cable. This effect was taken into account during treatment planning. Position verification using the PermaDoc phantom confirmed this 1 mm retraction. All radiographically measured dead spaces complied with the specifications, except for the plastic needles which were 1 mm shorter than indicated. The center of the active source is at 2.42 mm from the tip of the capsule. Combined with the 1 mm source retraction, the center of the dose distribution at the most distal position located always 3.5 mm behind the internal end-point of the source channel. Radiographic and dosimetric dead space measurements showed good agreement (<0.5 mm) for all applicators.

Conclusion: Measured source position and dwell time accuracy comply with the vendor’s specifications. Small deviations were found for the dwell time accuracy at the most proximal source position. Similar tests should be performed regularly to warrant the mechanical accuracy of the afterloader and the quality of the applicators and transfer tubes.

EP-1998
Real-time dosimetry for HDR brachytherapy
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Purpose or Objective: Dose verification and quality assurance in radiotherapy (RT) should be assessed in order to provide the best treatment possible and minimize risks for patient. In certain treatments there are no tools capable of performing real-time dose measurement. In addition, in-situ real-time dosimetry would enhance brachytherapy (BT) by providing technical conditions to perform treatment readjustment and real-time dose correction. Considering the current challenges, we developed a dosimeter intended for in-situ and real-time dosimetry in High Dose Rate brachytherapy (HDR-BT), e.g., prostate and breast.

Material and Methods: The dosimeter developed has a sensitive 3 m long optical fiber probe of 1mm or 0.5 mm diameter comprehending a 5 mm length scintillating optical fiber. To read the signal produced at the probe, 1x1 mm2 Silicon Photomultipliers (SiPM) from Hamamatsu were used. A custom made readout system with SiPM temperature compensation was used. The main concerns when performing dosimetry at high dose rates with high energy isotopes is the eventualty of Cherenkov light production. This form of noise accounts to the total noise signal, known as stem effect. The first round of in-vitro tests in clinical setting demonstrated that the fiber optical based dosimeters developed are suitable for dosimetry in regimes such as HDR prostate BT. The versatility of this kind of device and easiness of use allows application in other radiotherapy modalities. Besides fulfilling all the requirements for a dosimeter in HDR-BT, the high sensitivity of this device makes it a suitable candidate for application in LDR-BT.

Conclusion: The studies carried out allowed assessing the amount of stem effect produced in the optical fiber cable. In the conditions described above, the stem effect contribution is lower than 1% for both 0.5 and 1 mm probes. The measurements of the fiber dosimeter response as a function of the dose are represented in Figure 1. The small difference from the reference IC is due to the different detector volumes of the fiber dosimeter and the ionization chamber. The dosimeter shows a linear response with dose rate being capable of detecting µGy dose variations.

Figure 1: Fiber optic dosimeter stem-effect and response for 0.5 and 1 mm diameter versions compared to ionization chamber response.

EP-1999
Comparison of intraoperatively linked and loose seed in prostate brachytherapy using sector analysis
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Purpose or Objective: An intraoperatively built custom-linked (IBCL) seeds system is a push-button seed delivery system that allows the user to create intraoperatively customized linked seeds, using a combination of seeds, connectors, and spacers. To date, only three studies have compared the implant quality of IBCL seeds to loose seeds in prostate brachytherapy (PPB). However, they did not use sector analysis. Therefore, we compared the implant quality of IBCL seeds to loose seeds in PPB using sector analysis.

Material and Methods: Between June 2012 and January 2015, 64 consecutive prostate cancer patients underwent brachytherapy with IBCL seeds (n = 32) or loose seeds (n = 32). All the patients were treated with 144Gy of brachytherapy alone. IBCL and loose seeds were alternately used basically. All patients were treated by the same radiation oncologist and urologist. We used the same dose-
volume targets in the IBCL seed group and the loose seed group. Brachytherapy was performed using a dynamic dose calculation technique. Computed tomography/magnetic resonance imaging/fusion-based dosimetry was performed 1 month after brachytherapy. Post-implant dose volume histogram (DVH) parameters, prostate sector dosimetry, operation time, seed migration, and toxicities were compared between the two groups. A sector analysis tool was used to divide the prostate into six sectors (anterior and posterior sectors at the base, mid-gland, and apex). Analyses were performed using the 2-sample t test for continuous data that followed a normal distribution, the Mann-Whitney test for continuous data that did not follow a normal distribution, and the Chi-squared test for categorical data. Probability (P) values of <0.05 were considered significant.

Results: In prostate sector dosimetry, V100 (95.3% vs. 89.7%; P = 0.014) and D90 (169.7 Gy vs. 152.6 Gy; P = 0.013) in the anterior base sector was significantly higher in the IBCL seed group than in the loose seed group. Other post-implant DVH parameters did not differ significantly between the two groups. The seed migration rate was significantly lower in the IBCL seed group than in the loose seed group (6% vs. 66%; P < 0.001). There was no significant difference in mean operation time between the two groups; however, median operation time per seed was significantly longer in the IBCL seed group than in the loose seed group (1.31 min vs. 1.13 min; P = 0.003). The median follow-up was 18 months (range, 1-36 months). No significant differences in toxicities were seen between the two groups.

Conclusion: Our study showed more dose coverage postoperatively in the anterior base prostate sector and less seed migration in IBCL seeds implantation compared to loose seeds implantation.

EP-2000
Template guided saturation biopsy of prostate: what is the optimal volume for brachytherapy?

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Purpose or Objective: to evaluate results of saturation biopsy in candidates for focal, hemigland high dose rate (HDR) brachytherapy or irradiation with “low-dose tunnel for urethra”

Material and Methods: Template guided saturation biopsy was performed in 52 primary patients with suspicion to prostate cancer and PSA below 10 ng/ml. Biopsy was performed under US control with the help of brachytherapy grid and 5mm distance between samples. During positioning and biopsy procedure we put special attention for accurate sampling of prostate in periurethral region. The number of cores varied from 17 to 50 (average 33 cores). Finally in 31 patients with confirmed prostate cancer results of biopsy were used for brachytherapy planning.

Results: Saturation biopsy revealed prostate cancer in 31 of 52 evaluated patients. Involved volume ranged from 5% to 100% (average - 57%). Focal nature of PC diagnosed in 6 (19.4%). Multifocal - in another 25 (80.6%) patients. Hemigland invasion mentioned in 10 cases. Saturation biopsy detected PC in periurethral cores in 22 (70.9%) of 31 evaluated patients: invasion of one core revealed in 1, 2 cores - in 6, 3 and more cores - in another 14 cases. In 10 patients extent of involvement in periurethral cores varied between 10% and 50%, in another 12 observations exceeded 50%. According to results obtained on saturation biopsy we performed HDR brachytherapy with “urethra low dose tunnel” (D10a≤80%) in 9 patients with noninvolved periurethral cores. Theoretically hemigland brachytherapy was possible in 10 of 31 evaluated patients.

Conclusion: in low risk patients with prostate cancer results of template guided saturation biopsy can significantly influence strategy of HDR brachytherapy.

EP-2001
Radical salvage brachytherapy (BT) for local recurrences after previous radiation treatment

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Purpose or Objective: We presented a retrospective analysis in 11 patients with histological proven local-recurrent prostate cancer, undergoing salvage BT, treated between February 2009 and December 2014.

Material and Methods: The previous radical treatments were: 3 Low dose rate BT (LDR-BT) (145 Gy), one combined treatment with external radiotherapy (EBRT) (45 Gy) and LDR-BT (100 Gy), and 7 EBRT (64-74 Gy). Four patients have been rescued with HDR-BT and seven with High-Dose-Rate-BT (HDR-BT). All patients have a complete study with abdominal CT scan, pelvic MRI, and bone scan to diagnose local disease exclusively. LDR-BT patients received 145 Gy with 125I. HDR patients, has been treated with 30 Gy in 3 fractions of 10 Gy separated ten days. Median time to Biochemical failure (BF) from the first treatment was 48 months (12-114). All patients received previous hormonotherapy. Median time to rescue was 69 months (33-156). Toxicities were evaluated according with CTCAE scale (version 4.0).

Results: Median follow-up: 26.5 months (3-72 m). The overall survival time was 98 months (65-174). At the end of the follow up, March of 2015, all patients are alive, nine (82%) without evidence of disease, one patients had a retroperitoneal failure 7 months after the salvage-BT and other patient was diagnosed of a solitary bone metastases at 12 months. Median PSA nadir post-salvage-BT was 0.1 ng/ml (0-0.29). There were not grade 3 GU or GI toxicities. 100 % of LDR-BT patients presented acute GU-toxicity grade 2. Fifty-seven % of the HDR-BT patients had GU-toxicity grade 1 (0% grade 2).

Conclusion: Prostate BT is an effective and well tolerated reirradiation treatment in local-recurrent prostate cancer patients, with, few long-term toxicities, mainly in those treated with HDR-BT.

EP-2002
Focal prostate brachytherapy: aspects of multi-modality registration and dosimetry feasibility

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Purpose or Objective: The different conventional treatments for prostate cancer are multiple and for low-risk tumors, focal brachytherapy can be a therapeutic alternative option to active surveillance. However, this focal treatment remains still under evaluation and within the frame of the focal brachytherapy project conducted in Toulouse, we will present in this study two parts of the project: first, the contribution of multi-modal rigid and non-rigid registrations for localization and delineation of the treated volume, then the dosimetry evaluation after registration.

Material and Methods: First step of prostate brachytherapy at our institute consists in a contour-based non-rigid registration between MRI and US performed with Koels software where positive biopsy trajectory is retrieved and a fiducial non-radioactive marker is implanted to localize the tumor focus. As a result of this localization, dosimetry was performed using VariSeed software, dose prescription is...