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Evaluation of Current Consensus Statement Recommendations for Accelerated Partial Breast Irradiation: A Pooled Analysis of William Beaumont Hospital and American Society of Breast Surgeon MammoSite Registry Trial Data

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Summary

Current guidelines for the use of accelerated partial breast irradiation were applied to a combined group of patients treated at William Beaumont Hospital and as part of the American Society of Breast Surgeons MammoSite®

Purpose: To determine whether the American Society for Radiation Oncology (ASTRO) Consensus Statement (CS) recommendations for accelerated partial breast irradiation (APBI) are associated with significantly different outcomes in a pooled analysis from William Beaumont Hospital (WBH) and the American Society of Breast Surgeons (ASBrS) MammoSite® Registry Trial.

Methods and Materials: APBI was used to treat 2127 cases of early-stage breast cancer (WBH, n=678; ASBrS, n=1449). Three forms of APBI were used at WBH (interstitial, n=221; balloon-based, n=255; or 3-dimensional conformal radiation therapy, n=206), whereas all Registry Trial patients received balloon-based brachytherapy. Patients were divided according to the ASTRO CS into suitable (n=661, 36.5%), cautionary (n=850, 46.9%), and unsuitable

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Registry Trial. The overall rate of ipsilateral recurrence was 2.8% at 5 years, with no statistical difference in rate of ipsilateral breast tumor recurrence or difference in failure at the lumpectomy bed observed between risk groups at 5 years. A trend toward an increased rate of elsewhere failures was observed, however, within the cautionary and unsuitable categories.

(n = 302, 16.7%) categories. Tumor characteristics and clinical outcomes were analyzed according to CS group.

Results: The median age was 65 years (range, 32-94 years), and the median tumor size was 10.0 mm (range, 0-45 mm). The median follow-up time was 60.6 months. The WBH cohort had more node-positive disease (6.9% vs 2.6%, $P < .01$) and cautionary patients (49.5% vs 41.8%, $P = .06$). The 5-year actuarial ipsilateral breast tumor recurrence (IBTR), regional nodal failure (RNF), and distant metastasis (DM) for the whole cohort were 2.8%, 0.6%, 1.6%. The rate of IBTR was not statistically higher between suitable (2.5%), cautionary (3.3%), or unsuitable (4.6%) patients ($P = .20$). The nonsignificant increase in IBTR for the cautionary and unsuitable categories was due to increased elsewhere failures and new primaries ($P = .04$), not tumor bed recurrence ($P = .93$).

Conclusions: Excellent outcomes after breast-conserving surgery and APBI were seen in our pooled analysis. The current ASTRO CS guidelines did not adequately differentiate patients at an increased risk of IBTR or tumor bed failure in this large patient cohort.

Introduction

Accelerated partial breast irradiation (APBI) delivers adjuvant radiation therapy to the tissue immediately surrounding the lumpectomy cavity, which is at highest risk for tumor recurrence after breast-conserving surgery. Previously used as a technique to boost the lumpectomy bed, APBI was initially investigated in the United States in the early 1990s for its use in treating the lumpectomy cavity as monotherapy. Recommendations regarding appropriate patient selection for this technique have been issued by several professional societies, including the American Brachytherapy Society (ABS) and the American Society of Breast Surgeons (ASBrS); these recommendations primarily focused on patient age, tumor size, and margin status. In 2009, the American Society for Radiation Oncology (ASTRO) released expansive Consensus Statement (CS) recommendations regarding the use of APBI outside of a clinical trial (1). Although multiple groups have attempted to validate this system of patient stratification (2-7), to date only 1 study has been able to show statistically different rates of ipsilateral breast tumor recurrence (IBTR) between risk groups after APBI by use of the suitable-cautionary-unsuitable system (8). The purpose of this analysis was to pool 2 large patient cohorts and create the largest collection of cases published to date to determine whether the ASTRO CS guidelines are useful in differentiating subsets of patients who may be at an increased risk of IBTR after APBI at 5 years.

Methods and Materials

A combined group of 2127 patients with of early-stage breast cancer were treated with breast-conserving surgery followed by APBI at either William Beaumont Hospital (WBH) or as part of the American Society of Breast Surgeons (ASBrS) MammoSite® Registry Trial. A breast surgeon or general surgeon and a radiation oncologist evaluated each patient independently regarding appropriateness for treatment with APBI. Breast-conserving surgery was performed with the goal of obtaining at least 2-mm margins in all dimensions. In general, APBI was delivered by use of twice-daily radiation therapy over 5 days to the lumpectomy bed, with either brachytherapy or a 3-dimensional conformal radiation therapy (3D-CRT) technique.

WBH patient cohort

Patients treated at William Beaumont Hospital (WBH) were treated with APBI between October 1992 and January 2012. Three forms of APBI were used at WBH to treat this patient cohort (interstitial, n = 221; balloon, n = 255; 3D-CRT, n = 206). Details regarding patient eligibility, treatment planning, and follow-up for each technique have been previously published (9-11). In general, the patients were treated with a single implant receiving either low-dose-rate permanent-implant brachytherapy (50 Gy) or high-dose-rate brachytherapy (32-34 Gy, 8-10 fractions) temporary implant brachytherapy. Forty-five patients were treated as part of 2 separate institutional hypo-APBI protocols (28 Gy in 4 twice-daily fractions). The 3D-CRT patients received a total external beam radiation dose of 38.5 Gy delivered in 10 fractions to account for decreased heterogeneity with this technique. All high-dose-rate 3D-CRT treatments were delivered twice daily, with at least 6 hours between fractions. Data for women who were treated at WBH as part of the original ASBrS MammoSite® Registry Trial were kept with the ASBrS Trial data and removed from the WBH dataset for the purpose of this analysis to ensure that they were evaluated only once. Follow-up at WBH was performed every 3 to 6 months for the first 5 years and annually thereafter.

American Society of Breast Surgeons MammoSite® Registry Trial

The ASBrS MammoSite® Registry Trial evaluated patients receiving adjuvant radiation therapy via the MammoSite® (Hologic, Inc, Bedford, MA) single-lumen Radiation Therapy System and consisted of 97 institutions treating a total of 1449 cases of early-stage breast cancer between May 4, 2002, and July 30, 2004. The goals and objectives of the registry trial were to provide a forum to prospectively document data on the use and efficacy of the applicator. Information on enrollment criteria, data collection, treatment techniques, follow-up protocols, and data management has previously been published (12, 13). After treatment, patients were followed by their radiation oncologist, their surgeon, or both, and data collected included cosmetic evaluation, use of adjuvant