Published in final edited form as:

Am J Surg. 2016 July ; 212(1): 178–179. doi:10.1016/j.amjsurg.2015.06.024.

Did the adoption of Accelerated Partial Breast Irradiation Reduce the Noncompliance with Adjuvant Radiation in Lumpectomy Patients?

Nengliang Yao, PhD and

University of Virginia, College of Medicine, Department of Public Health Sciences, Charlottesville, VA

Abram Recht, MD

Harvard Medical School, Department of Radiation Oncology, Boston, MA and Beth Israel Deaconess Medical Center, Department of Radiation Oncology, Boston, MA

Abstract

Background—The under-utilization of radiation therapy after breast-conserving surgery in early stage breast cancer patients has been attributed to the inconvenience and potential side effects of whole-breast radiation treatment regimens. Accelerated partial breast irradiation (APBI) involves twice-daily treatments over 4–5 days, which could potentially improve convenience and adherence for women undergoing treatment.

Methods—We studied local therapies in about a third of a million female breast cancer patients who were diagnosed between January 2000 to June 2011.

Results—We found that the use of APBI brachytherapy increased rapidly from 0.2 % in 2000 to about 3.1 % in 2008 and leveled off after 2009. The increased use of APBI did not reduce the percentage of early stage breast cancer patients who improperly forego radiation (about 14% over the whole study period).

Conclusion—Noncompliance with adjuvant radiation is still common when shortened radiation therapy becomes increasingly accessible.

Clinical guidelines call for the routine use of radiation therapy after breast-conserving surgery (BCS) for early-stage cancer. Nonetheless, many patients still do not receive radiation treatment after BCS.^{1,2} This under-utilization has been attributed to the inconvenience and potential side effects of whole-breast radiation treatment regimens. In contrast, accelerated partial breast irradiation (APBI) involves twice-daily treatments over 4–5 days, which could potentially improve convenience and adherence for women undergoing

Corresponding Author: Nengliang (Aaron) Yao, PhD., Department of Healthcare Policy and Research, Virginia Commonwealth University School of Medicine, ayao@virginia.edu, 434-924-5118 (phone).

The authors do not have any financial disclosures or conflicts of interest.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

treatment, as well as minimize toxicity.^{3,4} Although the conclusive results of large phase III randomized trials will not be available for at least several more years, since 2002 APBI (especially using brachytherapy) has been rapidly incorporated into breast cancer care as the sole radiation treatment after BCS.^{5,6} This brief report examines if the rapid adoption of APBI brachytherapy has resulted in a reduction of the proportion of lumpectomy patients not receiving radiation therapy.

We used data from the 2014 Surveillance, Epidemiology, and End Results (SEER) database, which collects cancer incidence and survival data from 18 population-based cancer registries covering approximately 28 percent of the US population. We identified 309,429 female breast cancer patients who were diagnosed between January 2000 to June 2011. Patients met the following inclusion criteria for analysis: ages 18 to 70 years; unilateral tumor; pathologically confirmed case; Stage I or II tumor; first primary cancer diagnosis; diagnosis not obtained through death certificate or autopsy; and a minimum survival period of 6 months. Patients with noninvasive ductal carcinoma in situ or lobular carcinoma in situ were excluded. We categorized patients into five treatment groups: BCS without radiation (BCS only); BCS with APBI brachytherapy (BCS-APBIb); BCS with whole breast irradiation (WBI); mastectomy; and others. Patients who received external-beam radiation combined with a brachytherapy boost were grouped into the WBI group. We report the monthly proportion of patients undergoing specific local treatments. We then used linear regression models to examine the substitution relationship between those treatment strategies.

Most patients were treated with mastectomy (38%) or BCS-WBI (44%) during the study period. Figure 1 shows how treatment choice varied over the study period. The use of APBIb increased rapidly after the approval of the “MammoSite” device by the Food and Drug Administration and the Centers for Medicaid and Medicare Services (CMS) decision to reimburse for APBIb, resulting in the proportion of patients treated rising from 0.2 % in 2000 to about 3.1 % in 2008. The decision by CMS to decrease reimbursement for APBI-b and the caution urged by the ASTRO consensus statement may have resulted in the leveling off in the use of APBI-b seen after 2009.⁸ The increased use of APBIb was not accompanied with any significant reduction in the overall proportion of patients with lumpectomy not receiving radiation therapy (about 14% over the whole study period). Regression analysis also suggests that the increase in the use of APBIb was not associated with statistically significant decrease in the omission of radiation after lumpectomy ($p=0.642$).

It seems that being able to drastically shorten the course of radiotherapy did not reduce the percentage of early stage breast cancer patients who improperly forego radiation, although APBI becomes increasingly accessible. There will still be substantial numbers of patients who will not receive radiation after BCS. Previous studies found that radiation is more often omitted after BCS in certain groups of patients such as minority women, younger and older women, women living in rural areas, and those with Medicaid coverage.^{1,9,10} Removing institutional, logistical, and financial barriers to care seem more promising avenues to reduce noncompliance with treatment guidelines than changes in technology.

Acknowledgments

Funding source: Dr. Yao was supported under a fellowship from the National Cancer Institute (2R25CA093423).

References

1. Yao N, Matthews SA, Hillemeier MM, Anderson RT. Radiation Therapy Resources and Guideline-Concordant Radiotherapy for Early-Stage Breast Cancer Patients in an Underserved Region. *Health Serv Res*. 2013; 48(4):1433–1449. DOI: 10.1111/1475-6773.12047 [PubMed: 23445478]
2. Freedman RA, He Y, Winer EP, Keating NL. Trends in racial and age disparities in definitive local therapy of early-stage breast cancer. *J Clin Oncol Off J Am Soc Clin Oncol*. 2009; 27(5):713–719. DOI: 10.1200/JCO.2008.17.9234
3. Arthur DW, Vicini FA. Accelerated Partial Breast Irradiation As a Part of Breast Conservation Therapy. *J Clin Oncol*. 2005; 23(8):1726–1735. DOI: 10.1200/JCO.2005.09.045 [PubMed: 15755981]
4. Njeh CF, Saunders MW, Langton CM. Accelerated Partial Breast Irradiation (APBI): A review of available techniques. *Radiat Oncol*. 2010; 5(1):90.doi: 10.1186/1748-717X-5-90 [PubMed: 20920346]
5. Smith GL, Xu Y, Shih Y-CT, et al. Breast-conserving surgery in older patients with invasive breast cancer: current patterns of treatment across the United States. *J Am Coll Surg*. 2009; 209(4):425–433. e2. DOI: 10.1016/j.jamcollsurg.2009.06.363 [PubMed: 19801315]
6. Hattangadi JA, Taback N, Neville BA, Harris JR, Punglia RS. Accelerated partial breast irradiation using brachytherapy for breast cancer: patterns in utilization and guideline concordance. *J Natl Cancer Inst*. 2012; 104(1):29–41. DOI: 10.1093/jnci/djr495 [PubMed: 22180643]
7. Smith BD, Pan I-W, Shih Y-CT, et al. Adoption of Intensity-Modulated Radiation Therapy for Breast Cancer in the United States. *J Natl Cancer Inst*. 2011; 103(10):798–809. DOI: 10.1093/jnci/djr100 [PubMed: 21525437]
8. Smith BD, Arthur DW, Buchholz TA, et al. Accelerated partial breast irradiation consensus statement from the American Society for Radiation Oncology (ASTRO). *Int J Radiat Oncol Biol Phys*. 2009; 74(4):987–1001. DOI: 10.1016/j.ijrobp.2009.02.031 [PubMed: 19545784]
9. Lazovich DA, White E, Thomas DB, Moe RE. Underutilization of breast-conserving surgery and radiation therapy among women with stage I or II breast cancer. *JAMA J Am Med Assoc*. 1991; 266(24):3433–3438.
10. Pan I-W, Smith BD, Shih Y-CT. Factors contributing to underuse of radiation among younger women with breast cancer. *J Natl Cancer Inst*. 2014; 106(1):djt340.doi: 10.1093/jnci/djt340 [PubMed: 24317177]

Figure 1.
Monthly Trends of Treatment Choices in Early Stage Breast Cancer Patients