

## Robotic Stereotactic Body Radiotherapy for the Management of Adrenal Gland Metastases - A Bi-institutional Analysis

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Abstract  
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## Abstract

**Objective:** Adrenal gland metastases (AGMs) are a common manifestation of metastatic tumor spread, especially in patients with non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). Patients suffering from a limited systemic tumor burden may potentially benefit from an effective and safe local AGM treatment. Due to various fractionation schemes and limited reports, short-course treatment results for robotic stereotactic body radiotherapy (SBRT) for AGMs are lacking. Moreover, recent analyses suggest that dose escalation may be associated with an improved local control (LC). This bi-institutional analysis reports the outcomes of SBRT for AGM and investigates the impact of the applied biologically effective dose (BED) on the LC.

**Methods:** Patients who underwent robotic SBRT for AGMs at two centers between 2006 and 2021 were eligible for analysis. Only treatments with five or fewer fractions were included. All treatments were delivered using the CyberKnife robotic radiosurgery system (Accuray Inc., Sunnyvale, CA, USA).

**Results:** A total of 55 patients with 72 AGMs met the inclusion criteria. All but one AGM treatment utilized fiducial tracking with Synchrony (Accuray Inc., Sunnyvale, CA, USA). Eight AGM treatments did not have a radiographic follow-up. The median prescription dose and isodose line were 24 Gy and 70%, respectively. The median gross tumor volume was 16.8 cubic centimeter (cc) (range: 2.1 - 71.6 cc). Most AGMs (86%) received SBRT with just one fraction. The median biologically effective dose assuming an  $\alpha/\beta$  ratio of 10 (BED10) was 81.6 Gy. The median follow-up was 16.4 months. The LC at 1-year and 2-years were 92.9% and 67.8%. The 1-year and 2-years progression-free survival (PFS) were 46.2% and 24.3%, respectively. Thirteen patients (23%) suffered from grade 1 and 2 toxicities, including nausea, fatigue, and adrenal insufficiency. No toxicities  $\geq$  grade 3 were observed. Treatments with a BED10 equal to or above the median were significantly associated with a better LC ( $p < 0.01$ ). Twelve of the thirteen observed local failures (92%) occurred in patients with a BED10 below the median. Patients with a single AGM had an improved PFS compared to those patients suffering from additional metastases ( $p = 0.04$ ). This difference did not translate into a significantly prolonged overall survival.

**Conclusion:** Robotic SBRT is an efficient and safe treatment modality for AGMs. Treatment-associated side effects are sporadic and manageable. Results suggest short-course SBRT to be a preferable and time-saving treatment option for the management of AGMs if an adequate BED10 can be applied.