

AbstractID: 8670 Title: On-line Adaptive IMRT for Prostate Cancer

Purpose: This study proposes a novel on-line IGRT technique that can modify the original IMRT plan to match with the “anatomy-of-the-day” within few minutes. The performance of this technique is compared with current on-line IGRT strategies using bone/soft-tissue based alignment.

Method and Materials: Six prostate IMRT patients were studied. An initial IMRT plan was designed on a commercial treatment planning system, using five/seven co-planar 15-MV beams. The plan information was exported to an in-house adaptive planning system. Five daily CBCT images of each patient were analyzed. Daily GTVs (prostate and seminal vesicles), bladders and rectums were contoured on each CBCT. The original plan dose distribution was deformed to match the daily anatomy and to serve as prescription dose distribution for the daily re-optimization of the original plan. The re-optimization process utilized linear programming technique which can reach the solution within less than two minutes. The delivered dose distributions were compared among the ART versus alignment based IGRT techniques. Three bone and soft-tissue based alignment techniques: Bone10, Soft5, and Soft10, were included. The number 5 and 10 indicate the PTV margins; with Adapt indicating ART technique with 5mm margin.

Results: The average GTV D99 doses for all six patients are 99%-100%, 65%-98%, 87%-99%, and 95%-99% for Adapt, Bone10, Soft5, and Soft10 plans respectively. The Bone10 missed GTV coverage at D99 and D95 in 2 of the 6 patients, while the Soft5 technique also missed D95 coverage in 3 patients. The Soft10 and Adapt techniques show adequate GTV coverage for all. Compare to Soft5, the Adapt technique shows improvement on bladder/rectal sparing when local volume/shape variation occurs.

Conclusion: This demonstrates the advantage of the online ART technique over patient alignment techniques in handling complex anatomical positioning and shape changes during prostate IMRT treatment.

Conflict of Interest: Research sponsored by Varian Medical Systems.