

AbstractID: 10432 Title: IMRT treatment delivery efficiency - A multi-institutional retrospective study

Purpose: To compare daily clinical IMRT delivery efficiency in 6 institutions using different accelerators, delivery techniques, treatment planning systems, and clinical practice environments; to deduce key contributing factors for IMRT delivery efficiency improvement.

Method and Materials: IMRT treatment MUs, daily treatment delivery time (time elapsed between beam-ON of the 1st field and beam-OFF of the last field), and other parameters from Record & Verify systems for 421 patients using accelerators from 4 different vendors and 4 different accelerators treatment planning systems are retrospectively analyzed. IMRT treatments are delivered using compensator-IMRT on Siemens, segmental MLC-IMRT on Siemens, Elekta and Varian accelerators, and via TomoTherapy.

RESULTS: In average the shortest average IMRT delivery times are associated with TomoTherapy (7.3 min.), plans using the least MLC segments (10.1 min.) and compensator-IMRT (11.3 min.) (times quoted for 9-fld IMRT). Longer delivery time is not mainly due to more MUs as beam-ON time for all LINAC-based IMRT were all < 2 min., which is only < 20% of the IMRT delivery time. The majority of the IMRT delivery time is spent on preparation of delivery such as segment field formation and verification. LINAC-based IMRT MUs are < 7 times TomoTherapy-IMRT MUs. The average MU ratio of LINAC-based IMRT to non-IMRT treatments is less than 2:1.

CONCLUSION: Major improvement in the MLC-IMRT delivery time requires significant reduction in MLC leaf motion and verification time. In meantime the most efficient approach to delivery time reduction is to reduce the total number of MLC segment. The retrospective study shows that compensator-IMRT delivery time is comparable to the most efficient MLC-IMRT, and TomoTherapy uses the shortest IMRT delivery time.

Conflict of Interest: Thomas Mackie has financial interest in TomoTherapy Inc. Sha Chang has a research grant (unrelated to this work) from Siemens.