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Brachytherapy ■ (2016) ■

BRACHYTHERAPY

Trends in the use of implantable accelerated partial breast irradiation for ductal carcinoma *in situ*: Implications of the recent amendments to the American Society for Radiation Oncology consensus guidelines

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ABSTRACT

PURPOSE: In 2009, the American Society for Radiation Oncology (ASTRO) published consensus recommendations that stated ductal carcinoma *in situ* (DCIS) patients were in a ''cautionary'' group for accelerated partial breast irradiation (APBI) and should not receive APBI outside of a clinical trial. However, very recently, ASTRO placed low-risk DCIS patients in the ''suitable'' category. Given this recent change, we aimed to use the Surveillance, Epidemiology, and End Results (SEER) database to evaluate past patterns of implantable APBI (IAPBI) utilization in women with DCIS.

METHODS AND MATERIALS: The Surveillance, Epidemiology, and End Results database was queried for patients from 2000 to 2012 with DCIS that underwent lumpectomy and adjuvant radiation therapy. Patients receiving IAPBI were differentiated from those receiving whole breast radiation therapy. Trends based on treatment year and patient demographics were collected, and multivariable logistic regression determined factors independently predictive of use of IAPBI.

RESULTS: Of 52,012 eligible patients, 49,450 (95%) underwent external beam radiation and 2562 (5%) received APBI. Though IAPBI utilization steadily increased from 2000 (0.2% of the study population) to 2008 (9.4%), it abruptly declined in 2009 (7.9%, $p = 0.009$) and yearly thereafter. The 40−49 age group was proportionally most associated with this decline (8.6% in 2008 to 4.3% in 2009). Factors independently associated with IAPBI receipt included increasing age, hormone receptor negative status, and women living in the South.

CONCLUSIONS: Patterns of IAPBI administration in DCIS are described. These trends are important to consider as a benchmark going forward, in light of the very recent change in ASTRO recommendations to include low-risk DCIS patients.

Keywords: Breast cancer; Accelerated partial breast irradiation; Radiation therapy; Ductal carcinoma *in situ*

Introduction

The role of radiation therapy (RT) as part of adjuvant treatment for ductal carcinoma *in situ* (DCIS) of the breast continues to evolve. Multiple randomized trials have demonstrated the benefit of postoperative RT in reducing ipsilateral breast tumor recurrences (IBTRs), but no overall survival benefit has been demonstrated to date (1). Extrapolating from experience treating patients with invasive breast cancer, adjuvant RT is most commonly administered in DCIS using a conventionally fractionated or, occasionally, a hypofractionated approach (2). Multiple retrospective reviews have demonstrated medical equipoise for patients with DCIS treated with either conventionally fractionated RT or hypofractionated RT, and early results from a randomized trial suggest improved cosmesis with the use of hypofractionation (3−6).

Received 2 November 2016; received in revised form 7 December 2016; accepted 8 December 2016.

This has never been presented/published before in any form.

Conflict of interest: All authors declare that conflicts of interest do not exist.

Financial disclosure: There was no research support for this study.

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1538-4721/$ - see front matter
http://dx.doi.org/10.1016/j.brachy.2016.12.002

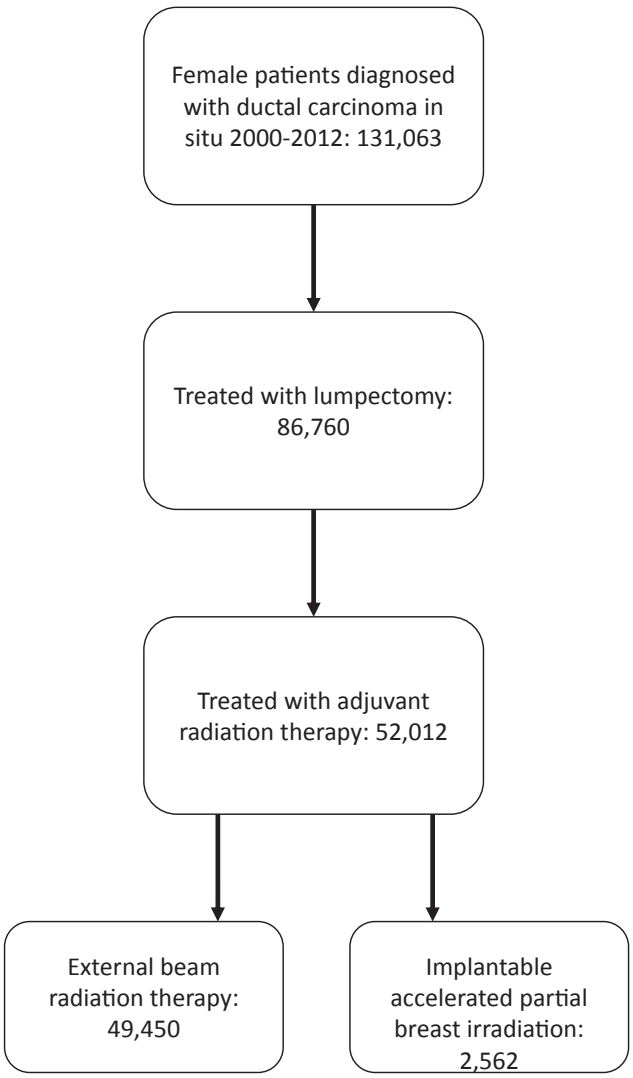

Fig. 1. Flowchart for patient selection.

Table 1
Baseline characteristics for female patients diagnosed with ductal carcinoma *in situ* between 2000 and 2012

Characteristic	Number (%) RT N = 49,450 (95.1%)	IAPBI N = 2562 (4.9%)	p-value
Age at diagnosis			
18−39	1029 (2.1)	10 (0.4)	<0.0001
40−49	10,411 (21.1)	334 (13)	
50−59	14,917 (30.2)	810 (31.6)	
60−69	13,468 (27.2)	820 (32)	
70−79	7813 (15.8)	482 (18.8)	
80+	1812 (3.6)	106 (4.1)	
Race			
White	39,142 (79.2)	2133 (83.3)	<0.0001
African American	5104 (10.3)	276 (10.8)	
Other/unknown	5204 (10.5)	153 (6)	
Laterality			
Left	25,215 (51)	1345 (52.5)	0.2734
Right	24,234 (49)	1217 (47.5)	
Unknown	1 (0%)	0 (0)	
Marital status			
Married	30,907 (62.5)	1647 (64.3)	0.0163
Widowed	5294 (10.7)	284 (11.1)	
Single	5933 (12)	256 (10)	
Divorced/separated/unknown	7316 (14.8)	375 (14.6)	
Median family income			
<40,000	3840 (7.8)	233 (9.1)	0.0019
40,001−50,000	13,372 (27)	619 (24.2)	
50,001−75,000	25,438 (51.4)	1378 (53.4)	
>75,000	6797 (13.7)	332 (13)	
Unknown	3 (0)	0 (0)	
Hormone receptor status			
ER+/PR+	24,152 (48.8)	1676 (65.4)	<0.0001
ER+/PR−	3447 (7)	200 (7.8)	
ER−/PR+	245 (0.5)	10 (0.4)	
ER−/PR−	4010 (8.1)	234 (9.1)	
Unknown	17,596 (35.6)	442 (17.3)	
Region			
Alaska	32 (0)	0 (0)	<0.0001
Metro Atlanta	2094 (4.2)	326 (12.7)	
Greater California	9379 (19)	407 (15.9)	
Connecticut	3637 (7.4)	128 (5)	
Metro Detroit	3599 (7.3)	107 (4.2)	
Greater Georgia	2800 (5.7)	310 (12)	
Hawaii	1398 (2.8)	4 (0.2)	
Iowa	2253 (4.6)	98 (3.8)	
Kentucky	2058 (4.2)	121 (4.7)	
Los Angeles	3539 (7.2)	163 (6.4)	
Louisiana	2197 (4.4)	169 (6.6)	
New Jersey	6569 (13.3)	269 (2.7)	
New Mexico	573 (1.2)	46 (1.8)	
Rural Georgia	64 (0.1)	3 (0.1)	
San Francisco	2940 (5.9)	92 (3.6)	
San Jose	1718 (3.5)	101 (3.9)	
Seattle	3815 (7.7)	187 (7.3)	
Utah	786 (1.6)	31 (1.2)	

RT = radiation therapy; IAPBI = implantable accelerated partial breast irradiation.

However, owing to a greatly shortened treatment course, improved patient convenience, comparable cosmesis, and potentially fewer toxicities, accelerated partial breast irradiation (APBI) is now a legitimate option for selected invasive lesions (7). The American Society for Radiation Oncology (ASTRO) guidelines for patient selection, published in 2009, recommended that pure DCIS cases were not ''suitable'' for APBI but were ''cautionary'' if ≤3 cm and ''unsuitable'' if >3 cm (8). As mentioned by the panel, much of this recommendation centered on the fact that seminal data of APBI excluded (or greatly underrepresented) DCIS cases.

Since 2009, many retrospective investigations pointed to the efficacy of APBI for DCIS in producing low rates of IBTRs, as well as maintaining acceptable cosmesis (9−14). Population-based data described a near 10-fold increase in the utilization of APBI between 2001 and 2007 (15, 16). Consequently, the American Brachytherapy Society recommended in 2013 that APBI was considered acceptable to treat pure DCIS (17). A randomized trial from Europe comparing adjuvant treatment with either conventionally fractionated RT or APBI for patients with