AbstractID: 10038 Title: Feasibility of 4D IMRT Delivery for Hypofractionated High Dose Partial Prostate Treatments

While IMRT is proving to be effective in the treatment of prostate cancer there remains room for improvement. Specifically, dose escalation to areas of the prostate demonstrating high clonogenic cell density may improve treatment outcome. These partial prostate target areas may be found through MR spectroscopy or direct biopsy. However, the surrounding normal structures and the movement of the prostate during treatment limit the dose that can be delivered safely.

An in-house protocol is being developed in which 76 Gy in 38 fractions is delivered to the entire prostate PTV via IMRT. An IMRT boost to the high disease density region(s) is then delivered in a single 10 Gy fraction that brings the dose to a biological equivalent of 106 Gy. Isoeffective dose calculations (EQD_2) were employed to determine the boost dose. Composite plans were generated assuming 2 Gy fractions for the entire treatment. Additionally, EQD_2 calculations were performed and composite plans generated for cumulative rectal dose. DVH and isodose analysis is performed and comparisons made with our routine acceptance criteria. In order to meet these criteria it is necessary to reduce the PTV margins from our standard 8mm (5mm posteriorly) to uniform 3mm expansions. This is not possible using daily localization techniques and active tracking is employed throughout using implanted Calypso Beacons. This allows for a decrease in the PTV margins for the initial prostate and boost IMRT regimes and subsequent increased rectal sparing.

However, simple Cartesian intrafractional motion is not the only source of discrepancy involved when determining the appropriate PTV expansion. Other sources of error such as target rotation and deformation may play significant roles requiring correction if margins are to be reduced to 3mm.

This lecture will describe a method to limit the dose to critical structures, namely the rectum, during routine IMRT delivery to the prostate allowing for a dose escalated boost to be delivered to the areas in need. Additionally, sources of error encountered through our clinical use of the Calypso Beacons and the ramifications for PTV reduction by utilizing active tracking will be discussed.

Educational Objectives:

1) To be exposed to advanced IGRT methods (MRS) utilized in the planning process.
2) To understand issues related to combining hypofractionated “boost” plans to conventional IMRT plans.
3) To understand active organ tracking and the implications for target coverage and normal tissue sparing through PTV reductions.