Palliative Radiotherapy at the End of Life

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Abstract

Purpose: A significant proportion of patients with advanced cancer undergo palliative radiotherapy (RT) within their last 30 days of life. This study characterizes palliative RT at our institution and aims to identify patients who may experience limited benefit from RT due to imminent mortality.

Materials and methods: 518 patients treated with external beam RT to a site of metastatic disease between 2012-2016 were included. Mann-Whitney U and chi-squared tests were used to identify factors associated with RT within 30 days of death (D30RT).

Results:

also recorded BMI, as weight loss has been shown to be a poor prognostic sign in patients with cancer, and inpatient status at the time of consult [10,11]. Vital status and date of death were confirmed with our institutional tumor registry. This retrospective review was approved by the institutional review board.

Prognostic scores

The TEACCH and Chow models have been described previously [12,13]. The Chow model of risk factors grouping is simple to use and categorizes patients based on 3 risk factors: non-breast primary, non-bone metastases, and KPS 60. Group I includes patients with 0-1 risk factors, Group II with 2 risk factors, and group 3 with all three risk factors [14]. The TEACHH model assigns points based on the following risk factors: non-breast or prostate primary, age > 60, ECOG performance status 2-4, liver metastases, hospitalization within 3 months of palliative RT consult, and 2 or more prior palliative chemotherapy courses [12]. Patients with 0-1 risk factors are categorized in group A, 2-4 risk factors in group B, and 5-6 risk factors in group C.

Statistics

The Shapiro-Wilk test was used to evaluate normality of continuous variables. Mann-Whitney U and Chi-squared tests were used to compare patients who received RT within 30 days of death (D30RT) and those who did not. D30RT was calculated from the start of RT. Multivariate analysis was used to identify factors associated with D30RT. A two-sided p<0.05 was considered significant. Statistics were performed using IBM SPSS, version 24 (SPSS; Chicago, IL).

Results

518 patients were included in this analysis. The median age at initial diagnosis was 60 years (interquartile range (IQR) 50-68 years) (Table 1).

Variable	Median (IQR) or % (n, of 518)
Age at diagnosis	60 (50-68)
Percent female	46% (238)
Race	
White	66% (340)
East Asian	14% (74)
African American	8.7% (45)
Southeast Asian	3.7% (19)
Asian NOS	3.7% (19)
Other (includes American Indian, Pacific Islander)	4.1% (21)
Percent Hispanic	9.1% (47)
Survival time since diagnosis (months)	28 (11-53)
Primary diagnosis	
Lung	26% (137)
Breast	19% (97)
Prostate	9.7% (50)
Renal cell	5.8% (30)
Colorectal	5.8% (30)
Hepatocellular	3.8% (20)
Head and Neck	3.5% (18)
Skin	3.3% (17)
Other*	23% (119)
Metastatic at diagnosis	49% (254)
Site of metastases	
Brain	47% (244)

Lung	55% (284)	
Liver	40% (208)	
Bone only	17% (90)	
BMI last course	24(21-27)	
KPS last consult	60 (50-80)	
KPS >70	45% (231/511)	
Hospitalization within 3 months of RT consult	58% (289/500)	
TEACHH score**	**%(n, of 450)**	**Median survival, months (IQR)**
0-1	6.2% (32/450)	6 (2.8-11)
4-Feb	68% (352/450)	2.2 (1.0-5.0)
6-May	13% (66/450)	1.3 (0.5-2.3)

CHOW model**

I	18% (92/510)	4.7 (2-11)
II	44% (227/510)	2.5 (1.0-5.6)
III	37% (191/510)	1.6 (0.7-2.7)

Hospice involved

Yes	47% (245)
No	28% (147)
Unknown	24% (126)

Place of death

Inpatient, acute care	23% (120)
Home	29% (151)
Inpatient hospice, non-acute care	10% (52)
SNF (not hospice)	1.5% (8)
Unknown	36% (187)

NOTE: * Includes primary cancer of the liver, bile ducts, esophagus, ovary, pancreas, meninges, endometrium, anus, lymph nodes, CNS, and pleura

**Some patients had incomplete information and thus TEACHH or Chow groups could not be calculated (denominators 450 and 510 respectively). Performance status at RT consult was the most commonly missing information, but also hospitalizations within 3 months of RT consult and number of prior palliative chemotherapy courses.

Characteristics	Median (IQR) or % (n, of 518)
Palliative course #	1 (1-2)
Age at RT	63 (54-71)
Prescribed fractions	5 (4-10)
1	17% (89)
4-Feb	9.6% (50)
5	32% (167)
9-Jun	3.5% (18)
10	34% (177)
>10	3.3% (17)
Treatment site	
Bone	57% (293)
Brain	28% (146)
Lung	2.9% (15)
Node	1.7% (9)
Other*	11% (55)
Incomplete RT course	12% (63)
Time from start of last RT course to death (days)	74 (33-174)
NOTE: * Includes soft tissue and visceral metastases	

Table 2: Summary of RT.

e median number of palliative chemotherapy regimens prior to RT was 1, though the range was quite large (0-13 regimens) (IQR 0-3 regimens)

e median time from the start of last RT course to death was 74 days (IQR 33-174 days). 125 patients (24%) died within 30 days of RT. D30RT was associated with older median age at initial diagnosis (63 vs. 59 years, p=0.002) and at the time of nal RT course (64 vs. 62 years, p=0.04), shorter interval since diagnosis (14 vs. 31 months, p<0.001), liver but not brain or lung metastasis (p = 0.02, 0.43, and 0.06 respectively), lower median KPS at consultation (50 vs. 70, p<0.001), lower median BMI (22 vs. 24, p=0.001), and inpatient status at consult (56% vs. 26%, p<0.001)(Table 3).

Parameters	D30RT (median (IQR) or % (proportion)**)	D>30RT (median (IQR) or % (proportion)**))	Chi-squared or p-value
Age at diagnosis	63 (52-70)	59 (47-67)	
Age at RT	64 (55-73)	62 (52-70)	
Gender, % female	42% (52/125)	47% (184/393)	
% Hispanic	5.8% (7/119)	11% (40/381)	
Survival time (months, diagnosis to RT)	14 (5-38)	31 (14-59)	
KPS at RT consult	50 (20-70)	70 (50-80)	
KPS>70	27% (33/124)	51% (198/387)	
BMI at RT consult	22 (IQR 20-25)	24 (21-27)	
Primary diagnosis breast/prostate	18% (22/125)	32% (124/393)	

Treatment site

Bone	53% (66/125)	77% (227/393)
Brain	34% (43/125)	26% (103/393)
Lung	4% (5/125)	3% (10/393)
Other*	9%(11/125)	13% (53/393)
Hospitalization within 3 months of consult	78% (97/125)	51% (192/375)

Increased hospice enrollment was associated with a longer interval since diagnosis (28 months *vs.* 21 months, p=0.04). Hospice was less likely to be involved when inpatients were evaluated for RT compared to outpatients (31% *vs.* 42%, p=0.02). ere was no association between age at diagnosis, age at RT, TEACHH or Chow score, or KPS and hospice involvement. Patients enrolled in hospice were less likely to die in a hospital setting (6.2%) but rather at home (67%) or in a non-acute care inpatient setting (27%, inpatient hospice unit or skilled nursing facility) compared to those not enrolled in hospice (81% in a hospital, 13% at home, 6% non-acute care inpatient) (p<0.001).

Discussion

Almost one-quarter of patients receiving palliative RT in this series were treated within their last 30 days of life, slightly higher than reported elsewhere, though Ellsworth et al. did nd that in a cohort of patients receiving RT for bone metastases, 26% were treated within 30 days of death [8,10,14]. Gripp et al. demonstrated that 15% of patients referred for palliative RT died within 30 days of admission, however this number may be lower than what we observed due to poorer performance status in their cohort (KPS<50 in >90% of patients compared to 25% of patients in our study), in whom RT may have been deferred [8].

Forty-two percent of patients who received RT within 30 days of

Together this data suggests we may not be optimally caring for patients at the end of life and that there are many questions that still need to be explored in order to optimize timing and dose of palliative radiation therapy for these patients. Development of prognostic models may allow better patient selection in this context, however the current tools available are not speci c for patients at risk for death within 30 days of treatment. Earlier integration of palliative care or hospice services may allow patients and physicians to optimally direct treatment at the end of life.

As all patients in this study received palliative RT to a site of metastatic disease, which is generally not available on hospice, our cohort is likely enriched with patients interested in pursing more aggressive treatment options; thus the rate of hospice involvement in

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