

Purpose: The VMAT(Volumetric Modulated ARC radiotherapy) technique have not shown enough dosimetric merits for O- or C-shaped tumor volumes in which critical organs were located in central region without sufficient margins. We propose new VMAT planning technique for O- or C-shaped tumor volume and have examined dosimetric benefits and utility in comparison with conventional IMRT and VMAT planning techniques.

Methods: In the new split field method of VMAT planning, the isocenter is located in the central critical organ and the critical organs were shielded by collimators. Critical organs in central region and C-shaped tumors in an artificial hexagonal phantom were contoured with Eclipse 8.9 planning system (Varian Medical System inc., Palo Alto, CA, USA) to determine margins and constraints in optimization process. For real cases, five Spine SBRT, one mesothelial and 2 H&N cases were involved to investigate the new techniques in comparison with 11 field IMRT and normal 2 arc VMAT plans.

Results: The split field VMAT planning was shown the better dose distribution than normal VMAT planning, especially when the margin is not enough at the interface of tumor and critical organ. For the tumor coverage and uniformity, it was comparable with IMRT and for conformity index, the new method shown the best results. Since the MU value was increased almost up to the MU of IMRT cases, the upper limit of total MU was set in the optimization process of split field VMAT planning.

Conclusions: The split field VMAT plan clearly has dosimetric benefits for O- and C-shaped tumor volume with critical organs in the central region. That is attributable to the rotational symmetry of structures, which was used to minimize the dose in critical organ.