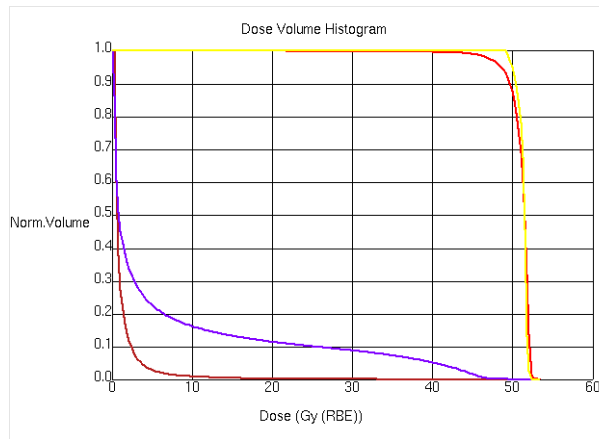
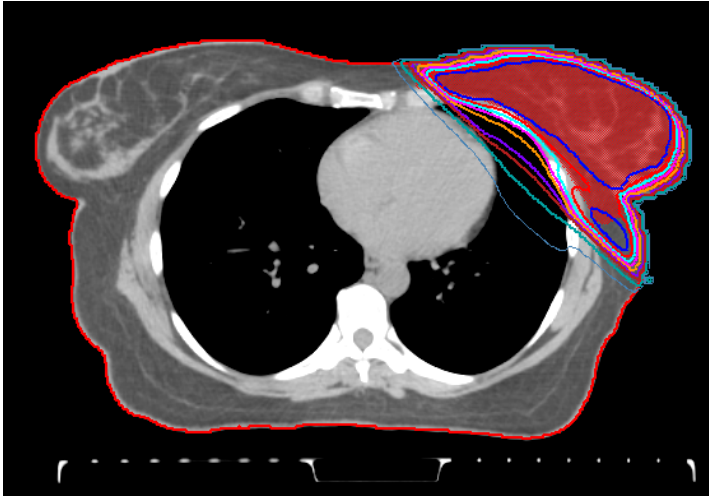


- After mastectomy
- Treatment duration:
 - 4-5 minutes
- Schema:
 - 25x / 28x
(5 / 5.5 weeks)
 - 33x
(6.5 week)

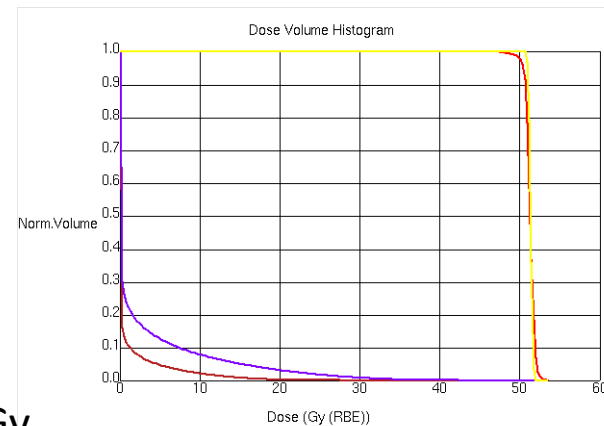
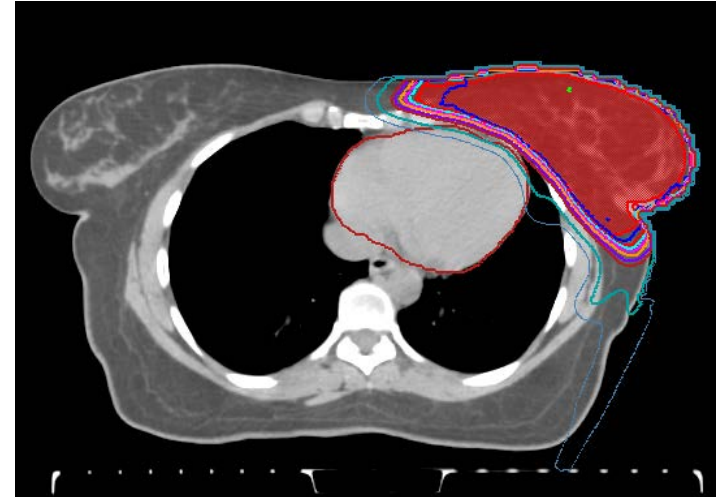
Comparison between x-ray and proton



Comparison between x-ray and proton



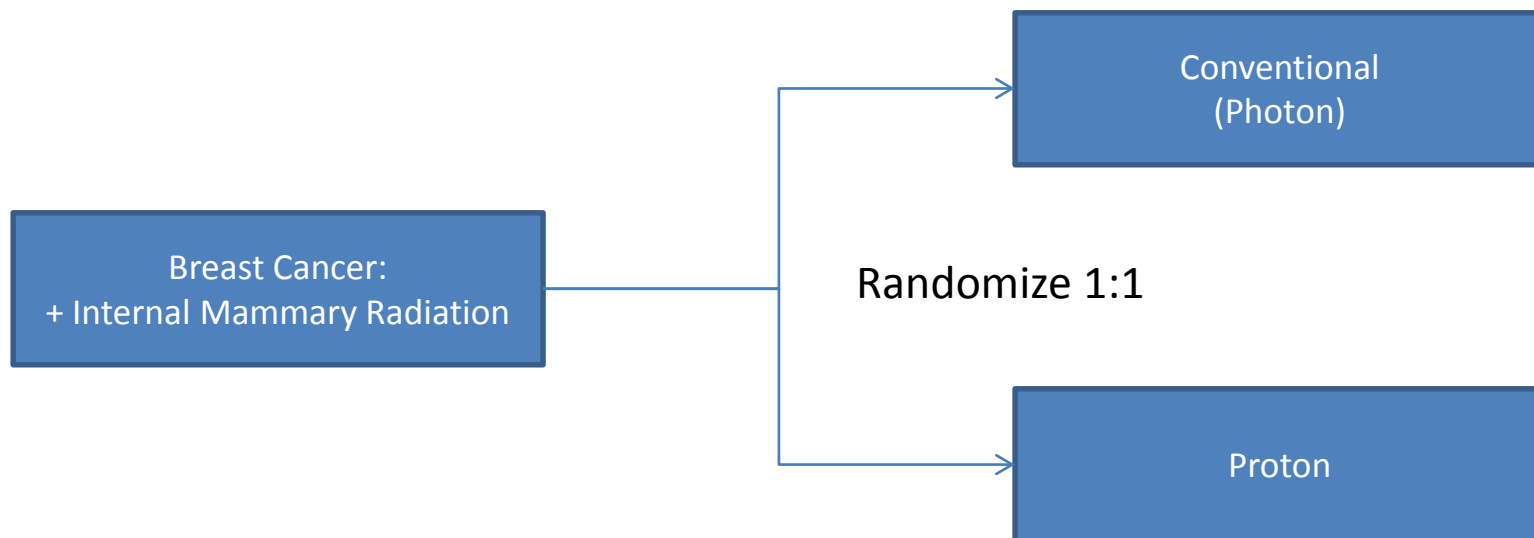
Mean Heart Dose = 1.2 Gy



Goal < 4 Gy

Mean Heart Dose = 0.7 Gy

National Randomized Clinical Trial



Penalty? Acute Radiation Dermatitis



End of Treatment



6 Month Visit

In Conclusion:

- Radiation therapy remains a key component of breast cancer care
- Advances in risk stratification: who needs radiation, how much, or not at all
- Advances in logistics: shorter schedules, better targeting
- Advances in delivery: proton therapy

THANK YOU!