AbstractID: 5234 Title: A Comprehensive Patient-Specific IMRT Quality Assurance Procedure on Hi-Art Tomotherapy® Unit

Purpose: To present a comprehensive patient-specific IMRT QA procedure on Tomotherapy® unit using ion chamber and radiographic film for those facilities with RIT® film dosimetry system.

Method and Materials: A cylindrical Virtual Water® phantom was scanned in CT with an ion chamber in the hole 1.5 cm below the middle coronal plane. Three-dimensional dose calculation in fine grid using treatment beam was performed to the phantom which is appropriately positioned so that the measuring point and plane are within the volume of interest. A sheet of Kokak® EDR-2 Readypack was sandwiched between two halves of the phantom and pricked on green lasers. Film exposure and ion chamber measurement were made simultaneously. To verify planar absolute dose distribution, the film was calibrated in a separate sheet of the same batch on the same day IMRT QA was performed. To facilitate the film calibration and film dosimetry analysis on Tomotherapy planning station, an in-house software was developed to perform step-valley film calibration and film image data conversion from RIT® format to DICOM format which is acceptable by the current version of Tomotherapy planning system.

Results: 213 patient-specific IMRT QA procedures have been performed on Tomotherapy unit since it was installed about two years ago. The average discrepancy between ion chamber measurement and dose calculation in phantom is 1.74%. Film dosimetry results agree with ion chamber measurements in an average discrepancy 1%. Three cases have failed the QA procedure based on 5% discrepancy criteria.

Conclusion: Three-dimensional dose calculation algorithm for helical IMRT works very well in homogeneous phantom. This QA procedure is clinically practical and necessary when independent dose calculation tools are not available. It is feasible to verify two-dimensional absolute dose distribution using radiographic film if it is calibrated against ion chamber reading which is traceable to ADCL or NIST.