AbstractID: 9119 Title: Feasibility study for linac-based intensity modulated total marrow irradiation

Purpose: Total body irradiation (TBI) is used in the pre-conditioning regimen prior to bone marrow transplant for treatment of hematological malignancies. Intensity modulated total marrow irradiation (IMTMI) is proposed to reduce the large volumes of normal tissue irradiated during TBI, and thus the associated toxicities. The goal of this study was to assess the feasibility of a linac-based IMTMI method.

Method and Materials: The planning and delivery of linac-based IMTMI was assessed using an anthropomorphic Rando phantom. A three-isocenter technique was used to provide a full body plan with dynamic feathering at the edges of each isocenter plan. During treatment delivery, thermoluminescent dosimeters (TLDs) were placed at twenty two positions throughout the phantom to compare the delivered doses to the planned doses. Individual IMRT verification plans were also delivered to a solid water phantom for each isocenter, and doses measured from an ion chamber and film were compared to the planned doses.

Results: The treatment plan indicated that target bone coverage was achieved with 98% of the volume receiving 99% of the prescription dose. Doses to critical structures were reduced by as much as 64% compared to conventional TBI. TLD readings demonstrated accurate dose delivery, with a mean point dose difference of 3% from the calculated value. Ion chamber readings for the verification plans were also within 3% of the expected doses and film measurements showed accurate dose distributions.

Conclusion: The results of this study suggest that linac-based IMTMI is feasible with delivered doses that compare favorably to planned doses. Moreover, our planning study indicates that IMTMI reduces the volume of normal tissue irradiated, and may lead to a decrease in treatment related sequelae.

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