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Poster

Linear Accelerator Based Total Marrow Irradiation: Description of Technique and Initial Clinical Experience

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Abstract

Purpose

Total marrow irradiation (TMI) allows for delivery of a specified dose of radiation to bone marrow as part of the conditioning regimen for hematologic stem cell transplants, while selectively sparing organs at risk such as lung, liver and heart. This is in contrast to traditional total body irradiation (TBI), which delivers a uniform radiation dose to bone marrow and visceral organs.

Materials and Methods:

A technique for TMI was developed using a linear accelerator with volumetric modulated arc therapy (VMAT) and implemented in October 2015. The clinical target volume includes bone marrow (excluding mandible, facial bones and hands) and central nervous system; prescription dose is 12 Gy in 6 fractions given twice daily. Treatment planning is done using Eclipse - individual patient plans are comprised of multiple isocenters with 2 co-planar 6 MV photon arcs per isocenter to provide treatment from head to midthigh. Open 6 MV anterior and posterior opposed beams are used to treat the legs inferior to midthigh, with the upper pair matched to the inferior field edge from the lowest VMAT isocenter.

Results

Twenty patients were treated with TMI from Dec 2015 to January 2017; one patient was planned but did not proceed with transplant due to relapse of leukemia. There were 14 males and 6 females with ages ranging from 25 to 61. For the VMAT- treated PTV the average D99 was

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95.06%, D2 was 119.62%, V90 was 99.88%, V100 was 92.52%, and V110 was 35.98%. Average of the mean doses for selected organs was as follows: 64.16 for lungs, 59.96% for liver, and 54.69% for heart.

Conclusions

TMI can be delivered with acceptable dose uniformity to bone marrow and central nervous system tissue while significantly sparing critical organs at risk such as lung,liver and heart.

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