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Abstract

Feasibility of Treating Multiple Brain Metastases Using Multi-leaf Collimator In Robotic Radiosurgery Devices

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Abstract

Objectives: Treating multiple brain metastases with stereotactic radiosurgery (SRS) is commonly use in modern radiotherapy. In this study, we investigate the feasibility of treating multiple brain metastases using multieaf collimator system (MLC) in robotic radiosurgery devices.

Methods: 10 patient with 57 metastases were selected for this study. All patient were immobilized using thermoplastic mask and scanned in 1mm slice thickness. All GTVs and critical structures(OARs) were contoured by same physician. PTVs were created by giving 1 mm margin to GTVs. Multiplan 5.1 treatment planning system was used for all plans. Treatment plans were done both using MLC and fix collimator system(FC). Ray-tracing and Finite Size Pencil Beam algorithm were used in fix collimator and MLC plans, respectively. The number of beam/segment and MU, beam on time and OAR doses were evaluated.

Results: Median collimator size was 10 mm (range 7.5-25 mm). The number of the beam used in MLC plans significantly lower than FC plans ($p<0.001$). Mean reduction in the number of the beam was 45% in MLC plans. The mean number of MLC segments were 98. MU values significantly lower in MLC plans ($p<0.014$). Mean reduction in MU value was %33 in MLC used plans. Beam on time was higher in FC plans ($p<0.008$). Mean reduction in the beam on time was %25 in MLC plans. Statically no significant dose differences were examined in OARs. V8Gy, V10Gy and V12Gy were evaluated for the normal brain. Normal brain doses were lower in MLC plans and statically significant. (For V8Gy, V10Gy and V12Gy volumes were $p<0.031$, $p<0.021$ and $p<0.048$, respectively.)

Conclusions: Treating multiple brain metastases using MLC is safe and feasible. The patient could be treated with lower treatment time and receive lower brain doses.

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