



Trends in cervical cancer brachytherapy volume suggest case volume is not the primary driver of poor compliance rates with brachytherapy delivery for locally advanced cervical cancer

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ABSTRACT

PURPOSE: The aim of this study was to evaluate temporal trends in the volume of cervical cancer brachytherapy cases available to trainees as a potential contributing factor to national trends toward decreased utilization of brachytherapy for locally advanced cervical cancer.

METHODS AND MATERIALS: The National Cancer Database was queried to identify a cohort of women diagnosed with locally advanced cervical cancer during 2004–2013 who received primary radiation therapy. We identified academic facilities that reported radiation therapy and brachytherapy delivery the study period, categorized facilities based on annual number of cases, and evaluated temporal trends.

RESULTS: A total of 6290 patients treated at 220 facilities were evaluated. During the study period, the proportion of facilities with higher brachytherapy volume remained stable. The trend of each grouping was not significant ($p > 0.05$) with the exception of centers treating one case per year, which demonstrated a decrease over time ($p = 0.022$).

CONCLUSIONS: Our analysis suggests that cervical cancer case volume at academic institutions, available for resident training, was stable throughout the study period. These findings suggest that targeting resident educational programs should not be the highest priority for interventions to improve rates of appropriate brachytherapy utilization for cervical cancer. © 2017 American Brachytherapy Society. Published by Elsevier Inc. All rights reserved.

Keywords:

Cervical cancer; Brachytherapy; Resident training; Volume; Disparities

Introduction

Brachytherapy is an essential component of curative treatment for locally advanced cervical cancer. However, several investigations have recently identified low and declining rates of brachytherapy utilization for cervical cancer, with associated negative influence on survival. Han *et al.* (1) identified a sharp decline in brachytherapy utilization in a cohort from the Surveillance, Epidemiology, and End Results database, with the rate of brachytherapy use declining from 83% in 1988 to 58% in 2009. Gill *et al.*

(2) showed that brachytherapy use decreased from 96.7% to 86.1% from 2004 to 2011 in a cohort from the National Cancer Database (NCDB). Although not all population-based studies agree on this topic (3, 4), a similar trend was noted in the 2005–2007 Quality Research in Radiation Oncology study, which also demonstrated that brachytherapy was significantly more likely to be omitted at small nonacademic facilities than at academic facilities (5).

Factors that have been cited as potentially contributing to the decline in brachytherapy include inadequate maintenance of brachytherapy skills among practicing radiation oncologists, decline in quality of brachytherapy training during residency, financial disincentives against brachytherapy use, and the availability of intensity-modulated radiation therapy (IMRT) and stereotactic body radiation therapy (SBRT) as alternative modalities (6). We hypothesized that, among these potential contributors, brachytherapy training during residency is not a primary contributor

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Conflict of interest: None to report.

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to the observed decline and that academic centers have maintained relatively stable cervical cancer case volume. By investigating this issue, we hope to focus attention instead on other potential factors, particularly brachytherapy reimbursement because the higher physician effort and complexity of brachytherapy compared with external beam radiation therapy (EBRT) are not rewarded with parallel increases in physician payment. We used the NCDB to evaluate temporal trends in brachytherapy case volume at academic facilities during 2004–2013.

Methods and materials

From among a total of 98,347 women in the NCDB who were diagnosed with cervical cancer during 2004 through 2013, we identified an analysis cohort of patients who met inclusion criteria. Patients were included if they received primary radiation therapy, had Stage IB2–IVA cancer (as defined by the American Joint Commission on Cancer clinical staging system), received treatment at an academic center (as defined by the NCDB under facility type) (7), and received brachytherapy as part of their treatment (Fig. 1). Using this cohort, we evaluated trends in annual number of patients who received brachytherapy at each academic facility during the study period. Because patients frequently receive multiple fractions of brachytherapy during a complete course, it should be noted that patient volume is not the same as case volume. We only included centers in the analysis once they began contributing cases to NCDB to avoid misrepresenting lack of reporting as low patient volume (i.e., if a center joined in 2007, they would not contribute from 2004 to 2006). Tests for trend over time were performed using the χ^2 linear-by-linear association test, and p -values of <0.05 were considered statistically significant.

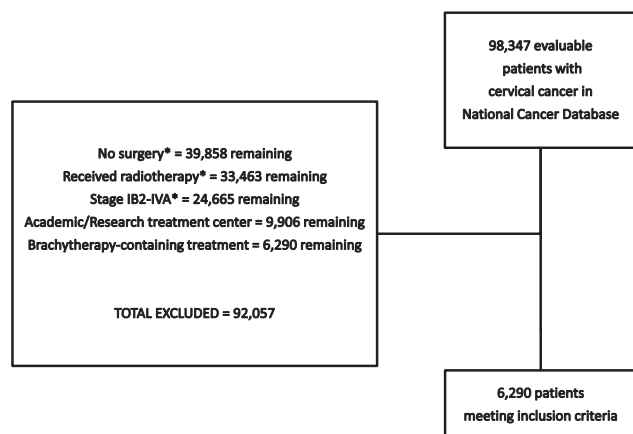


Fig. 1. Cohort selection process to identify an analysis cohort of patients in the National Cancer Database who were diagnosed with locally advanced cervical cancer during 2003–2014 and received brachytherapy at an academic facility. *Cases with unknown values or with contraindications to surgery and/or radiotherapy were excluded.

Results

The final cohort comprises 6290 patients who met inclusion criteria and who received treatment at a total of 220 academic centers. Patient characteristics are shown in Table 1. Most patients received chemotherapy and had Stage II/III cervical cancer.

Figure 2 displays the proportion of academic facilities each year with specific categories of annual patient volume (none, 1, 2–3, 4–5, and 6+ patients who received brachytherapy). The number of reported cases remained relatively stable over time with increase because of additional centers reporting to the NCDB. Overall, the proportion of academic facilities with 6+ or 4–5 annual patients appeared relatively stable during the study period without a clear downward trend over time. In tests for trend analysis, the trend of each grouping was not significant ($p > 0.05$) with the exception of centers treating one case per year, which demonstrated a decrease over time ($p = 0.022$). The proportion of facilities with 6+ annual patients treated with brachytherapy was consistently low (near 20%), and the proportion of facilities with 0 annual patients was consistently high (near 20%), throughout the study period.

Discussion

In a large cohort of patients in the NCDB who received treatment at an academic center during 2004–2013, we did not observe a trend toward lower proportion of academic centers with relatively high number of cervical cancer brachytherapy patients. This finding suggests that an ongoing downward trend in residency training case volume is not a likely culprit for the reported decline in compliance with brachytherapy for locally advanced cervical cancer because no major changes were observed during the study period. On the other hand, it is important to also note that we observed a surprisingly low proportion of facilities reporting brachytherapy for six or more cervical cancer patients annually and a relatively high proportion reporting no brachytherapy during the study period, which indicates a general deficiency in opportunities for brachytherapy training at some facilities. Our findings are consistent with self-reported data from radiation oncology residents: graduates of U.S. radiation oncology residency programs have demonstrated stable responses regarding adequate education experiences in gynecologic cancers on the Association of Residents in Radiation Oncology survey of chief residents, with 80% or more of graduates reporting adequate exposure on surveys administered in 2003, 2005–2008, and 2013–2015 (8–10). In the 2015 Association of Residents in Radiation Oncology survey, more than 90% of respondents reported adequate experience in high-dose-rate brachytherapy for gynecologic cancer, up from 70% in the 2014 survey (9), suggesting a high rate of comfort with brachytherapy. In addition, reported gynecologic brachytherapy volume remained stable during the

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