Proton Beam Accelerated Partial Breast Irradiation: Prospective Multi-Institutional PCG Registry Analysis

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Purpose/Objective(s)

To evaluate toxicities and clinical outcomes after accelerated partial breast irradiation (APBI) using proton beam therapy (PBT) for early breast cancer.

Materials/Methods

From 2013 to 2016, 43 patients with 45 treated breasts (2 patients treated bilaterally) received proton APBI in the prospective multi-institutional Proton Collaborative Group registry. Toxicities were prospectively evaluated using NCI Common Terminology Criteria for Adverse Events version 4.0. Toxicities were considered acuteif they occurred within 6 months after starting PBT and late if they occurred or persisted beyond 6 months after starting PBT. Clinical data was obtained directly from patient charts. Luminal A was defined as ER/PR-positive, HER2-normal, Ki-67 < 14%. Luminal B was defined as ER/PR-positive, HER2-normal, Ki-67 ≥ 14%. Kaplan Meier curves were used to measure clinical outcomes. Statistical analysis was performed using SAS v 9.4 (SAS Institute Inc.).

Results

Median follow-up was 11.8 months (range 0-36.6). Median age was 67 (range 47 – 81). Median body mass index (BMI) was 29.3 (range 18.4 – 44.9). Histologic subtypes included: 11 Luminal A, 18 Luminal B, 3 triple-positive, 7 unspecified ER/PR-positive HER2-normal, and 6 DCIS. TNM stage included: 3 pTisNx, 3 pTisN0, 36 pT1N0, 1 ypT1N0, 1 pT1N1a, and 1 pT2N0. All invasive margins were negative. DCIS margins were < 2 mm in 5 cases (4 of whom also had invasive disease). Surgery included 45 lumpectomies and 2 re-excisions. One patient had implants, and one patient had neoadjuvant chemotherapy and HER-2 therapy. Median PBT dose was 40 Gy Relative Biologic Effectiveness (RBE) in 10 fractions. One patient withdrew after 16 Gy RBE. Proton technology included 76.7% uniform scanning, 18.6% pencil beam scanning, and 4.7% unreported. Adjuvant endocrine therapy was employed in 85%. Maximum toxicity was grade 2. Grade 2 toxicities included 1 patient with acute grade 2 lymphedema and 2 patients with late grade 2 dermatitis. Grade 1 toxicities included 32 patients with dermatitis, 10 with fatigue, 10 with pain, 4 with cough, 3 with pruritus, 2 with hyperpigmentation, 2 with nipple deformity, 1 with lymphedema, and 1 with skin induration. Eight patients had no radiation-related toxicities. No patient experienced local recurrence, metastasis, or death.

Conclusion

To our knowledge, this is one of the largest reported cohorts of proton APBI. Proton APBI was safe and well-tolerated with only 7% grade 2 toxicity.