

AbstractID: 13512 Title: Feasibility study of total marrow irradiation using RapidArc

**Purpose:** Total body irradiation (TBI) is commonly used in conjunction with chemotherapy as a preconditioning regimen prior to bone marrow transplantation in patients with hematological malignancies. It is associated with significant toxicities due to irradiation of large volume of normal tissue. The purpose of this work is to investigate feasibility of using RapidArc for targeted total marrow irradiation (TMI) while minimizing dose to critical organs.

**Method and Materials:** The CT image volumes with 5 mm thickness of a pediatric patient treated with other disease was used for this planning study in an Eclipse treatment planning system (Varian Medical Systems, CA). The target volume was defined as the skeletal bone, excluding mandible and maxillary bones. The technique used three separate treatment plans targeting the head-neck region, chest and pelvis. Each plan consists of one clockwise and one counter-clockwise full arcs. The chest plan was initially optimized and subsequently used as the based plan for both head-neck and pelvic plans optimization. For dosimetry quality assurance (QA), the calculated plan was delivered on a Varian 23 iX Clinac linear accelerator equipped with RapidArc (Varian Medical Systems, CA). The dose accuracy was verified with volumetric portal images, using Dosimetry Check (Math resolutions, LLC) program.

**Results:** Average dose reduction of the RapidArc based TMI, compared to conventional TBI, are 16% for lung, 23% for kidney, 29% for liver, and 74% for lenses while more than 95% of the PTV is covered by 97% of the prescribed dose. Each plan passed dosimetry QA when the gamma evaluation criteria of 5% absolute point dose difference and 5 mm of distance to agreement (DTA) was selected.

**Conclusion:** The adequate target dose coverage and reduced normal organ dose were observed. Patient-specific QA is achieved using the Dosimetry Check system. Initial results are encouraging and warrant further investigation.