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

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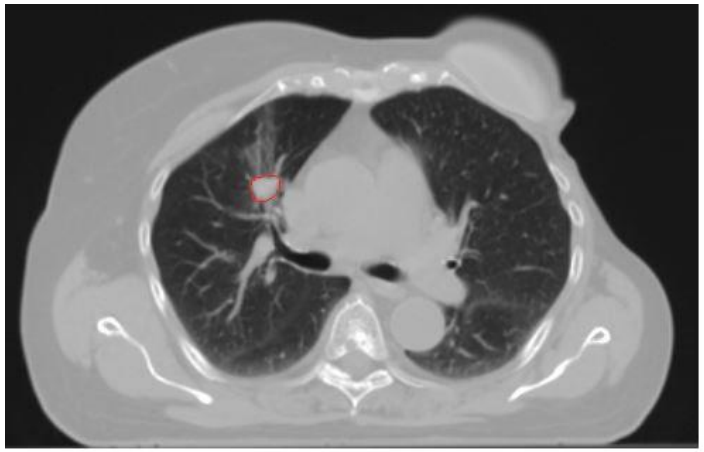
Purpose

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.

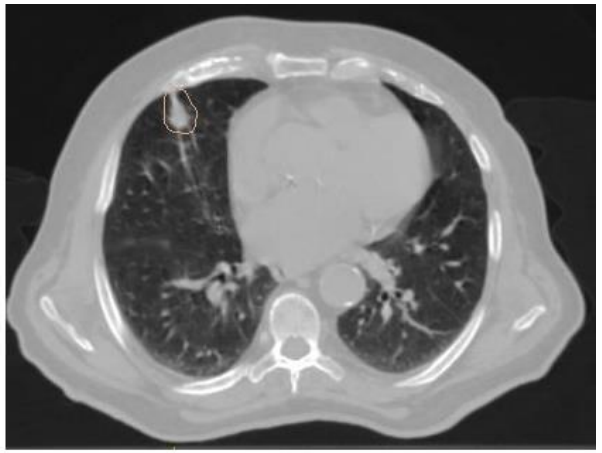
The aim of the study was to determine the impact of inverse planning technique with dynamic multi leaf colimator (dMLC) and volumetric arc therapy (VMAT) with FFF on peripheral organ doses.

Materials



1th Patient

2th Patient



3th Patient

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.

One of the patients' tumor was located centrally and two of them were located peripherally.

Materials

SBRT treatment plans were generated using Monaco treatment planning system (Monte Carlo algoritm) with 6 MV FFF beams for both dMLC and VMAT techniques.

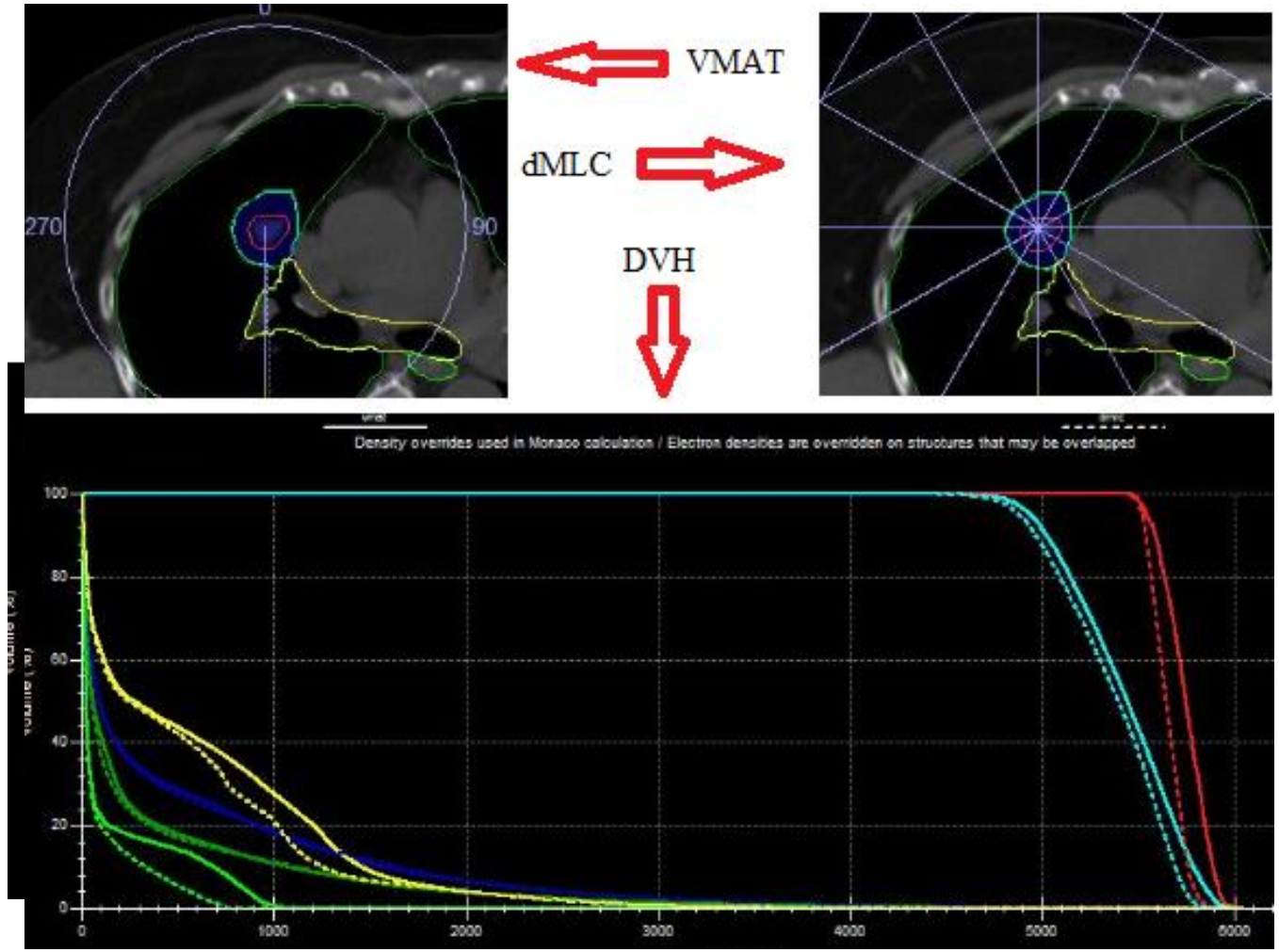
6 beams technique for dMLC plans and full gantry arc technique for VMAT was used in the plans.

Plans were evaluated with V20(ipsi), V20(bilat), D1.5L and D1L for lungs, V32 for heart, V18 for trachea, V27.5 for esophagus and max dose for spinal cord.

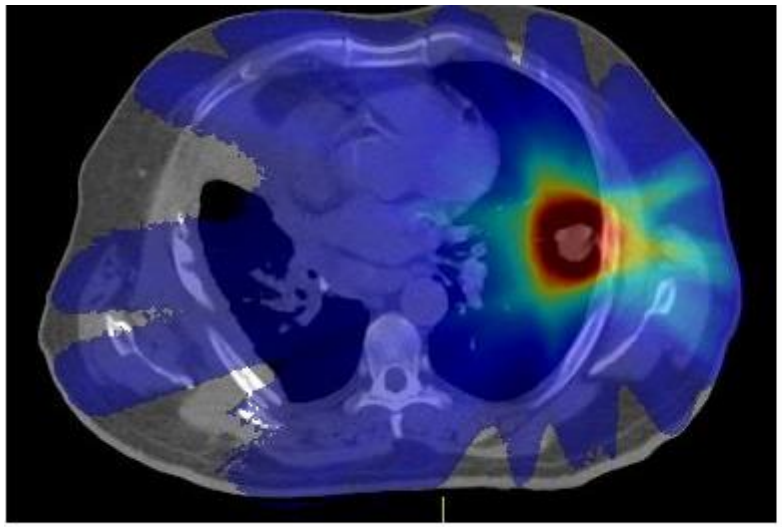
For the peripheral doses contralateral mean lung dose and heart mean dose (for the peripherally located lung cancers) were evaluated.

Results

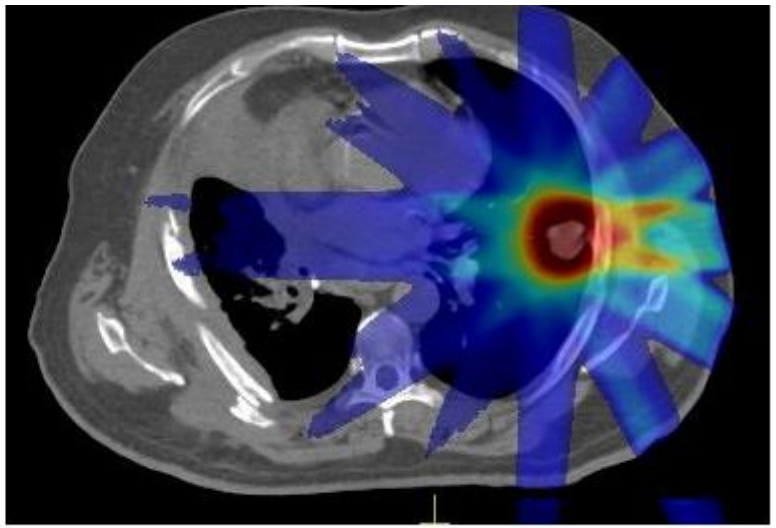
There was no clinically significant difference in normal tissue constraints between dMLC and VMAT SBRT plans.



Results



VMAT



IMRT with dMLC

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

Inverse planning technique with dMLC can be selected as a planning technique to decrease the contralateral lung doses for patients with peripheral lung tumor.