data, we evaluate initial PSA, the Gleason, the stage of the tumor, the dose of radiation therapy administered to prostate and the sequence and months of hormone therapy. Multivariable analysis was performed using Cox regression model to predict the risk of metastasis and biochemical failure. As criterion for the inclusion of variables in models take $p < 0.1$ with improvement in the Akaike index. This model has been validated internally through technical bootstrap and compared the predictive models of Kattan. Biochemical failure was defined as nadir+2 or patients who were treated with endocrine therapy after finish the treatment of radiation therapy +/-endocrine therapy, even without reaching nadir+2 values.

Results: In a preliminary analysis, the metastasis rate was 4.5% and 19.0% for biochemical failure. Five variables are significant in the predictive model of metastasis: initial PSA, clinical stage, Gleason score, months of hormone therapy and months of adjuvant therapy, with p values of 0.0001, 0.0003, < 0.0001, 0.004, 0.002 respectively. This model has a concordance index (C-index) of 0.716. Significant variables in the multivariate model of biochemical failure included initial PSA, Gleason score, clinical stage, doses of radiation therapy and months of hormone therapy, with p values of < 0.0001, < 0.0001, 0.002, < 0.0001, < 0.0001 respectively. The C-index of this prognostic model is 0.690. The calibration curves showed close agreement between metastasis or biochemical recurrence observed and predicted probabilities.

Conclusions: We have developed and validated a predictive model of prostate cancer treated with external radiation therapy, which allows predicting the biochemical failure and the development of metastases that presents a good calibration and discrimination ability. Aiming to improve the prediction, we increased the variables analyzed, in comparison with the models previously published.

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Transperineal Ultrasound/CT Fusion for LDR Prostate Brachytherapy Postplanning

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Purpose/Objective(s): Low dose rate brachytherapy (LDR) has emerged as a standard, highly effective treatment for low and intermediate risk prostate cancer. Quality practice requires routine post-planning to ensure target volume coverage and to evaluate rectal dose. While brachytherapy planning and delivery are ultrasound-based, post-planning uses CT. Rigorously locating the base and apex of the prostate to obtain V100, V80 and D90 is not possible with CT alone. Routine post-planning has included transabdominal ultrasound (TAUS) combined with CT in a single session for over one year. Fused CT/MRI has been advocated, but additional uncertainty is introduced in the registration of both modalities, and obtaining MRI for this purpose is not feasible in many clinics. Equipment has been developed which can capture 3D transperineal ultrasound (TPUS) images of the prostate, with a self-scanning probe, in the coordinate system of the CT. Imaging through the perineum results in a short distance between the prostate and probe, allowing excellent image quality throughout the gland, particularly at the apex. Early experience with the ultrasound probe prompted us to hypothesize that it would offer a very significant benefit in post-plan PTV (PPTV) delineation at the prostate base and apex over CT alone.

Materials/Methods: Five low and intermediate risk prostate cancer patients underwent LDR I-125 prostate brachytherapy. One-month post-implant CT data was obtained, immediately followed by Clarity Autoscan TPUS imaging. The perineal probe was placed prior to CT and the patient was not moved between image sets. The fused images were used to optimize prostate visualization and PPTV contouring. Analysis of the dosimetry (V100, V80 and D90) was then performed using CT alone and with TPUS/CT fusion.

Results: We present image and dosimetry analysis for the five consecutive patients. The intraoperative transrectal ultrasound (TRUS) was used to develop anatomic prostate contours and calculate the prostate volume in order to compare to the PPTV. The average TRUS prostate volume was 26.5 cc. Using CT alone we measured 34.4 cc, as compared to 24.8 cc when TPUS was fused with CT and used in a complementary way. When TPUS was fused to CT, implant quality as measured by D90 > 140 Gy was confirmed in all 5 patients, and improved, on average, from 136 Gy (CT alone) to 175 Gy. Qualitatively, the radiation oncologist had greater confidence in post-plan CT target delineation when TPUS was fused to CT.

Conclusions: We conclude that transperineal ultrasound using autoscanning equipment, fused to CT in a single session, has the potential to increase the accuracy of LDR prostate brachytherapy post-planning and offers an alternative to MRI imaging at much lower cost and accessibility. Further study is warranted.

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Does Low PSA Predict for Worse Outcome in Patients With Gleason 8-10 Localized Prostate Cancer Treated With Radiation Therapy?

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Purpose/Objective(s): High pre-treatment PSA (pPSA) correlates with poorer outcomes in the overall population of patients with clinically localized prostate cancer. High Gleason (8-10) tumors are usually associated with higher pPSA, but occasionally such patients present with low pPSA. Some patients with poorly differentiated tumors have been anecdotally reported to develop distant metastases despite persistently low PSA. We hypothesized that a low pPSA in patients with Gleason 8-10 tumors represents a less-differentiated tumor with a worse prognosis. We analyzed the prognostic value of pPSA in patients with localized Gleason 8-10 prostate cancer treated with definitive radiation therapy.

Materials/Methods: Between 1993 and 2009, 215 patients with localized prostate cancer with initial biopsy Gleason 8-10 and pPSA 0-10 ng/mL were treated at a single academic institution with conformal external beam radiation therapy and/or brachytherapy. Hormonal therapy was used as part of the definitive management in 174 of these patients. The median follow-up of this cohort was 76 months. We analyzed the prognostic significance of pPSA in terms of biochemical and distant disease control in this cohort. The biochemical relapse-free survival (BRFS) and distant metastases-free survival (DMFS) outcomes for low pPSA and higher pPSA groups were compared.

Results: Low pPSA did not predict for worse outcome in this cohort of patients. There were no biochemical or distant failures in the 8 patients with pPSA 0-2 ng/mL. The 10-year BFRS for pPSA 0-2 ng/mL vs >2-10 ng/mL were 100% vs. 54% ($p = 0.06$). The 10-year DMFS for pPSA 0-2 ng/mL vs >2-10 ng/mL were 100% vs. 73% ($p = 0.2$). We also analyzed these patients with a cut-off pPSA 0-4 vs >4-10 ng/mL. The 10-year BFRS for pPSA 0-4 ng/mL vs >4-10 ng/mL were 76% vs. 50% ($p = 0.06$). The 10-year DMFS for pPSA 0-4 ng/mL vs >4-10 ng/mL were 81% vs. 73% ($p = 0.58$).

Conclusions: Low pPSA does not predict for worse outcome in patients with Gleason 8-10 localized prostate cancer treated with definitive radiation therapy, with or without hormone therapy.

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Interfraction Motion in Image Guided Radiation Therapy for Prostate Cancer – Protocol Code: IGRT-PROSTATE 1-09

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Purpose/Objective(s): Image guided radiation for prostate cancer allows correcting the treatment volume position before every daily fraction. A phase II trial was undertaken to evaluate the quality of micturation after image guided radiation therapy by fiducial markers or cone beam CT at our