AbstractID: 3710 Title: Feasibility Study of Helical Tomotherapy for Total Body and Total Marrow Irradiation

Purpose:

Total body radiation (TBI) has been used for many years as a pre-conditioning agent before bone marrow transplantation. Many side effects still plague its use. To assess the feasibility of using Helical Tomotherapy, we investigated various parameters and treatment techniques.

Methods:

We studied variations in pitch, field width, and modulation on total body and total marrow helical tomotherapy treatments. We varied these parameters to provide a uniform dose along with a treatment times similar to conventional TBI (15-30 min.). We also investigated using limited total body mega-voltage CT (MVCT) scanning rather than total body MVCT scanning to shorten the time per treatment fraction. Thermoluminescent detectors (TLDs) were placed inside a Rando phantom and we measured dose at seven anatomical sites including the lungs. Whole body MVCT and limited MVCT (head, chest, and pelvis) scanning were used for 3-D set up verification.

Results:

TBI simulation showed homogeneous dose coverage to the whole body. Doses to the sensitive organs were reduced by 35-70 % of the target dose. In the TMI study, dose was mainly conformal to the bone marrow only. TBI and TMI treatment delivery time was reduced (by 50%) by increasing the field width from 2.5 cm to 5.0 cm in the inferior-superior direction**.** TLD measurements on Rando showed accurate dose delivery to the target and critical organs. A limited MVCT reduced the target localization time significantly compared to whole body MVCT.

Conclusion:

This study showed that Helical Tomotherapy can deliver uniform dose to the total body and total marrow by a judicious selection of pitch, modulation, and field size. A limited MVCT also can be used in place of whole body MVCT. Details of this investigation will be presented.

Conflict of Interest:

The authors associated with TomoTherapy Inc. have a financial interest in that company.