**Risk of Radiation Pneumonitis Following Individualized Modern Radiation Therapy with IMRT, a Breath-Holding Technique and Prone Positioning for Breast Cancer**

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**Purpose/Objective(s):** State of the art techniques for delivering radiation to breast cancer patients have emerged to improve target coverage while limiting traditional toxicities (e.g., heart disease) associated therewith. Despite resource intensiveness and technical difficulties to applying these techniques for all patients, individualized advanced beam delivery is advantageous, especially in patients with anatomic challenges. The present study reports the pulmonary outcomes of women treated with an individualized cardiac-sparing radiation beam delivery approach.

**Materials/Methods:** Women with breast cancer who received adjuvant RT between 2015 and 2017 were identified from a prospectively collected registry. Patients who received accelerated-partial breast irradiation (n = 114) and who were followed at another hospital (n = 127) were excluded. In a left-sided tumor, the deep inspiration breath hold (DIBH) technique was recommended if the distance between the heart and adjacent chest wall was increased >1cm than that in the free breathing phase. The prone breast technique was attempted in women with large pendulous breasts. When applying IMRT, use of VMAT with two partial arcs, each irradiating between gantry angles of 60°/160° to 190°/310°, was recommended. The primary endpoint was the occurrence of symptomatic radiation pneumonitis (RP). For dosimetric analysis, all planning data were transferred into MIM software, which was used as a reference system for multiple-plan comparison.

**Results:** During the study period, 1658 patients received adjuvant RT either with conventional fractionation (23.5%) or hypofractionation (76.5%). The most commonly used technique was VMAT (38.9%), followed by DIBH (33.5%), field-in-field (13.3%), tangential wedge fields (11.4%), prone positioning (2.2%), and reverse-hockey stick technique (0.8%). Including internal mammary nodes (IMN) RT was applied in 38.5%. At a median follow-up of 18 months, RP occurred in 40 patients (2.4%). RP rates were significantly lower for VMAT (0.9%) and DIBH/prone (2.0%), compared to other techniques (5.2%). Differences in RP rates between techniques became more prominent upon subdividing patients according to IMN RT use (no-IMN RT, 1.0% vs. 1.5% vs. 4.7%, P = .003; IMN RT, 0.9% vs. 3.2% vs. 6.5%, respectively, P = .004). In multivariate analysis, RT technique and IMN irradiation were independently associated with RP risk. In 233 patients with available dosimetric data, RP was significantly associated with increased mean lung dose, V5, V10, V15, V20, and V30, but not V40. Additional dosimetric parameters including mean heart dose, for all patients, will be presented.

**Conclusion:** This study represents one of the largest, single-institution, retrospective reviews of pulmonary outcomes after adjuvant RT with available modern techniques in women with breast cancer. Individualized radiation beam delivery can optimize pulmonary outcomes, particularly when including IMNs in the treatment target.