

About APBI Brachytherapy

Introduction

Accelerated partial breast irradiation with brachytherapy (APBI brachytherapy) is a course of high-dose radiation therapy for early-stage breast cancer patients where radiation is delivered directly into the tumor cavity. APBI brachytherapy is delivered as part of breast conservation therapy (BCT), which consists of lumpectomy surgery followed by radiation.

The traditional approach for radiation therapy as part of BCT has been whole breast irradiation (WBI). A full course of WBI exposes the entire breast and surrounding critical structures to radiation and requires daily treatments for three and a half to seven weeks where radiation is delivered from outside the breast. APBI brachytherapy, which was developed to address several issues with WBI, delivers radiation only to the lumpectomy cavity and immediate surrounding tissue.

APBI brachytherapy offers three significant advantages over WBI: lower toxicities and better cosmesis due to a reduction in total radiation exposure, the preservation of future treatment options and a reduced treatment duration. Since its introduction in the late 1990s, more than 100,000 women in the U.S. have received APBI brachytherapy.

What are the differences between APBI with brachytherapy and WBI?

APBI Brachytherapy	WBI
Delivers radiation only to the lumpectomy cavity and surrounding tissue from within the breast, sparing healthy tissue from radiation. Enables reduced toxicities and better cosmesis.	Radiation is delivered externally to the entire breast exposing much of the breast to radiation.
Can be completed in five days or less.	Requires daily treatments for 3-7 weeks with an additional 'boost' radiation dose that is often added to prevent local recurrence.

What do we know about APBI brachytherapy in early breast cancer treatment?

- **Demonstrated Efficacy:** Cancer control and long-term survival rates similar to EBRT.^{i,ii,iii}
- **Minimized Risk of Side Effects:** Precision delivery enables surrounding healthy tissues to be spared from unnecessary radiation, reducing toxicity/damage to healthy breast tissue and nearby structures such as the chest wall, heart, lungs or skin.^{v-vii, iv}
- **Preservation of Future Treatment Options:** In the case of a tumor recurrence BCT can be performed a second time with APBI brachytherapy allowing the breast to still be preserved and avoiding mastectomy.^v
- **Excellent Cosmesis:** Limited fibrosis and skin toxicity, providing excellent cosmetic results.^v
- **Convenience:** The short treatment course (five days or less) allows patients to get back to their routines more quickly.^{vi}

Are there long-term data supporting the use of APBI brachytherapy in early breast cancer treatment?

Studies have shown that treatment responses are maintained in the long term with excellent 12-year follow-up rates for actuarial recurrence (9.3%), disease-free survival (DFS; 75.3%), cancer-specific survival (CSS; 91.1%) and overall survival (88.8%).^v

Long-term efficacy results are equivalent to those achieved with whole breast irradiation (with or without boost), demonstrating that reducing the overall target treatment volume does not negatively impact efficacy outcomes (7-year relapse free survival rates for APBI: 79.8%, WBI: 73.5%, WBI + boost: 77.7%).^{vii,v}

Which breast cancer patients are candidates for APBI brachytherapy?

The following table provides an overview of currently available guidelines written by key societies in the U.S. and Europe regarding use of APBI in specific patient populations. No single unified set of guidelines is supported by all major medical associations.

Characteristic	GEC ESTRO ^{xiii}	ABS ^{xiv}	ASTRO ^{xv}
Patient age (yrs.)	≥50	≥50	≥60
Histology	IDC and favorable subtypes	All invasive subtypes and DCIS	IDC or other favorable subtypes
Tumor size	≤3cm	≤3cm	≤2cm
Tumor stage	T1-T2	T1-T2	T1
Surgical margins	Negative (>2mm)	Negative	Negative (>2mm)
Lymph node status	Negative	Negative	Negative
Estrogen receptor	Positive/negative	Positive/Negative	Positive
Lymphovascular space invasion	Not present	Not present	Not present

The ASTRO guidelines are the oldest guidelines (published in 2009). They are stricter in terms of age/tumor size and pathology. Both the GEC-ESTRO and ASTRO guidelines include categories which define patients as “possible or cautionary” and “contraindicated or unsuitable” for APBI brachytherapy.

The guidelines were developed based upon the clinical data available and the consensus of the experts at the time of writing. The number of suitable patients for APBI brachytherapy is likely to increase in the future as more studies (including the PROMIS registry ^{xii, xvi, xvii, xviii}) indicate that a broader range of patients with diverse baseline and tumor characteristics have positive clinical outcomes following APBI brachytherapy treatment.

The data presented at ASTRO of the large prospective GEC-ESTRO randomized phase 3 trial comparing multicatheter APBI brachytherapy to WBI in patients with early breast cancer from the age of 40, are also likely to add important information on the suitability of more patients for APBI brachytherapy – including younger women.

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