160Gy to the PTV (GTV + 2mm) and Bard Quicklink system is used to implant I125 radioactive seeds. Multi-modal manual rigid and non-rigid transformations between MR and CT scans were performed on the first 9 patients with three software solutions: the treatment planning system Variseed, a research platform 3D Slicer and a commercial solution Mirada. MR onto CT registrations were approved by an expert uro-radiologist and quantitative evaluations of the registrations were performed by calculating the means of vectors displacement marked on four relevant points of interest detected on the I125 seeds. For the dosimetry, an assessment of the impact of these readjustments on the initial dose matrix was also performed in Mirada by applying the deformation to the initial contours and injecting the initial dose matrix.

Results: For the first 9 patients, evaluation of registration gives rise to means of vectors displacement of 1.52mm [0.36-2.6] with Variseed, 0.62mm [0.26-1.29] with 3D Slicer and 0.42mm [0.24-0.81] with Mirada. Examples of fusions are illustrated in Figure1. Concerning the dosimetric data and considering the most relevant criteria from the initial outline, the D90/(Gy) to the prostate and respectively for the target has a mean difference of +0.68Gy and -12Gy. The D30/(Gy) and the D10/(Gy) to the urethra respectively have a mean difference of -0.99 and -5.58Gy. Lastly, D1cc(Gy) to the rectum has a mean difference of +4.37Gy.

Conclusion: Target volume definition remains a crucial step for focal brachytherapy as only confirmed tumor biopsy sub-volumes of the prostate are treated. Registration procedures tested in our institute confirmed the need to implement a precise rigid and non-rigid fusion of image to delineate relevant target volumes on different modalities. In addition, dosimetry evaluation on the registrations showed the impact of the deformations in high dose gradients.

EP-2003

HDR brachytherapy in monotherapy of one fraction in patients with prostate cancer at low risk

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Purpose or Objective: The High-dose-rate brachytherapy as monotherapy in one fraction, is a treatment option in patients with low-risk prostate cancer and can be used as an alternative to the low-dose-rate brachytherapy. Compared to the low-dose-rate, the HDR as monotherapy has not proven long-term results with regard to disease control. It is not known what dose of treatment should be used to increase the biochemical control, survival control disease and reduce unaffordable toxic effects.

Material and Methods: Results on patients treated with high-dose-rate brachytherapy as monotherapy are presented below.

Sample: A series of 75 patients between 2008 and 2013 treated with high-dose-rate brachytherapy (HDR) single dose of 19 Gy (62) and 20.5 Gy (13) were selected.

A technique of guided-ultrasound brachytherapy and dynamic-calculated intraoperative dose was used.

Results: The results show an overall survival of 91.3% of patients, with survival free of disease of 97% and a biochemical control of 72.5%.

Patients toxicity: Acute urinary toxicity: 53.8% (grade 2). Chronic urinary toxicity: 49.2% (grade 2). Acute gastrointestinal toxicity: 86.2% (grade 1). Chronic gastrointestinal toxicity: 89% (grade 1). Acute urinary retention rate of 2.9%.

Conclusion: HDR prostate brachytherapy as monotherapy in one single fraction of 19 Gy does not provide adequate biochemical control and survival free disease rates. It is necessary more studies to establish what would be the most appropriate dose to obtain higher rates of disease control.

EP-2004

Urethra dose homogeneity constraints in LDR prostate brachytherapy could diminish urinary morbidity

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Purpose or Objective: Evaluate the relationship between RTOG G2-G3 urinary morbidity after prostate brachytherapy and urethral doses at the end of real-time dosimetry planning.

Material and Methods: From November 2007 to December 2010, 204 prostate cancer patients underwent monotherapy I-125 seeds brachytherapy in our institution. Real-time US guided dosimetry planning was performed with Variseed 7.0 or 8.0. Of the 204 patients, 11 (5.4%) developed an acute urinary retention and required a urinary catheter from 2 weeks to 7 months (G2 morbidity), and 7 patients (3.4%) required a transurethral resection of the prostate (G3 morbidity). In a retrospective study, detailed urethral dosimetry was evaluated at the end of the real-time implant. Assessed values included maximum dose, V80, V100, V150 and D90 for overall urethra and segmented urethra (as base, midgland and apex urethra). 1.5-mm and 2.5-mm urethral expansions were also reviewed for all dosimetry parameters. To check if dose homogeneity around urethral regions was related to morbidity, subtraction of expanded minus non-expanded urethral dosimetry parameters was also performed. In total, 111 parameters were reviewed. T-Student test and U Mann-Whitney test were used to compare differences between patients free of urinary morbidity from those presenting G2 and G3 morbidity. p <0.05 was considered significant.

Results: No correlation was found between non-expanded urethra doses and urinary morbidity. Best result (p=0.005) for distinguishing free-morbidity cohort from G2-G3 morbidity-cohort was obtained for subtraction of the maximum dose of the non-expanded minus 2.5-mm-expanded overall urethra.
Diagnostic capability was determined by calculating the area under the curve (AUC) in the receiver operating characteristic (ROC) curves. This parameter had an AUC value of 0.786. It was predictive of G2-G3 complications with 71.4% specificity and 72.2% sensitivity for a dose difference threshold of 48 Gy.

Conclusion: A non-homogenous dose region around urethra at the end of the real-time implant is a risk factor for development of urethral morbidity. Several studies have found dosimetry correlations between CT post-plan and urinary morbidity. This study focuses on US real-time dosimetry parameters. It allows us to consider new constraints and dosimetry alerts during treatment planning. A prospective study is under consideration, where a new constraint of a 40-50 Gy maximum dose difference around a 2.5-mm expansion of the urethra will be implemented if feasible.

EP-2005
Analysis of PSA kinetics after HDR brachytherapy in prostate cancer patients
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Purpose or Objective: The PSA level after definitive treatment using radiotherapy decreases but still remains detectable. The aim of this study is to analyze clinical and dosimetric factors which influence the PSA level in the blood serum of patients with prostate cancer after HDR (High Dose Rate) brachytherapy.

Material and Methods: 53 patients after HDR brachytherapy were qualified to the study from June 2008 to December 2010. The patients were from T1c to T2c, PSA from 1.5 to 19.6 ng/ml with prostate adenocarcinoma (Gleason Scale <7) and belonged to the low and intermediate risk of recurrence. 20 patients had androgen deprivation therapy. Patients were treated with HDR brachytherapy 3 x 15 Gy or 3 x 10.5 Gy. Median follow-up was 3 years. The PSA Bounce threshold was >0.2 ng/ml and the biochemical failure definition was nadir PSA >2.0 ng/ml. The influences of clinical and dosimetric parameters were assessed. Statistical analysis was performed assuming significance level p < 0.05.

Results: PSA Bounce occurred in 22% after average 10.7 months. The time to PSA increase in BF group after brachytherapy HDR was 36 months. It was observed that patients with PSA nadir below 0.1 ng/ml were more likely to have normal follow-up than PSA Bounce, biochemical failure (BF), clinical failure (CF). The amplitude of the PSA increases were significantly different between subgroups. The further analysis demonstrated only a significant difference between the subgroup HDR_Bounce (median 0.7 ng/ml) and HDR_BF (median 2.6 ng/ml). The time to PSA increase was significantly different between the subgroups of the group HDR. It applies to patients with PSA Bounce (median 10.5 months) and biochemical failure (median 36 months). The analysis of others dosimetric and clinical factors (including hormonotherapy) didn’t show any significant effect on the studied HDR subgroups.

Conclusion: The percentage of patients who had a PSA Bounce was 22%. Predisposing factors for PSA Bounce after HDR brachytherapy were nadir PSA (median> 0.1 ng/ml) and time to PSA increase (median >12 months). There was no influence of other analyzed clinical, dosimetric factors and use of hormone therapy to occurrence of the PSA Bounce.

EP-2006
IPSS time recovery in patients with prostate cancer after 1-125 prostate brachytherapy
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Purpose or Objective: To evaluate evolution and average time to IPSS (International Prostate Symptom Score) recovery, in patients who have been submitted to 1-125 prostate brachytherapy (Low dose rate brachytherapy).

Material and Methods: Between March 2011 and December 2013 we performed 66 prostate brachytherapy in patients with low / intermediate risk prostate cancer. 4 patients also received external radiotherapy. 14 patients received previous hormone therapy. A 145 Gy dose was prescribed if exclusive brachytherapy was given and 108 Gy if combined with external radiotherapy. All patients were treated with Quicklink Delivery System® (BARD) and real-time planification. Of the 66 treated patients 5 did not have initial IPSS, 13 did not have complete follow up, and the 48 remaining have a suitable follow up. The variables that have been evaluated were: Prostate volume, Qmax, number of implanted seeds, number of needles and urethra’s D1; “p value” was obtained from Mann-Whitney test. The prostate average volume was 33.73 cc, Qmax: 18.7 ml/sec, number of seeds: 60.2, number of needles: 16.1 and urethra’s D1: 138% to the prescribed dose.

Results: With an average follow up of 27 months, 41 of 48 patients (85.4%) recovered their IPSS, with an average recovery time of 9 months. 7 patients (15%) showed progressive worsening without recovery, and 3 (4.5%) of them developed acute urinary retention (AUR) one month after the implant. In a multivariate analysis the main factor that influenced AUR was the prostate volume, with p= 0.0583, (in these 3 patients prostate average was 42.47 cc, higher than the average non AUR) and other factors that seem to influence were IPSS and Qmax values, without statistical significance (‘p’ value) (In these patients Qmax average was 7.63 and IPSS average was 9.33, worse than non AUR).

Conclusion: 85% of patients with complete follow-up, recovered its basal IPSS. The average time to recovery was 9 months, and the incidence of acute urinary retention was lower than 4.5%.

EP-2007
A multicenter study of exclusive brachytherapy in younger patients with prostate cancer
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