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Dosimetric Characteristics of Multileaf Collimator-Based Intensity-Modulated Arc Therapy for Stereotactic Radiosurgery(Shin's Arcs)

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This study was designed to develop a new radiosurgery technique by using multiple noncoplanar arc therapy with intensity modulated fine MLC shaped photon beam. The stereotactic radiosurgery was performed with 6-MV x-ray beams from a Clinac 21EX LINAC (Varian, Palo Alto, CA, USA) with a MLC-120, which features a full 40 x 40 cm field and is the first MLC for general use that offers 0.5 cm resolution for high precision treatment of small and irregular fields. We used a single isocenter and five gantry-couch combinations with a new set of intensity modulated arc therapy, Using a 3D treatment planning system (Eclipse, Varian, Palo Alto, CA, USA), which was developed for IMRT converted into multiple non-coplanar arc therapy with a fine MLC shaped photon beam. We investigated dosimetric characteristics for 2 cm sized spherical target volume with film (X-OMAT V2 film, Kodak Inc, Rochester NY, USA) dosimetry within 25 × 25 cm acrylic phantom. A simulated single isocentric treatment using inversely planned 3D radiotherapy planning system demonstrates the ability to conform the dose distribution to an spherical target volume. The 80% dose level is adequate to encompass the target volume in frontal, sagittal, and transverse planes, and the region between the 40% and 80% isodose lines was 4.0~4.5 mm and comparable to the dose distribution of the Boston Arcs. We expect that our radiosurgery technique could be a treatment option for irregular-shaped large intracranial target, and the time to deliver will be reduced compared with conventional cylindrical collimator technique.

Keywords : LINAC-Based Radiosurgery, Multileaf Collimator, Shin's Arcs