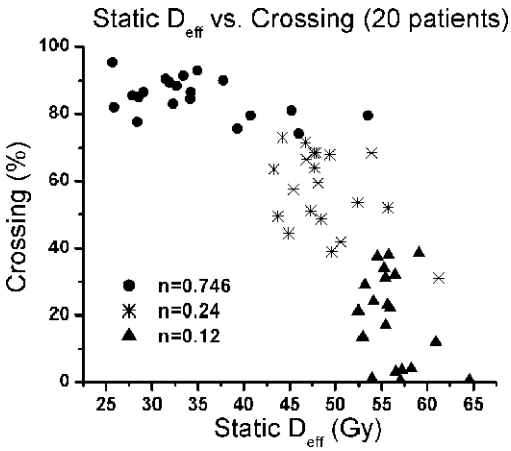
using the Monte Carlo method, to look at the impact of dose escalation on TCP and rectal toxicity.
Material and methods: 20 prostate patients' anatomies were chosen. Reference Plan (RP: 10 mm PTV margin, 70 Gy/35 fx, full uncertainty) and the Escalated Plan (EP: 5 mm PTV margin, 78 Gy/39 fx, reduced uncertainty) were generated. Setup and organ motion uncertainties were modeled in a stochastic manner, and the dose to organs was recorded. TCP for prostate and effective doses (D_{eff}) to rectum were calculated. Different volume dependence factors available from literature were tested for D_{eff}: n = 0.12 (serial), 0.24, and 0.746(parallel). To compare the rectal toxicity, dose-population histograms (DPH) were generated. We deemed EP acceptable as long as the currently observed complication rate (15% grade II toxicity) was not exceeded; this is defined as the reference point on the RP's DPH. If the crossing point between the EP's DPH and the RP's DPH was at >20%, then the DPH was deemed to be acceptable. This was assumed to lead to a lower risk of complication.
Results: With reduced positioning uncertainties using fiducials, compared to the RP, the EP leads to an increased TCP from ~60% to ~80% for intermediate risk patients. The location of the crossing points for each patient with different n values are shown in the graph. If we consider rectum as a parallel organ, a majority of patients would have reduced complication risk from EP; even if serial model is considered, only a small proportion of patients are at increased risk compared to RP.



Conclusion: Reduced geometrical errors using fiducial markers and EPID allow us to reduce PTV margin to 5mm and escalate dose to 78Gy with lower rectal toxicity rates provided rectum has a strong dose-volume dependence (n=0.24).

827 POSTER

Quantification of organ intra-fractional motion during IMRT for prostate cancer

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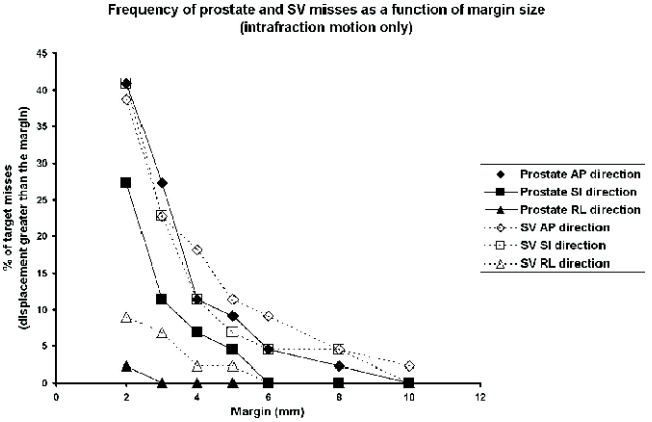
Background/Purpose: Recent advances in image-guided radiation therapy have allowed safely decreasing the PTV margin around the prostate by minimizing the effects of inter-fractional prostate motion and setup variation. However, most of the image-guided procedures acquire target information prior to the start of treatment and therefore don't address the remaining intrafraction variation in prostate position. The purpose of the study is to quantify the variability in prostate and seminal vesicle (SV) position during an IMRT treatment and to assess the impact of rectal and bladder variation.
Material and methods: Forty-four prostate cancer patients receiving IMRT for prostate carcinoma were treated using a commercial integrated CT-LINAC system (EXaCT, Varian Oncology Systems) that allows CT imaging while the patient remains immobilized in the treatment position. On one of the treatment days for each patient, two CT scans were acquired: one before starting an ultrasound-guided prostate localization procedure and the other was immediately after the IMRT fraction. A single physician performed the organ contouring. The two CT images before/after the treatment fraction were registered using in-house CT-to-CT 3D image registration software based on bony structures in the pelvic region. After bony alignment, the displacement of the prostate and seminal vesicles (SV) over the treatment fraction was calculated in the anterior-posterior (AP), superior-inferior (SI) and right-left (RL) directions.
Results: The mean time elapsed between two CT image scans ±1SD was 21.3±4.3 minutes. The mean values of the prostate shifts±1SD were 1.1±2.6 mm (range: −3.4 to 8.6 mm) in the AP, −0.4±2.1 mm (range: −5.9 to 3.4 mm) in the SI, and 0.03±0.7 mm (range: −2.6 to 1.3 mm) in the RL axes. A 3-mm margin would successfully cover the intra-fractional prostate motion in 73%, 89%, and 100% of the patients in the AP, SI, and RL directions, respectively. The risk of prostate and SV misses as a function of margin size is presented in the Figure. The bladder volume had a systematic increase (±1SD) of 126±80 cc (range: 21 to 303 cc). The volume of rectum varied more in a random fashion with an averaged net volume increase of 5.5±18.5 cc (range: −12.1 to 78.4 cc). The rectal volume and the rectal gas volume were highly correlated with the anterior prostate shifts ($p < 0.001$) and anterior SVs shifts ($p < 0.001$). The bladder volume variation showed a lesser correlation with the inferior prostate shifts ($p = 0.016$).



Conclusions: Intra-fractional prostate motion remains significant in AP and SI direction (SD = 2–3 mm, up to 9 mm), emphasizing the need for a PTV margin around the prostate in case of image-guided radiation therapy. AP prostate motion is highly correlated with rectal volume variation.

828 POSTER

Co-morbidity impact on survival in irradiated prostate cancer patients

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Purpose: To evaluate co-morbidity impact at diagnosis on survival prostate cancer selected for radiation therapy in clinical practice.
Patients and method: Two hundred sixty four patients from a general hospital influence area treated with radiation for prostate cancer from 1993 to 2003 were included. Median follow-up was 38 months and median age was 70 years old. Dose for adjuvant therapy or therapeutic postoperative dose was 66 Gy, and 70 Gy was indicated for radical intention. One hundred five patients received neoadjuvant and concomitant hormonal treatment. A univariate by Kaplan-Meier method with log-rank and Breslow comparison test and multivariate analysis by Cox model were done to detect prognostic factors on survival.
Results: Clincal stages were distributed as follows: T1 29% of patients, 51% for T2, 19.5% were T3 and 1% T4. Mean PSA concentration value was 11.5 ng/ml. Gleason score was 6–10 in 37% of patients. Patients median age was 70 years old. Comorbidity at diagnosis was present in 65.5% of patients. Overall survival was 97.7%, 89.2% and 66.9% at 2, 5 and 7 years respectively. Overall survival by co-morbidity decreased from 97.6% at 2 years and 96% at 5 and 7 years without co-morbity to 97.7%, 84.3% and 75.2% at 2, 5 and 7 years respectively with co-morbid diseases. Overall survival by comorbidity status show a significant increase at 30 months. Breslow test: $p = 0.1612$; Log-Rank test $p = 0.0217$.
Conclusions: Co-morbidty has an impact on survival for prostate cancer patients send for radiation therapy. Careful selection should be recommended in scalating prostate dose delivery.