

Dosimetric Comparison of CyberKnife M6 Multileaf and Fixed Cone Collimator Plans in Benign Skull Base Tumors

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Abstract

Objectives:

CyberKnife (CK) is a SRS technique that ensures highly conformal dose distributions using a linac based robotic arm and image guidance with real-time tumor tracking. We aimed to retrospectively evaluate the clinical feasibility and dosimetric outcomes of MLC and fixed cone-based plans.

Methods:

Eleven acoustic schwannoma and 7 glomus jugulare patients' plans were retrospectively re-planned and analyzed. Treatment time, homogeneity index (HI), conformity index (CI) and gradient index (GI) for PTV, volumetric doses of brain and brainstem, cochlea, beams and monitor units (MUs) were compared between MLC and fixed collimator.

Results:

Cochlea dose was significantly decreased in MLC plans compared to fixed plans ($p=0.023$). Brainstem maximum point dose and also V10 Gy and V15 Gy of brain were significantly lower in MLC plans ($p=0.021$, $p=0.014$, $p=0.000$, retrospectively). Due to MLC plans consist of less nodes and segments in comparison to fixed plans, use less MU and are deliverable in a shorter treatment time ($p=0.00$). The average delivered MUs in MLC plans are lower by 45 % ($p=0.000$).

Conclusion(s):

We confirmed the feasibility of increasing time delivery efficiency and reduced delivered MU and number of beams when using MLC compared to fixed collimator. MLC plans demonstrated equivalent treatment plans compared to fixed ones, also provided better protection on critical structures and consistently showed better dose gradient fall off in our study.