

## OC-0343

## Pattern of intraprostatic recurrence on multiparametric MRI after radiotherapy for prostate cancer

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**Purpose or Objective:** The majority of intraprostatic recurrences after radical prostate radiotherapy occur at the site of initial tumour, in previous reported series. However, there is no published data directly comparing recurrence patterns after different modalities of radiotherapy. The aim of this study was to investigate differences in spatial pattern of intra-prostatic recurrences on multiparametric MRI, after external beam radiotherapy or brachytherapy.

**Material and Methods:** We identified 382 consecutive patients referred for multiparametric MRI after previous prostate cancer treatment. Patients with post-radiotherapy biochemical recurrence and intraprostatic recurrence on MRI were included in the study. Scans were independently reviewed by two radiologists. The location of recurrence was mapped to prostate sectors based on European consensus guidelines. The chi-square test was used to analyse differences in site of recurrence between modalities of radiotherapy.

**Results:** 66 patients who had radical radiotherapy between 1997 and 2013 had intraprostatic recurrence on MRI. The D'Amico risk stratification at initial diagnosis was 14% low-risk, 34% intermediate-risk and 52% high-risk. The series consisted of 34 patients after external beam radiotherapy (EBRT), 20 patients after low-dose rate brachytherapy (LDR) and 12 after high-dose rate brachytherapy monotherapy (HDR mono). 68% of the EBRT recurrences had received a dose-fractionation schedule with an EQD2 less than 74 Gy. The mean time between the end of radiotherapy and imaging recurrence was 77 months (95% CI 68 - 85 months) with no significant differences between treatment groups. 80% of patients did not have any associated pelvic bony metastasis or nodal disease. 88% of patients had a contiguous intraprostatic recurrence. The median recurrence size detected on MRI was 2.0 cm (range 0.6 - 4.2 cm). Recurrences after EBRT were more likely to involve multiple sectors of the prostate. 71% of EBRT recurrences involved the apex compared to 30% after LDR and 25% after HDR mono ( $p = 0.003$ ). In the LDR group, recurrences involved the base of the gland in 60% of cases, compared to 41% after EBRT and 8% after HDR mono ( $p = 0.016$ ). 21% of patients underwent salvage treatment with cryotherapy, HDR brachytherapy or prostatectomy.

**Conclusion:** Apical recurrences predominated in patients following EBRT. This highlights the need for MR-fusion during EBRT target definition because the apex is difficult to visualise on CT. Basal recurrences were associated with LDR brachytherapy, which may reflect a tendency of radioactive seed migration away from the base. The use of multiparametric MRI facilitates identification of patients for focal salvage treatment.

## OC-0344

## Risk of second primary cancers after radiotherapy for prostate cancer

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**Purpose or Objective:** The average 5-year survival rate of men diagnosed with prostate cancer (PCa) is 93%. The long life expectancy exposes them to a greater risk of developing second primary cancers. To quantify the risk of radiation

induced second primary cancer, we analysed data of PCa patients based on our Cancer Registry.

**Material and Methods:** We analysed 19.538 patients treated for PCa from 1988 until 2008. They were either treated with surgery (RPE only) or received radiation therapy as primary (RT only) or as postoperative treatment (RT after RPE). Statistical analysis was performed using a stratified Cox proportional hazard model and a chi-square test.

**Results:** Patients who received RT only were 5 years older (median) than patients who underwent RPE only or RT after RPE. Second primary cancers were observed with 13.1% and 13.6% in the RPE only and in the RT after RPE group and 16.4% in the RT only group ( $p = 0.0001$ ), respectively. Colon carcinoma was seen in the RPE only and RT only group in roughly 10 percent, whereas in the RT after RPE group in 14.6% ( $p = 0.2140$ ). Bronchial cancer surpassed 10% in the RT only group (12.5%) vs. 9.7% and 7.8% in the RPE only and the RT after RPE group ( $p = 0.0552$ ). Bladder cancer was observed with roughly 10% in the RPE only (10.2%) and RT after RPE (10.4%) group versus 15.5% in the RT only group ( $p = 0.0007$ ). Rectal cancer after treatment of PCa was diagnosed in 5.7%, 7% and 3.1% in the RPE only, RT only and RT after RPE group ( $p = 0.1037$ ). Within the first 10 - 15 years the cumulative hazard curves for second primary cancers gave no hint to an increased tumor risk due to prior treatment. After 15 years there are hardly any cases left and the occurring events can no longer be reasonably interpreted. Cox proportional hazard ratio revealed that patients with a higher age have a significantly higher risk of developing second primary cancer (Hazard Ratio 1.279 in 60 - <65 year old patients vs. 2.169 in  $\geq 75$  year old patients,  $p < 0.0001$ ).

**Conclusion:** Based on this population with PCa from the PSA era the incidences of second primary cancers did not differ significantly between the three arms apart from bladder and lung cancer that came close to being significantly different. However, these differences cannot reliably be ascribed to radiation, but to other factors such as older age, lifestyle habits like smoking and the well known fact that cancer survivors generally have an increased risk of new tumor formation.

**Proffered Papers: Clinical 8: Adult and paediatric CNS malignancies**

## OC-0345

## Patterns of failure after radiotherapy in pediatric ependymoma: correlation with dose parameters

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**Purpose or Objective:** The aim of this study was to investigate the patterns of failure after radiotherapy for pediatric intracranial ependymoma and their correlation to dose parameters.

**Material and Methods:** Between 2000 and 2013, 206 patients with intracranial ependymoma were treated in the 13 french reference pediatric radiotherapy centers. The magnetic resonance imaging obtained at recurrence were registered with the original planning CT for topographic analysis of the patterns failure. Clinical target volume (CTV) and planning target volume (PTV) margins were extracted; several dosimetric quality indices were derived from Dose Volume Histogram (DVH) to compare relapse with no-relapse patient.

**Results:** With a median follow-up of 44.81 months (95% CI [36.80; 56.51]), 85 (41.3%) patients presented with recurrence. The topographic analysis of patterns of failure showed 50 (58.8%) patients with local recurrence in the radiation field (LF), 6 (4.1%) in the edge of field (EFG), 6 (7.1%) were loco-regional outside the field (LRF), 8 (9.4%) in spine (SF), 5 supratentorial (SUF) and 10 (11.8%) local and distant (LDF). The median prescription dose was respectively: 55.8 Gy [50.4; 60] in LF, 54 Gy [48.6; 59.4] in EF, 56.7 Gy [50.4; 60] in LRF, 54 Gy [50.4; 59.4] in LDF, 59.4 Gy [48.6-59.4] in SUF and 56.7Gy [54; 60] in SF. The median PTV margins was 0.5 mm [0.3; 1]. The median Coverage index and The Target Coverage index of the PTV were both lower in the relapse group as they were respectively 0.97 and 94.8% in the relapse group compared with 0.98 and 95.99% in the no-relapse group. The median Homogeneity index was 0.097 in the relapse group versus 0.091 in the no-relapse group. The median volume of relapse was 1.29 cc [0.11; 27] in the LF group, with a median dose of 58.81 Gy [50.86; 61.38].

**Conclusion:** In patients with intracranial ependymoma, local failure in the tumor bed was the major pattern of failure. The preliminary results showed that all dosimetric indices on the PTV were worse in the relapse group. Improving the coverage of target volume may be an effective way to reduce the local failures. Thus a complementary correlation of relapse patterns with dose parameters to PTV and organs at risks and the irradiation techniques is under statistical analysis and final results will be presented at the meeting.

#### OC-0346

**Pediatric diffuse intrinsic pontine glioma re-irradiation: better survival and better time**

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**Purpose or Objective:** Since 2009 we launched a strategy for children with centrally reviewed MRI diagnosis of diffuse intrinsic pontine glioma (DIPG) implying the intravenous administration of vinorelbine with nimotuzumab -an anti-EGFR monoclonal antibody- weekly, for a total of 12 weeks, during radiotherapy delivery of 54 Gy, 1.8 Gy/fraction daily. After radiotherapy completion, vinorelbine and nimotuzumab were administered any other week until tumor progression or for a total of two years. In the attempt to improve survival and quality of life of our children, a protocol amendment in July 2011 introduced re-irradiation at relapse/progression.

**Material and Methods:** Local re-irradiation consisted of 19.8 Gy, fractionated over 11 days. A 3DCRT with 5-6 coplanar beams was adopted with a beam geometry possibly not overlapping that of the first line irradiation; the most demanding planning issue of re-irradiation was to meet optic chiasm dose constraints. Three additional children were re-irradiated to distant sites of relapse, spine (2) or ventricular system at doses of 36 Gy or 54 Gy respectively.

**Results:** Of the 39 patients treated from 8/2009, 28 had local (23) or disseminated (5) progression and 18 were given local (15) or distant (3) relapse re-irradiation at a median of 8 months after first radiotherapy (2.5-19 months). Reasons for not re-irradiating the other 10 children were: progression before July 2011 (4), parents refusal (4), too poor Lansky status (2); median PFS and progression site were not different in the two subgroups. Survival after re-irradiation lasted between two weeks and 14 months, median 6 months, and determined a statistically difference in median OS between the two groups of re-irradiated or not children, being 16 and 12 months, respectively (P=0.004). In 16 radiologically evaluated patients, re-irradiation induced: reduction of tumor volume in 8, stable volume in 3 while 5 had progression; 13 had symptom amelioration and 12 steroid suspension. Volume reductions were obtained in 7/8 children that have shown the same response after first line irradiation while one was obtained after stable disease in first line treatment. No adverse event was reported and all children were re-irradiated as outpatients.

**Conclusion:** Re-irradiation after relapse/progression represented a significant benefit for both OS and quality of life of children with DIPG with symptom amelioration in 13/18. This option is worth to be offered also in case of disseminated progression.

Partially supported by Associazione Italiana per la Ricerca sul Cancro (AIRC)

#### OC-0347

**Outcome and prognosticators in adult patients with medulloblastoma: a Rare Cancer Network study**

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**Purpose or Objective:** For the treatment of adult patients newly diagnosed with medulloblastoma, there is no standard to guide multimodality therapy. With a multi-institutional cohort, we investigated and reported the multidisciplinary approach, clinical outcome, and prognostic factors of medulloblastoma in adult patients treated with postoperative radiotherapy (RT).