

The Determination of the Impact of Inverse Planning Technique with Dynamic Multi Leaf Colimator (dMLC) and Volumetric Arc Therapy (VMAT) with Flattening Filter Free (FFF) on Peripheral Organ Doses

Esil Kara ¹, Burcu G. Kalyoncu ², Okan Ozdemir ¹, Ayse Hicsonmez ²

¹. Radiation Oncology, Koru Ankara Hospital, Ankara, TUR ². Radiation Oncology, ONKO Ankara Oncology Center, Ankara, TUR

✉ **Corresponding author:** Esil Kara, esilkara@hotmail.com

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Abstract

Objective(s): Recently, the use of linear accelerators without a flattening filter has increased. Due to reduced scatter, leaf transmission and radiation head leakage a reduction of out-of-field dose is expected for flattening filter free (FFF) beams. FFF beams can be used in different planning techniques. The aim of the study was to determine the impact of inverse planning technique with dynamic multi leaf colimator (dMLC) and volumetric arc therapy (VMAT) with FFF on peripheral organ doses.

Methods: Three lung cancer (one is lung metastasis, two are primer lung cancer) patients receiving stereotactic body radiotherapy (SBRT) in our clinic with tumor located in different anatomic regions were selected for our study. The tumor of one of the patients was located centrally and two of them were located peripherally. SBRT treatment plans were generated using Monaco treatment planning system (Monte Carlo algorithm) with 6 MV FFF beams for both dMLC and VMAT techniques. 6 beams technique for dMLC plans and full gantry arc technique was used in the plans. Plans were evaluated with V20(ipsi), V20(bilat), D1.5L and D1L for lungs, D32 for heart, D18 for trachea, D27.5 for esophagus and max dose for spinal cord. For the peripheral doses contralateral mean lung dose, heart mean dose (for the peripherally located lung cancers) were evaluated.

Results: There was no clinically significant difference in V20(ipsi), V20(bilat), D1.5L and D1L for lungs, D32 for heart, D18 for trachea, D27.5 for esophagus and max dose for spinal cord values between dMLC and VMAT lung SBRT plans. However, the contralateral mean lung doses were higher in VMAT technique for the peripherally located lung cancer patients while centrally located lung cancer patients were lower. There was no significant difference in the heart mean dose for both technique.

Conclusion(s): Inverse planning technique with dMLC and FFF can be selected as a planning technique in patients with peripheral lung tumor patients for decrease the contralateral lung doses.

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Abstract

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