Conclusion: Salvage I-125-BT patients can be selected based on their disease free survival interval after primary therapy and the PSA-doubling time pre-salvage, ensuring sufficient biochemical control of >70% until three years.

OC-0065
Risk of second malignancies after seed prostate brachytherapy as monotherapy in a single Institution
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Purpose or Objective: To report the incidence of second primary cancer (SPC) after iodine-125 brachytherapy for early prostate cancer in a single institution with an intense urological surveillance and to compare it with the cancer incidence in the Australian population

Material and Methods: This retrospective, single-institution study included 889 patients treated with iodine-125 brachytherapy alone. All the patients had a baseline cystoscopy before the implant. Data were collected on all subsequent SPC diagnoses. SPC incidences were retrieved for all type of cancers and for cancers close to the radiation field. Interval since the implant was evaluated for potential association to the treatment. Standardized incidence ratios (SIRs) were calculated for all cancers and for bladder cancers and matched with the general population. The absolute excess risk (AER) was expressed in relation to 10000 persons-years in the study. Kaplan-Meier analysis was used to determine the actuarial second malignancy and pelvic malignancy rates and the death from SPC and from any cause.

Results: Patients were followed for a median of 4.16 (0-12) years with 370 (42.4%) patients having 5 years or more follow up. 62.8% patients were older than 60 years. 61 patients (6.8%) subsequently developed a SPC with 12 pelvic malignancies: 8 bladder and 4 rectal cancer. The 5- and 10-year cumulative incidences are 6.9% (95% Confidence Interval 5.0-9.4) and 19% (95% CI 14-26) for any second malignancy, 1.3% (95% CI 0.6-2.7) and 3.9% (95% CI 1.9-7.8) for any pelvic malignancy and 1% (95% CI 0.4-2.4) and 3.2% (1.4-7.1) for bladder cancer, respectively. The SIR was significantly higher for all pelvic malignancies at 2.10 (95% CI 1.09-3.67) and for all bladder cancers at 3.33 (95% CI 1.44-6.57). In the subgroup analysis bladder SPC risk was higher than expected for patients under 60 years (SIR 6.52; 95%CI 1.3-19; AER 13) and within the first 5 years of follow up (SIR 2.9; 95% CI 0.97-6.95; AER 10). Rectal cancer SIRs were not significant or close in any of the categories. The 5- and 10-year rates of death from SPC were 1.9 % (95% CI 1.0-3.5) and 9.1% (95% CI 5.0-14.7) and from any cause were 3.2% (95% CI 2.5) and 14.4% (95% CI 9.5-21.6). On multivariable analysis, older age was associated with increased SPC risk (HR 1.05, p<0.021), all cause mortality (HR 1.13, p<0.001) and mortality due to SPC (HR 1.09, p=0.014). Smoking status was associated with all cause mortality (HR 2.15, p=0.026) and with mortality from second malignancy (HR 2.59, p=0.045).

Conclusion: There may be an increased but small risk of second pelvic malignancy after prostate brachytherapy. A tendency towards a higher risk of bladder SPC after brachytherapy was found in the first 5 years of follow up, probably resulting from screening bias. There was no significant increase of risk of rectal cancer in any of the categories. Longer follow up is needed to draw strong conclusions.

OC-0066
Adaptive cone-beam CT planning improves progression-free survival for I-125 prostate brachytherapy
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Purpose or Objective: To determine the independent effect of additional intraoperative adaptive C-arm cone-beam computed tomography (CBCT) planning versus transrectal ultrasound (TRUS)-guided interactive planning alone in primary permanent I-125 brachytherapy for prostate cancer on long term biochemical disease free survival (bDFS).

Material and Methods: All patients with biopsy proven T1-T2-stage prostate cancer treated with I-125 brachytherapy were included in this cohort. Treatments were performed with TRUS-guided primary brachytherapy (+/- neoadjuvant hormone therapy (NHT)) at a single Institution in the period of November 2000 to December 2014. From October 2006 onwards, all patients received additional intraoperative adaptive CBCT planning for dosimetric evaluation and, if indicated, subsequent remedial seed placement in underdosed areas (which was performed in 15% of all patients). These procedures lasted 1-1.5 hours and were performed by a team of 2 radiation oncologists and 2 therapeutic radiographers. Pre-operative characteristics, follow-up PSA and mortality were prospectively registered. Patients were stratified into National Comprehensive Cancer Network (NCCN) risk groups. Kaplan-Meier analysis was used to estimate bDFS (primary outcome), overall survival (OS) and prostate cancer specific survival (PCSS) (secondary outcomes). Cox-proportional hazard regression was used to assess the independent predictive value of CBCT use on biochemical failure (BF) (Phoenix definition) and overall mortality (OM).

Results: 1623 patients were included. Median follow-up was 99 months (interquartile range (IQR) 70-115) for TRUS patients (n=613) and 51 months (IQR 29-70) for CBCT patients (n=1010). BF occurred 203 times and 206 patients died, of which 26 due to prostate cancer. For TRUS and CBCT patients, estimated 7-year bDFS was 87.2% vs. 93.5% (log rank: p=0.04) for low risk patients, 75.9% vs. 88.5% (p=0.001) for intermediate risk patients and 57.1% vs. 85.0% (p=0.001) for high risk patients. For TRUS and CBCT patients with low, intermediate and high risk disease, estimated 7-year OS was respectively 86.5% vs. 90.4% (p=0.11), 79.6% vs. 85.1% (p=0.30) and 66.4% vs. 84.2% (p=0.01). For TRUS and CBCT patients, 7-year PCSS was 96.0% vs. 100% (p=0.0001). After Cox regression, CBCT patients had lower rates of BF: HR 0.45 (95%-CI 0.33-0.61; p=0.0001). Corrected for age, IPSA, Gleason grade, T-stage, NHT-status and duration of NHT use, year of implantation, activity of the implant and prostate volume, CBCT showed to be an independent predictor of BF: HR 0.54 (95%-CI 0.33-0.89; p=0.02). CBCT was not an independent predictor of OM: HR 0.66 (95%-CI 0.40-1.07; p=0.09).

Conclusion: Additional intraoperative adaptive C-arm cone-beam CT planning in I-125 prostate brachytherapy leads to a significant increase in biochemical disease free survival in all NCCN risk groups.

Proffered Papers: Physics 1: Images and analyses

OC-0067
An automated patient-specific and quantitative approach for deformable image registration evaluation
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Purpose or Objective: In adaptive radiotherapy, deformable image registration (DIR) is used for contour propagation and dose warping. Contour evaluation is visual and qualitative and only accurate in high contrast regions. Dose warping requires fully spatial and quantitative DIR evaluation measures also valid in low contrast regions. While