AbstractID: 11614 Title: Assessment of dose conformality and the effects of inter- and intra-fraction motion on the dose distribution Intensity modulated proton radiotherapy for locally advanced prostate cancer: a treatment planning study

Purpose: Locally advanced prostate cancers show a strong dose-response relation. Intensity modulated proton therapy (IMPT). Small spot size proton pencil beam scanning, has the potential of excellent dose conformality to the target volumes with good normal tissue sparing. However, the effect of patient and organ motion on the dose distribution is more evident in highly conformal dose distributions. Here the target volume coverage and dose to the risk organs were assessed using repeated CT scans. **Methods and Materials:** A planning CT and 2 low dose CTs were obtained during the planning session at 5 min and 10 min in order to estimate intra-fraction motion. In addition, another planning CT was taken at a later stage of the radiotherapy. Furthermore, three radio-opaque fiducial markers were implanted into the prostate at least one week prior taking the planning CT to verify the position of the prostate. The conformality and robustness of the dose distributions resulting from two beam field arrangements were investigated. The plans were verified on the repeat low dose CTs to investigate the intra-fractional motion and on the second planning CT for the inter-fractional motion. **Results:** good coverage of the PTVs and CTVs and good dose homogeneity for all beam arrangements was found despite the recorded intra-fractional motion. Less changes in the mean and maximum doses to the bladder and rectum were registered when slightly oblique field arrangement was used (85° and 275°). The PTV coverage deteriorated due to inter-fractional motion resulting in cold and hot spots, depending on the motion pattern. However, the angulations of the fields by mere 5° resulted in robust plans. **Conclusion:** The parallel opposed lateral field arrangement resulted in undesirable sensitivity to motion in comparison to opposed fields slightly oblique by 5 degrees.