Intrabeam: a new method of partial breast irradiation

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Goals of discussion

- Describe partial breast irradiation (PBI) and discuss why it is being used.
- Detail methods of performing partial breast irradiation.
- Explain how the Intrabeam works and its advantages and disadvantages.
Patients have the option of either mastectomy or breast preservation therapy (BPT) for operable tumors.

In BPT, patients have a lumpectomy and receive 6 ½ weeks of radiation to the whole breast.
Who is eligible for breast preservation therapy?

- Classically the size cutoff was 4 cm but recent consensus conference stated that any size is eligible as long as clear margins are obtained with an acceptable cosmetic result; NCCN states that tumors > 5 cm are a “relative” contraindication to BPT.

- If multicentric tumors can be excised in a single specimen with clear margins (including in situ disease) and the imaging shows no other suspicious lesions, the patient is still a candidate.

- No absolute age cutoff; NCCN 2008 guidelines states that women < 35 years have a relative contraindication.

- Prior chest XRT and pregnancy are absolute contraindications while active connective tissue disease, especially lupus and scleroderma are relative contraindications.
Majority (~ 85%) of women who present with breast cancer are eligible for breast preservation therapy (BPT).

Women who have lumpectomies don’t always receive their radiation therapy even though it always will decrease the chance of the cancer returning.

Women don’t receive their XRT after preserving surgery because of age, distance, payer, race and type of hospital (academic vs community).
Why partial breast irradiation (PBI)?

- Rationale is that by having a therapy that can be completed in a short period of time (e.g. 1 week) more patients can be eligible for BPT.
- Majority of recurrences seen in those pts not receiving XRT occur at or near tumor bed so rest of breast may not need treatment.
- Treating less of the breast may produce fewer side effects, specifically pain and fatigue.
How is PBI performed?

- Several methods now available including brachytherapy, 3D conformal, IORT, protons.
- Most of the experience has been with brachytherapy with some institutions having 10 years of experience.
- With brachytherapy, 3D conformal and protons, the treatment takes one week to complete with treatments given twice daily.
MammoSite brachytherapy

- Balloon is placed into surgical cavity.
- Balloon available in spherical and elliptical shapes.
- Balloon sizes are 4–5 cm.
- Ten fractions given in 5 days, 34 Gy.
Balloon must conform to cavity shape without air gaps. Device explanted in ~ 10–15% of pts.

Ideal is to have 7 mm b/w balloon and skin to decrease risk of erythema.

Very dependent on surgical placement.
**Intraoperative Radiation Therapy for PBI**

- TARGIT trial is comparing whole breast irradiation to IORT delivering a single dose of 20 Gy. Primary accrual is in Europe.
- Using the Intrabeam Photon Radiosurgery System, 50 kV x-rays.
- Trial has nearly completed enrollment with a target of 2200 patients.
Advantages of Intrabeam

- The source of radiation is placed directly in the surgical cavity so there should be no “misses”.
- There is greater biologic killing effect on the tumor cells when the dose is given as a single large dose.
- The treatment is complete in one treatment.
- Even for those patients who still require whole breast irradiation, having the Intrabeam treatment decreases overall treatment length by 1 ½ weeks.
Disadvantages of the Intrabeam

- Depth of penetration: limited coverage with dose distribution. Patient must have complete excision.
- Margin status: since the depth of penetration is not very deep, the patient must have negative margins. This means that they require a second procedure after the initial lumpectomy to have the procedure performed.
Small accelerator that generates electrons and produces x-rays.

X-rays are 50 kV in energy; can be shielded with x-ray shielding.

The device is portable.
Intrabeam applicators

- Reusable spheres that are placed in the cavity.
- Allow for spreading out dose in a spherical distribution.
- Come in sizes from 1.5–5 cm.
Other uses for Intrabeam

- Originally designed for treatment of brain tumors.
- May have application in any surgical site where a cavity is at risk for having residual cancer cells at the margin.