AbstractID: 10355 Title: Intra fractional motion in clinical IMRT prostate treatments, warrants the use of faster treatment techniques

Purpose: To estimate intrafracional motion of the prostate in a routine clinical setting and its impact on margin reduction and treatment time.

Method and Materials: External beam treatment for cancer of the prostate using an IMRT technique was evaluated. Fifteen patients underwent a marker match procedure ensuring correct positioning at time of treatment. For all fields intra-treatment images were obtained, yielding 5 to 7 images per fraction. IMRT was delivered using a dynamic sliding window technique. The obtained images were processed to remove IMRT information. The markers were detected in the image using an automated methodology. Every image was timestamped and chronologically adjacent images were backprojected to yield 3D marker coordinates. Allowing to calculate the position of the prostate during the treatment delivery at specific time instances. Using a Poisson model for the probability of movement we can determine the maximal allowable time frame within which to perform this treament.

Results: The maximal treament time measured was 1460s, the shortest lasted 343s. The times were measured starting from the last image in the marker-match procedure and includes the decision and adjustment process. Depending on the elapsed time we noticed an increase in positional confidence level from 5.8mm to 7.6mm. The delivery of the fields are of the order of 250s.

Conclusion: We note a significant increase in probability of prostate movement in our treaments as time elapses. This limits the amount of margin reduction possible. There are two strategies possible to reduce this time. 1) Increase the marker match speed, or 2) increase the delivery speed. A good candidate to do this is the use of a volumetric Arc technique (VMAT) which is implemented in our department with RapidArc™. The latter is able to deliver the same or even better dose distribution in under 2 minutes (8 patients).