

# Normal tissue dose reduction associated with use of jaw tracking in multiple metastasis single-isocenter VMAT radiosurgery

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## Abstract

**Objectives:** Jaw tracking (JT) is an increasingly available feature of modern linear accelerators (linac) in which the jaws of the linac track the MLC (multi-leaf collimator) apertures continuously with delivery of the beam. Interest in treating multiple intracranial metastases with stereotactic radiosurgery (SRS) has also increased with the emergence of evidence that patient cognitive outcomes are improved when compared to WBRT. The purpose of this study was to determine whether or not tracking of MLC (multi-leaf collimator) apertures by linear accelerator jaws improves radiosurgery plan quality.

**Methods:** 28 multiple metastasis ( $N_{min} = 2$ ,  $N_{max} = 9$ ) cases were planned for single-isocenter VMAT SRS. Prescription dose was standardized to 18Gy for all targets. Plans were simulated for 10MV FFF (flattening-filter free) delivery with HD (high definition) MLC. Each was simulated with and without jaw-tracking with no other variation in any parameter. Conformity (RTOG), moderate isodose spill [V50%(cc)], and low dose spill [mean skull dose (Gy)] were compared between the two sets of cases. Data were non-normally distributed so Wilcoxon signed-rank test was used for all comparisons.

**Results:** Plans with the jaw tracking feature enabled exhibited slightly reduced moderate isodose spill (median V50%<sub>w/JT</sub> = 17.4cc, median V50%<sub>w/o\_JT</sub> = 18.0cc;  $p = 0.006$ ) and low dose spill (median V25%<sub>w/JT</sub> = 59.3cc, median V25%<sub>w/o\_JT</sub> = 65.0cc;  $p = 0.011$ , median  $d_{mean\_w/JT}$  = 1.29Gy, median  $d_{mean\_w/o_JT}$  = 1.46Gy;  $p = 0.00016$ ). Overall plan conformity was not statistically different ( $p = 0.08$ ), however individual target conformity was improved with JT (median target RTOG CI<sub>w/JT</sub> = 1.29, median target RTOG CI<sub>w/o\_JT</sub> = 1.48;  $p < 0.0001$ )

**Conclusions:** In single-isocenter VMAT plans for multiple metastasis plans, enabling the jaw tracking feature conferred slight improvements (3 to 13%) to all studied aspects of plan quality. These improvements were slight, but occurred consistently. If available, jaw tracking should be enabled for these plans to maximize achievable plan quality.

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### Abstract

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