
## Single-Fraction Stereotactic Body Radiotherapy (SBRT) Treatment to Early-Stage Primary Lung Tumors or Oligometastatic Lesions Confers Effective Local Control with Minimal Toxicity

**James A. Knight, II, MD -** University of Kentucky; Ronald C. McGarry, MD, PhD - University of Kentucky; Jeremiah D. Johnson, MD, MS - University of Kentucky; Damodar Pokhrel, PhD - University of Kentucky

**Objectives:** Single-fraction SBRT for early-stage non-small-cell lung cancer (NSCLC) and oligometastatic pulmonary disease has been shown to be a safe and efficacious treatment modality. However, adoption of this regimen has been limited despite the excellent local control rates, minimal rates of lung toxicity, and favorable survival outcomes. Here we present a prospective clinical follow up study of the use of singe-fraction SBRT in the definitive setting of oligometastatic and primary NSCLC.

**Methods:** Fifty-six patients with early-stage (T1-2N0) NSCLC or solitary pulmonary oligometastatic were treated using 4D-CT based ITV or free-breathing CT with abdominal compression on TrueBeam (6MV-FFF beam, 1400MU/min) via highly-conformal non-coplanar VMAT SBRT plan. Prescription was 30 Gy in one fraction to greater than 95% of PTV receiving 100% of dose with 120-130% hotspot inside the ITV. Treatments were delivered using pre-treatment CBCT-guided procedure and PerfectPitch couch corrections with overall treatment time of < 15 minutes. Patients underwent post-treatment CT imaging in 3 to 6-month intervals per standard of care. Pulmonary and rib toxicities per CTCAE v4.0 were reported, as well as rates of tumor local control, regional and distant failure, and survival.

**Results:** Fifty-six patients (51 early-stage NSCLC and 4 metastatic tumors) were evaluated, and thirty-nine (76.5%) of these patients underwent follow-up CT imaging. Median follow-up was 10.6 months (range 0-40 months). Local control was achieved in all patients (100%) evaluated radiographically, including 16 patients assessed at 1-year follow-up and 9 patients at 2-year follow-up intervals. Regional or distant failures were found in 15/39 (38.5%), and 5/15 cases (33%) of these patients were confirmed as deaths from disease progression. Two of the fifteen patients with isolated recurrences underwent repeat SBRT to 30 Gy in 1 fraction, with effective local control and no acute radiation-induced toxicities. The toxicity profile amongst 47 clinically evaluated patients showed one (2%) episode of grade 1 acute rib toxicity. Thirty-eight of 39 (97%) radiographically evaluated patients demonstrated grade 1 radiation pneumonitis, but no chronic pulmonary toxicities were reported.

**Conclusion(s):** Use of 30 Gy single-dose SBRT for early-stage NSCLC and oligometastatic pulmonary disease confers excellent (100%) tumor local control rates and minimal rates of acute and chronic toxicities. We propose further investigation combining single-fraction SBRT with systemic therapy to improve recurrent and distant disease rates, as well as rates of overall survival. We recommend its extended use in other cancer centers, providing additional benefits of optimized clinic workflow,

greater efficiency in treatment planning and physics quality assurance, and improved patient comfort, compliance, and access to care to underserved patient cohorts.