

AbstractID: 5608 Title: Helical Tomotherapy Targeting Total Bone Marrow – Initial Clinical Experience at the University of Minnesota

Purpose: We report here the successful use of Tomotherapy at delivering intensity modulated radiotherapy to the bone and bone marrow spaces along the entire axis of a patient and describe a dosimetric analysis of the total marrow irradiation (TMI) treatment. This is part of a dose escalation trial to determine the maximum tolerated dose (MTD) of TMI when given prior to an alkylator-intensive conditioning regimen for the treatment of high risk or relapsed solid tumors. **Method and Materials:** A patient enrolled in a dose escalation study trial received 600 cGy in 3 fractions. Two independent CT image sets (upper and lower part of the body) were obtained. A helical tomotherapy treatment plan was created from this CT image sets. The quality assurance was evaluated with the use of (a) ion chamber and (b) extended dose range film. The isorad-p cylindrical diodes were used for *in-vivo* dosimetry. **Results:** The patient showed neutrophil engraftment on day 11 and platelet engraftment by day 58. He is currently well at 120 days post transplant with no evidence of disease. The patient developed nausea and vomiting after the first fraction of Tomotherapy TMI. Other than above there were no adverse effects of TMI. The planned radiation conformed to all bone marrow sites. Average doses to lungs, kidneys, heart, and eyes were 50-70% of the prescribed dose for TMI treatments. The dose delivery verifications (pretreatment and *in vivo* dose measurement) were within $\pm 3-5\%$ of the expected dose calculated from the treatment planning station. **Conclusions:** We show that helical tomotherapy targeting the bone marrow of the whole body is clinically feasible. The clinical implementation of intensity modulated radiation to conform the radiation dose to all active bone marrow of the whole body opened up the possibility of a dose escalation study for high risk patients.