Gynecologic Oncology xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Gynecologic Oncology

journal homepage: www.elsevier.com/locate/ygyno

Cervical cancer care in rural Virginia: The impact of distance from an academic medical center on outcomes & the role of non-specialized radiation centers

Lisa A. Rauh [a,*], Erin J. Saks [b], Diana Nakad-Rodriguez [c], Timothy N. Showalter [d], Linda R. Duska [a]

[a] Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, University of Virginia, Charlottesville, VA, United States of America
[b] Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, Virginia Tech School of Medicine, Roanoke, VA, United States of America
[c] Division of Public Health Services, Wake Forest University School of Medicine, Winston-Salem, NC, United States of America
[d] Department of Radiation Oncology, University of Virginia, Charlottesville, VA, United States of America

HIGHLIGHTS

- Distance to a tertiary care facility does not affect outcomes in locally advanced cervical cancer patients.
- Facility where external beam radiation is performed does not impact progression free or overall survival.
- Care coordination by a tertiary care facility may mitigate potential differences in outcomes based on geographic distance.
- Having non-private insurance or being uninsured increases the risk of death in locally advanced cervical cancer.

ARTICLE INFO

Article history:
Received 22 April 2018
Received in revised form 11 June 2018
Accepted 16 June 2018
Available online xxxx

Keywords:
Cervical cancer
Distance
Disparities
Chemo-radiation

ABSTRACT

Objective. To determine whether distance to a tertiary care facility affects outcomes for locally advanced cervical cancer and to evaluate the impact of receiving care at non-specialized centers in rural communities.

Methods. Retrospective, single institution study of patients with locally advanced cervical cancer managed with chemo-radiation from January 1, 2000 to June 1, 2014. Kaplan-Meier survival curves and Cox proportional hazard models were used to compare progression free and overall survival for patients by median distance to the tertiary care facility (<72 miles or >72 miles) and facility where treatment was received.

Results. 180 patients met inclusion criteria. There was no difference in PFS or OS between the travel distance cohorts. When compared by location of external beam radiation, patients treated at outside facilities were older ($p = 0.02$) and significantly more likely to be insured (95.6% versus 71.7%, $p < 0.0002$). There were more recurrences among patients treated at outside facilities (31.1% versus 15.8%) but this was non-significant ($p = 0.24$). On multivariable analysis, FIGO stage and insurance status were associated with overall survival. Uninsured patients had a significantly increased hazard risk of death as compared to privately insured patients (HR 3.85 95% CI 3.07–4.64, $p = 0.0008$).

Conclusions. Median distance to a tertiary care facility had no significant impact on PFS or OS, however treating facility for radiation may influence recurrence rates. Having non-private insurance or being uninsured is significantly associated with increased risk of death and speaks to the many barriers these patients face.

1. Introduction

Geographic disparity and its impact on non-standard care delivery and survival outcomes has been increasingly investigated in gynecologic oncology. Much of the early research in this area focused on adherence to National Comprehensive Cancer Network (NCCN) guidelines and survival outcomes for ovarian cancer patients, showing that access to expert gynecologic oncology care improves outcomes [1, 2]. For locally advanced cervical cancer (LACC), recent studies have demonstrated that whether a patient receives quality treatment, including external beam radiation therapy (EBRT), brachytherapy (BT), and chemotherapy (CT), depends heavily upon which treatment facility provides their care. Treatment at a high-volume (i.e., based upon number of cervical patients per year) or academic medical center is associated with higher likelihood of receiving BT and CT [3].

* Corresponding author at: Box 800712, Charlottesville, VA 22908, United States of America.
E-mail address: lar5v@hscmail.mcc.virginia.edu (L.A. Rauh).

https://doi.org/10.1016/j.ygyno.2018.06.019
0090-8258/

Geographic distance to high-volume and/or academic medical centers may contribute to disparities in cervical cancer outcomes. The more rural Midwest, Great Plains, and South have some of the highest incidences of cervical cancer as well as cervical cancer-associated deaths in the United States [4]. A potential explanation may be that the standard of care for locally advanced cervical cancer is complex and requires substantial patient effort and time to receive several weeks of daily EBRT with concurrent weekly cisplatin CT and BT boost. This treatment regimen represents a barrier to care adherence for patients living at significant distances from treating facilities or those who have transportation limitations. It has also been previously demonstrated that increasing time to complete radiation treatment is associated with worse clinical cancer outcomes, making it imperative that patients receive timely care and suggesting that delays in definitive chemoradiation therapy related to travel distance may be a potential contributor to disparities [5].

Interestingly, median distance traveled from home to a tertiary care facility has not been consistently demonstrated to be predictive of worse progression free (PFS) or overall survival (OS) among patients being treated with primary chemoradiation for LACC [6, 7]. And unlike what has been previously demonstrated for ovarian cancer, hospital volume has not been found to be associated with overall survival [8–10]. Rather, specific hospitals in which patients received care have been found to be associated with improved overall survival [8]. This may reflect the decreasing number of centers with experience in the treatment of cervical cancer given the disease's overall decrease in incidence [11]. Indeed, a recent analysis of the National Cancer Database found that a majority of participating facilities (78%) treated less than three patients for LACC annually [3].

As cervical cancer has a high incidence in rural regions, it may be that otherwise lower volume facilities have a preponderance of experience in the management of specifically locally advanced cervical cancer and thus achieve superior outcomes [12]. Given that the catchment area for our tertiary care facility is largely rural, our patient population is ideal to try and address this question. As such, the objectives of this study were to evaluate whether distance from a tertiary care facility impacted outcomes for LACC patients managed with primary chemoradiation and, secondarily, the impact of receiving care at non-specialized centers specifically in rural communities.

2. Methods

After receiving approval by the University of Virginia's (UVA) Institutional Review Board, we performed a retrospective chart review on all women (ages 18 to 89) evaluated for a diagnosis of cervical cancer from January 1, 2000 to June 1, 2014. Patients were identified using the UVA's tumor board registry. We excluded patients who never received treatment, were primarily managed with chemotherapy and/or surgery, and did not have a zip code listed in the electronic medical record. The following information was abstracted from included patients' charts: age, race, zip code, insurance, stage, histology, date of diagnosis, date of first recurrence, date of last contact and vital status at that time, metastatic disease at diagnosis, type of surgical resection (if any), type of radiation given (external beam alone, brachytherapy alone, both external beam and brachytherapy), if sensitizing chemotherapy was given, location of external beam radiation and brachytherapy, total Gray dose given, and time to complete treatment.

At our tertiary care facility, all cervical cancer patients have an initial consultation with a gynecologic oncologist and radiation oncologist. After initial meeting with the above physicians and care teams, all patients are followed by a nurse care coordinator from the radiation oncology service who ensures that patients receive appropriate and timely care including brachytherapy, regardless of facility where EBRT is received.

Shortest distance traveled in miles from patient's listed zip code to UVA was determined using an online mapping website; this served as a proxy for total distance required to travel to the tertiary care facility for treatment. The median distance to UVA was 72.0 miles; patients were then placed into two cohorts based on relationship to median distance required to travel to the tertiary care facility: cohort one, <72 miles to travel and cohort two, >72 miles to travel.

The primary outcome was overall survival (OS) based on distance traveled to our tertiary care facility. Secondary outcomes included progression free survival (PFS) based on distance traveled, and OS and PFS based on primary treating facility. Univariable analysis was conducted with Chi-square, Fisher's exact, and Wilcoxon rank sum test where appropriate. Survival analysis was performed using the Kaplan-Meier estimate of survival probability and compared with the log-rank test. A Cox proportional hazard model was employed to evaluate the independent effect of demographic and clinical characteristics on PFS and OS; variables significant after the univariable analysis were selected for this model. Of note, this model was performed first with and then without duration of chemoradiation treatment as a co-variate; however, results were unchanged and decision was made to omit it from the final hazard model. As this is a single institution study and our sample size was limited, we performed a power calculation to help better assess the validity of any results. Given our sample size and overall rate of death of 35%, this study had 51% power to detect a difference in overall survival.

3. Results

A total of 180 patients met inclusion criteria. The median age for the entire cohort was 51 years. Of the patients included, most were diagnosed with FIGO stage IB2 (27.8%), FIGO IIB (25.0%), or FIGO IIIB (16.7%) disease. A majority of these patients were treated with a combination of external beam radiation and brachytherapy (93.8%); 11 patients (6.2%) were treated with external beam radiation alone. One hundred and twenty-seven patients (73.4%) received external beam radiation therapy at our academic facility. All patients received brachytherapy at our academic institution. Median time to completion of radiation was 47.0 days however this data was only available for 96 of the 180 patients (53.3%). Most patients, 94.9%, received chemotherapy concurrent with radiation. The median travel distance to UVA was 72.0 miles (range 2.0 miles to 295.0 miles). Median follow-up time for the entire cohort was 50.1 months, and this was not significantly different when comparing those who traveled less than or more than the median distance.

When patients were divided by the median distance traveled to UVA, none of the demographic or clinical characteristics analyzed were statistically different (Table 1). Patients living at greater distances were not more likely to be diagnosed with an advanced stage or have metastatic disease at diagnosis. In addition, there were no significant differences in time to complete radiation or proportion of patients receiving concurrent chemotherapy. No significant difference was found in OS ($p = 0.43$) or PFS ($p = 0.49$) when comparing patients who lived less than and >72 miles from the academic center. While the median overall survival was not reached in this cohort, PFS was 19 months for those who lived <72 miles from UVA and 18 months for those who lived greater than the determined median distance.

Eight patients did not have facility site where external beam radiation was administered documented in the chart. When comparing the remaining 172 patients who received EBRT at an outside facility versus those who received care at the tertiary care center, they were older with a median age of 56 versus 49 years ($p = 0.02$) and more likely to be insured (95.6% versus 71.7%, $p = 0.0002$) (Table 2). While not statistically significant, there was a trend towards increased rate of recurrent disease in patients who received EBRT at an outside facility, with 31.1% versus of 15.8% of patients with a documented recurrence respectively. Race/ethnicity, FIGO stage, histologic type, metastatic disease at diagnosis, distance to the tertiary care facility, time to complete treatment, and administration of concurrent chemotherapy were not significantly different between these cohorts (Table 2). There was no significant

Please cite this article as: L.A. Rauh, et al., Cervical cancer care in rural Virginia: The impact of distance from an academic medical center on outcomes & the role of non-s..., Gynecol Oncol (2018), https://doi.org/10.1016/j.ygyno.2018.06.019