

AbstractID: 13744 Title: A new fluence-based volumetric modulated arc treatment (VMAT) planning method

Purpose: Aperture-based VMAT treatment planning may fail to generate acceptable plans due to the local minimum problem. We developed a fluence-based VMAT treatment planning method which may perform better in the search for a global minimum. The new planning method was evaluated using breast and chestwall cases in which VMAT can potentially minimize lung and heart dose.

Method and Materials: The optimization process followed this route: The arc range was determined based on the target geometry. Beamlets were calculated every 3 degrees along the arc. Two arcs were used with different rotation directions. Each arc consists of many initial beams which span several 3-degree segments. The beamlet intensities are optimized for each beam, then a sliding window leaf sequencing step generates deliverable MLC segments, which are distributed along the arc length. New beamlets are composed based on the actual gantry angles. Fluence optimization is performed again using the new composite beamlets. The planning method repeatedly alternates between fluence optimization and leaf sequencing processes until the objective score stops improving. Fluence optimization allows searching for the global minimum in a convex solution space. Leaf sequencing ensures plan deliverability. The VMAT treatment plans were generated for one chest wall patient and one breast patient. Standard IMRT plans were made for comparison.

Results: The presented arc planning method can maintain target coverage while significantly reducing lung dose for breast and chest wall patients.

Conclusion: We have developed a fluence-based VMAT planning method which can deliver improved plan quality.

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