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were included in the regional nodal irradiation arm (RNI+) and 119 patients were included in the no regional nodal irradiation arm (RNI-).

Results: Median follow up was 24 months (range, 1-55 months). No regional nodal failures were recorded in both groups. The actuarial LRFS was 98.2% in the RNI+ arm and 100% in the RNI- arm (P 0.28). The actuarial DMFS was 93.6% in the RNI+ arm and 97.4% in the RNI- arm (P 0.93). The actuarial OS was 96.3% in the RNI+ arm and 99.1% in the RNI- arm (P 0.75). Cox univariate regression analysis revealed initial tumor size > 5 cm (HR 1.276, CI 1.054-1.543, P 0.012) was the only factor associated with increased incidence of distant metastases. Age younger than 35 years was associated with worsened survival (HR 0.866, CI 0.760-0.986, P 0.03).

Conclusion: In the current interim analysis, omission of regional nodal irradiation did not compromise the outcomes in clinically node positive patients who received NAC and had ypN0 disease.

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1029

Proton Reirradiation for Recurrent or New Primary Breast Cancer in the Setting of Prior Breast Irradiation

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Purpose/Objective(s): Local breast cancer recurrences and new primary breast cancers are an increasingly common clinical challenge without clear treatment guidelines. To date, photon reirradiation (reRT) has not been widely adopted due to concerns for toxicities. Proton beam therapy (PBT) can optimize normal tissue sparing and may allow for safer delivery of a second definitive radiotherapy (RT) course. We hypothesize salvage PBT reRT can be safely delivered, and we present clinical outcomes and toxicities of patients with recurrent or new primary non-metastatic breast cancer who received prior RT and PBT reRT.

Materials/Methods: In an IRB-approved retrospective study, all consecutive patients with recurrent or new primary non-metastatic breast cancer treated with breast or chest wall (CW) RT and PBT reRT from a single institution were identified. Patient and tumor characteristics, treatment parameters, clinical outcomes and toxicities were collected. Distant metastasis-free survival (DMFS) and overall survival (OS) were defined from PBT reRT start to date of distant recurrence, death or last follow-up and estimated using Kaplan-Meier methodology.

Results: Forty-six consecutive patients were assessed. Eight patients (17.4%) were reirradiated to an intact breast, 13 (28.3%) to CW without reconstruction, 20 (43.5%) to CW with reconstruction, and 5 (10.9%) to regional lymph nodes (LN) alone. PBT reRT was delivered with uniform (70%) or pencil beam (30%) scanning PBT. Median first course dose was 60Gy (45-66Gy); median PBT reRT dose was 50.4Gy (RBE) (40-66.6Gy); median cumulative dose was 108.9Gy_{2, a/b=3}(RBE) (95.0-168.8 Gy_{2, a/b=3} (RBE)). When regional LN were retreated, median first course dose was 50.4 Gy (48.6-66.6Gy) and median PBT reRT dose was 50 Gy_{2, a/b=3} (46.7-66.0Gy_{2, a/b=3}). Four patients had significant brachial plexus overlap with cumulative doses up to 99.0 Gy. At a median follow-up of 21 months, there were no local or regional recurrences; 8 patients (17%) developed distant recurrence, of whom three died. Estimated 3-year DMFS and OS were 60% and 88%, respectively. Grade 3 acute toxicities were limited exclusively to RT dermatitis (30.4%). Grade 3 late toxicities occurred in 4 patients (8.7%) (3 capsular contracture requiring surgical intervention, 1 breast pain requiring mastectomy). Two patients developed rib fracture. No cases of neuropathies, skin ulceration or other acute or late grade ≥ 3 toxicities occurred.

Conclusion: In the largest series to date of PBT reRT for breast cancer recurrence or new primary after prior definitive breast or CW RT, PBT reRT provided excellent locoregional control with a low rate of high-grade toxicities limited to target tissue not amenable to sparing from full reRT dose. These data are encouraging and suggest PBT reRT may provide patients with a relatively safe and highly effective salvage option. Longer follow-up and additional patients are needed to correlate composite normal tissue doses with toxicities and assess long-term outcomes.

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1030

Post Traumatic Growth in Radiation Medicine Following the COVID-19 Outbreak

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Purpose/Objective(s): It has been reported that adversarial growth during traumatic events potentially enhances coping with sequelae. The purpose of this work was to assess post-traumatic growth amongst radiation medicine staff members at the individual level as well as changes in perceptions of departmental culture following the outbreak of the COVID-19 pandemic declared as a US public health emergency in February 2020.

Materials/Methods: A post-traumatic growth inventory (PTGI) survey comprising 21 growth indicators was disseminated electronically in May 2020 with the option of anonymous feedback to all 213 members of our multi-center radiation medicine department. The indicators were intended to measure perceptions of change in 3 domains following the outbreak: personal, interpersonal relationships and philosophy of life. In addition, 8 department safety culture survey questions were included in this survey taken from the National Hospital Patient Safety Culture Survey developed by the Agency for Healthcare Research and Quality (AHRQ). The goal was to assess changes in staff perceptions of department culture during the pandemic versus the baseline survey completed in 2019 ahead of the pandemic. The PTGI and AHRQ survey questions were scored using 6- and 5-point Likert scales with the higher scores yielding greatest perceived growth and most favorable perceptions respectively. Principal Factor Analysis with Varimax rotation was conducted on the PTGI indicators. Indicators with the highest degree of perceived change and department cultural improvements were identified.

Results: With a 56.3% survey response rate, factor analysis on the 21 PTGI indicators yielded Cronbach's alpha values of 0.958, 0.905 and 0.915 corresponding to the aforementioned domains. The average PTGI growth noted was 2.3 which fell between small and moderate on the Likert scale (none: 0, moderate 3, greatest 5.0). The values were 2.42 (personal), 2.11 (inter-personal) and 1.60 (philosophy) for the 3 domains. The total PTGI score was greater for staff members working from home (57.8) compared to frontline workers (43.7) out of 105 points (P -value 0.004). For the AHRQ survey there was an improvement of 18% in staff perceptions of safety culture. Of the 8 indicators, 7 showed improvements compared with baseline while 4 exceeded the 95th percentile of the nationwide responses in 2018.

Conclusion: A fair to moderate degree of post-traumatic growth was observed during the pandemic, such as in areas of changing priorities on what is important, appreciation of life, compassion for others, and readiness to change. Least change was noted in religious beliefs and openness to express emotions. Staff perceptions of department priorities towards patient safety, effectiveness of policies and openness to staff questioning

decisions improved substantially. Growth was thus perceived both at the individual and the department level.

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1031

Initial Experience Using Cherenkov Imaging in a Radiation Oncology Quality Assurance (QA) Program

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Purpose/Objective(s): Cherenkov imaging is a novel technique that captures light emissions during radiation therapy, allowing for visualization of radiation treatments on patients, in real-time. We hypothesized that simply viewing the Cherenkov video images, both in real-time and with post-treatment review by radiation therapists, would identify events not previously reported in the existing QA program.

Materials/Methods: In December 2020, Cherenkov imaging cameras were introduced into an academic medical center with an existing QA program consisting of a hospital wide incident reporting system that is anonymous, voluntary, and non-punitive. Events are reviewed monthly by a multidisciplinary group including representatives from radiation therapy, dosimetry, nursing, physics and radiation oncologists. The Cherenkov cameras were installed in each treatment bunker, positioned laterally on each side of the couch. The cameras provided continuous, real-time video images of the patients and visualization of the irradiated tissue. Live viewing of the treatments was provided via a dedicated monitor in the console room. All treatments were imaged with the exception of treatments where optical surface imaging lights were on for SGRT.

Results: During this 3-month period, 12 events were reported in the hospital-based incident reporting system. Events were reviewed and categorized as 3 operational/process improvement (e.g., scheduling errors), 3 other safety events (e.g., patient falls), 3 treatment planning errors (e.g., wrong shifts calculated for setup), 1 prescription transcription error, 1 treatment delivery error (a missed treatment field), and 1 simulation error (suboptimal immobilization equipment used). Aside from a patient fall, all events were deemed to have no detectable harm to the patient. In this same time period, review of Cherenkov images identified 3 treatment delivery events, which were not identified by other means. The first was an AP-PA thoracic spine treatment and on one day, the treating therapists noted the patient's chin in the treatment field. Treatment was stopped, the patient was re-positioned for the remainder of the treatment. Second was an AP-PA lumbar spine field that on post-treatment review was noted that the patient's hands moved into the field. The third was a 3-field sacrum plan that on post-treatment review was noted that for 7 of 10 fractions, the patient's left arm was positioned over the exit RPO beam. Physics review estimated that the uninjured arm received approximately 3 Gy.

Conclusion: Viewing of Cherenkov emission imaging by the treatment team identified delivery incidents due to non-ideal patient positioning during treatment and these events were not identified in the existing QA program. Future work will focus on determining incident rates detected by Cherenkov imaging and if this imaging can identify and/or avoid treatment delivery errors from reaching the patient. Automated detection and near real time notification of such events is a work in progress.

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1032

Safety and Satisfaction of Patients Opting for Fully Remote Consultation and On-Treatment Management Visits During COVID-19

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Purpose/Objective(s): We have previously demonstrated high patient satisfaction with telemedicine during the COVID-19 pandemic. During the relaxation of pandemic restrictions, patients are now offered a choice of in person or remote visits. Here we report on the experience of a cohort of patients treated with radiotherapy who opted for fully remote providers.

Materials/Methods: At the time of new visit consultation scheduling, patients were offered fully remote management if availability of onsite providers was limited. Additionally, after initial consultation with the treating oncologist, if patients expressed preference for treatment at a regional facility different from the oncologist's primary site, they were offered treatment at the preferred site with fully remote on-treatment visits, without transfer of care to an onsite provider. Potentially harmful patient safety events and "near-misses" were prospectively collected with an in-house quality improvement reporting system. Patient satisfaction surveys assessing several domains of the patient experience (including appointment logistics, patient-physician communication, and overall impressions) were distributed to patients before, during and after treatment.

Results: From 10/2020 to 2/2021, a total of 192 patients treated to 208 sites opted for fully remote management. 50% were male, 50% female. 61% of patients had metastatic disease. Sites treated included prostate (10%), breast (7%), thoracic (7%), head and neck (2%), gastrointestinal (25%), and other sites including bone, soft tissue and brain (49%). There were 46 minor (no harm or near-miss) patient safety events reported, of which 85% were unrelated to patient condition or physician communication and included events associated with treatment planning, orders, prescriptions and delivery. Minor events related to patient condition and patient scheduling/communication comprised 9% and 6% of events, respectively. There was 1 temporary harm event of patient decompensation in the department requiring activation of emergency services. The safety event rate per patient was similar between this cohort and non-remotely managed patients treated during the same period. The telemedicine survey response rate was 32%. Patient satisfaction with telehealth visits remained high with 98% of experiences across all domains rated as Good to Very Good. 90% of patients either preferred telehealth or expressed no preference with the in person vs. fully remote visits.

Conclusion: Treatment with fully remote providers is safe and feasible, with no serious patient events and minimal need for onsite care. We observed high patient satisfaction, consistent with our previously reported outcomes for telemedicine visits. These findings support the continuation of fully remote management for select patients in the post-COVID era, which can only continue if the current remote/telehealth exemption is continued beyond the emergency period.

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1033

Optimizing Safety in a Radiation Oncology Department Through Improving Timeliness of Treatment Planning Care Path

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