AbstractID: 7704 Title: Quality assurance for helical tomotherapy system and the mechanical stability

Purpose: We installed helical tomotherapy system in January 2006. Although highly conformal dose distributions can be delivered using this technique, this approach requires complex mechanical control including synchronization of gantry rotation, couch translation, and the opening and closing of the leaves of the binary multileaf collimator to modulate radiation beam intensity. Therefore intensive mechanical QA is required. Here we report the experience of mechanical QA (daily, monthly, annually) and the stability of tomotherapy system.

Materials and Methods:

  The QA items and tolerance level was based on the paper of Fenwick et al (Phys Med Biol, 49, 2004) and some tests were modified.

  For daily QA, 5 tests including laser alignment and output stability were checked. For monthly tests, the following items were performed. (1) Static output in reference geometry, (2) Rotation stability and lateral profile stability, (3) Static output stability over 5min. (4) Couch drive speed uniformity (5) leaf opening synchronized with gantry rotation, speed and uniformity, (6) Couch y-translation per gantry rotation, (7) Virtual isocenter, (8) Gantry zero, and (9) Jaw width constancy with the tolerance level of ± 2%, Gamma (3mm, 3%)<1 compared with the data of commissioning, 0.5%, ±2%, ± 1%, ± 1degree, ± 1mm, 0.5degree, and 1mm, respectively. Reproducibility of delivered dose and dose distribution when the treatment was interrupted and then restarted was checked using one of the previous Delivery QA cases.

Results:
Daily change of laser alignment and output stability was within 1%.   For monthly tests, Almost all the results were within tolerance value. Reproducibility of absolute dose and dose distribution when the treatment was interrupted and restarted was within 0.5%.

Conclusion: These data showed that Tomotherapy system is mechanically stable. Further accumulation and analysis of periodical QA data are required to determine the QA interval.