**The Impact of IMRT and Proton Beam Therapy on Overall Survival for Patients With Hodgkin Lymphoma**

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**Purpose/Objective(s):** The inclusion of radiation therapy (RT) may be part of standard practice for early or advanced stage Hodgkin lymphoma (HL) patients. It is unlikely that prospective, randomized trials will be powered to assess the efficacy of advanced RT modalities, such as IMRT (intensity modulated RT) or PBT (proton beam therapy), with respect to overall survival. The purpose of this study was to compare outcomes with patients receiving IMRT or PBT versus those receiving 2D/3D-CRT (3-Dimensional conformal RT) in a large observa- tional cohort.

**Materials/Methods:** We evaluated clinical features and survival outcomes among patients diagnosed with stage I-IV HL from 1998 to 2011 from a prospectively collected nationwide database, the National Cancer Database (NCDB). The association between IMRT or PBT use (vs 2D/3D-CRT), co- variables, and outcome was assessed in a Cox proportional hazards model. Propensity score (PS) matching was performed to adjust for patient and

treatment characteristics to balance potential confounding factors. Survival was estimated using the Kaplan-Meier method.

**Results:** Of the 76,672 patients with HL within the NCDB, 12,433 patients with stage I-IV HL received RT (median dose 30.6 Gy) and were eligible for this study, with a median follow-up of 6.2 years. The median age was 37 years (range: 18-90). Multi-agent chemotherapy was given to 98.2% of the patients. The RT modalities used were: 2D/ 3D-CRT (n = 11,491, 92.4%), IMRT (n = 902, 7.3%), or PBT (n = 40, 0.3%). Patients were more likely to receive IMRT or PBT if they were of male gender, early stage, no “B” symptoms, and treated at comprehensive cancer programs (all P < .05). There was no difference in use of 2D/3D-CRT versus IMRT/PBT based on insurance status, socioeconomic status, or distance from treatment facility (all P>.05). Interestingly, amongst the entire cohort of patients receiving RT during this time period, there was a significant decreasing trend in use of 2D/ 3D-CRT from 96.1% to 80.9%, with a subsequent increase in IMRT or PBT utilization from 3.1% to 19.1% during that time period. Five-year overall survival for patients receiving 2D/3D-CRT was 89.9% versus 94.7% for those receiving IMRT (HR = 0.45; 95% CI, 0.23-0.91, P = .02). After PS matching based on age, gender, stage, “B” symptoms, comorbidity score, insurance status, treatment facility type, and socioeconomic status, IMRT use remained associated with improved overall survival (HR = 0.40; 95% CI, 0.16-0.97, P = .04).

**Conclusion:** Our study reveals that a PS-matched cohort of HL patients who received RT with modern techniques had an improvement in overall survival, after controlling for all potential confounding factors. To our knowledge, this represents the only study examining survival outcomes of advanced RT modality techniques which may be considered on a case-by-case basis for patients with HL.