

Early Changes in Physical Activity and Quality of Life with Thoracic Radiation Therapy for Breast Cancer, Lung Cancer, and Lymphoma

Sheela Krishnan, MD¹, Hari Narayan, MD, MSCE², Gary Freedman, MD^{3,4}, Biniyam Demissei, MD, MSCE, PhD¹, Amanda M. Smith, MS¹, John P. Plastaras, MD, PhD^{3,4}, Steven Feigenberg, MD^{3,4}, Bonnie Ky, MD, MSCE^{1,4}

¹Department of Medicine, Division of Cardiology, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA , ²Department of Pediatrics, University of California San Diego, San Diego, CA, ³Department of Radiation Oncology, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, ⁴Abramson Cancer Center, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA



BACKGROUND

- Effects of thoracic radiation therapy (RT) on early changes in detailed measures of physical functioning and quality of life (QoL) are incompletely defined
- Evidence suggests that exercise can improve QoL for cancer patients¹

OBJECTIVE

- To examine the associations between thoracic RT dose volume metrics, physical activity, and QoL

METHODS

- Prospective, longitudinal cohort study of 130 participants with breast cancer, lung cancer, or mediastinal lymphoma initiating therapy with chemoradiation from 2015-2018 (NCT02769299)
- Data collected at 3 timepoints: (1) Pre-RT, (2) Immediately post-RT, (3) 5-9 months post-RT
 - Self-reported physical activity via the Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ)
 - QoL metrics of fatigue and dyspnea via Functional Assessment of Chronic Illness Therapy (FACIT) Fatigue and Dyspnea Scales
- Stratified analyses by subgroup: (1) Breast cancer alone, (2) Lung cancer and lymphoma combined
 - Two-sided paired t-tests to evaluate changes over time
 - Generalized estimating equations (GEE) with an independence correlation structure and a robust variance estimator to evaluate the (1) association between RT dose-volume metrics and changes in GSLTPAQ and QoL metrics, (2) association between GSLTPAQ and QoL

RESULTS

Table: Baseline Characteristics

	Overall (n=130)	Breast Cancer (n=80)	Lung Cancer and Lymphoma (n=50)	P-value*
Age (y)	53.5 [42.0–62.0]	53.5 [44.0–62.0]	54.5 [33.0–66.0]	1.000
Female Sex, n (%)	102 (78.5)	80 (100.0)	22 (44.0)	<0.001
Race, n (%)				
Caucasian	101 (77.7)	57 (71.2)	44 (88.0)	0.042
Black or African American	25 (19.2)	20 (25.0)	5 (10.0)	
BMI (kg/m2)	28.8±6.6	29.1±6.9	28.2±6.1	0.425
Current or Prior Smoking, n (%)	57 (43.8)	31 (38.8)	26 (52.0)	0.139
Chemotherapy, n (%)				
None	15 (11.5)	15 (18.8)	0 (0.0)	<0.001
Preceding	889(68.5)	65 (81.2)	24 (48.0)	
Concurrent	26 (20.0)	0 (0.0)	26 (52.0)	
Total Radiation Dose, Gy	52.6 [50.4–60.0]	52.6 [50.4–60.0]	50.4 [36.0–66.6]	0.414
MHD, Gy	2.6 [1.2–6.9]	1.4 [1.0–2.4]	9.3 [6.2–16.1]	<0.001
V5, %	10.1 [2.2–26.8]	2.9 [1.4–8.3]	38.1 [20.9–59.3]	<0.001
V30, %	0.9 [0.0–7.3]	0.1 [0.0–0.9]	12.5 [5.0–23.4]	<0.001

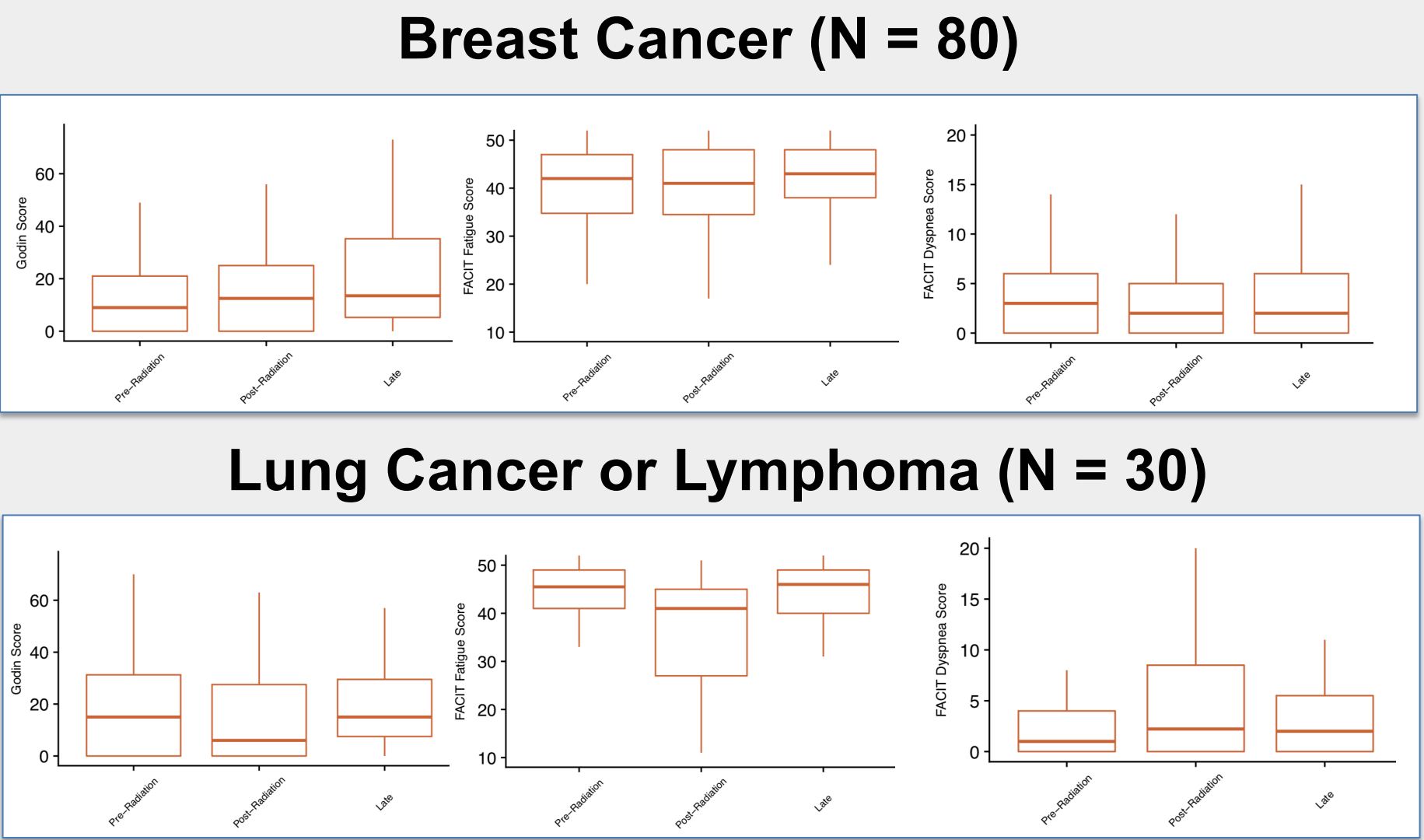
BMI = body mass index; MHD = mean heart dose; V5 and V30 indicate the percent volume of heart receiving 5 Gy and 30 Gy, respectively. Normally distributed continuous variables summarized with the mean ± standard deviation, non-normally distributed continuous variables were summarized with the median [interquartile range]. *P-values for categorical variables are from Pearson's chi-squared tests. P-values for continuous variables are from non-parametric K-sample tests of the equality of medians or T-tests of the equality means.

- In breast cancer, lung cancer, and lymphoma (Table), changes were observed in physical activity and QoL over time (Figure)
- In lung cancer and lymphoma, each 1 Gy increase in MHD was associated with decreased GSLTPAQ levels [-0.61 (-1.22, 0.00), p=0.049], and each 10% increase in V5 was associated with reduced GSLTPAQ levels [-2.43 (-4.35, -0.52), p=0.013]
- In breast cancer, accounting for chemotherapy and MHD, each 10-point increase in GSLTPAQ moderate-to-vigorous physical activity level at baseline was associated with improvements in FACIT fatigue scores over time [0.50 (0.01, 0.99), p=0.046]
- In both subgroups, accounting for chemotherapy and MHD, increases in physical activity over time were significantly associated with concurrent improvements in QoL measures of fatigue and dyspnea

CONCLUSIONS

- Increased RT dose to the heart is associated with increased fatigue and dyspnea and decreased physical activity, particularly in lung cancer or lymphoma
- Increased physical activity prior to and during RT is associated with improved QoL
- Strategies to decrease MHD and increase physical activity may improve QoL with RT

Figure: Changes Over Time in Physical Activity (GSLTPAQ), and Fatigue and Dyspnea (FACIT)*:



*Higher GSLTPAQ scores imply greater physical activity, lower FACIT fatigue scores greater fatigue, higher FACIT dyspnea scores greater dyspnea.