all rectum applicators. Simulations in patients 3DCT scan allowed us to evaluate CXRT dose to organs at risk and to the target volume. The comparison of dosimetric indices of EBRT and CXRT treatment delivery for the high risk target volume showed that the CXRT technique delivers higher dose to the target volume for the same dose, or even less for some cases, to the organs at risk.

Conclusion: Monte-Carlo simulations are useful to compute accurate dose distributions in 3DCT patient data for the CXRT treatment delivery. Moreover, this comparative study between the EBRT and CXRT techniques confirms the role of CXRT in curative treatment with organ preservation for early rectal cancers.

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PO-0863

Localizing the benefit of a hydrogel rectum spacer for prostate IMRT within the ano-rectal wall

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Purpose or Objective: In previous studies the dosimetric impact of an implanted rectum spacer (IRS) in prostate cancer patients undergoing intensity-modulated radiation therapy (IMRT) has been assessed by dose-volume histograms (DVHs) and dose-surface histograms (DSHs) obtained from 3D dose distributions of the ano-rectal wall (ARW). Unfortunately, spatial information is lost when analyzing DVHs or DSHs. This hampers to study the correlation between the shape and location of the ARW dose distribution and clinical outcome. Dose-surface maps (DSMs) have been suggested as a valuable tool for taking the spatial-dosimetric information into account.The purpose of this study is to assess spatio-dosimetric differences in DSMs obtained from planned ARW dose distributions in patients receiving IMRT with and without IRS (IMRT+IRS; IMRT-IRS, respectively).

Material and Methods: In 26 patients with localized prostate cancer a hydrogel rectum spacer (SpaceOAR®, Augmenix) was injected under transrectal ultrasound guidance in Denonvilliers' space between the prostate and the rectal wall. Per patient, two IMRT treatment plans (78 Gy in 39 fractions) were designed, based on CT scans acquired before and after hydrogel injection. DSMs of the ARW were generated from the planned 3D dose distributions by virtual unfolding the rectum contour as described in Buettner et al. (Fig. 1a-b).

Figure 1a

Rectal wall DSM (in Gy) without IRS (left) and with IRS (right). Vertical axis corresponds to superior-inferior direction. Horizontal axis represents circumferential direction: P, posterior; L, left; A, anterior; R, right.

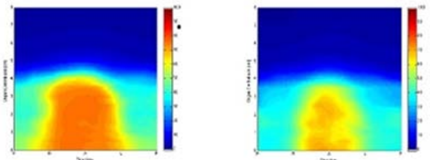
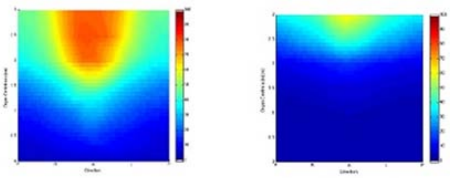


Figure 1b

Anal wall DSM (in Gy) without IRS (left) and with IRS (right).



Various shape-based dose measures were extracted from the DSMs. First, dose clusters were generated by thresholding the DSMs at 38 dose levels ranging from 5-79 Gy. Then, for each dose level an ellipse was fitted to the largest dose cluster. Lateral (posterior-anterior-posterior) and longitudinal (superior-inferior) extents were quantified by projecting the major and minor axes of this ellipse to the main axes of the DSMs. The non-circularity of the dose clusters was described by the eccentricity of the ellipse. The contiguity of the ARW dose distribution was assessed by the contiguous-DSH (cDSH), reflecting the single largest contiguous ARW area fraction as function of the dose threshold at the given level. Statistical differences were assessed with a one-sided paired Wilcoxon signed rank test.

Results: Lateral extent, longitudinal extent as well as cDSH were significantly lower in IMRT+IRS than for IMRT-IRS at high-dose levels. Largest significant differences were observed for cDSH at dose levels >50Gy, followed by lateral extent at doses >57Gy, and longitudinal extent. For these three features, no significant differences were observed for low to medium dose levels. For eccentricity no significant differences were found, independent of the dose level.

Conclusion: Significant spatio-dosimetric differences in ARW DSMs exist between prostate cancer patients undergoing IMRT with and without IRS. The IRS particularly reduces the lateral and longitudinal extent of high-dose areas (>50 Gy) in anterior and superior-inferior directions.

PO-0864

A planning study investigating different planning techniques for SBRT of NSCLC.

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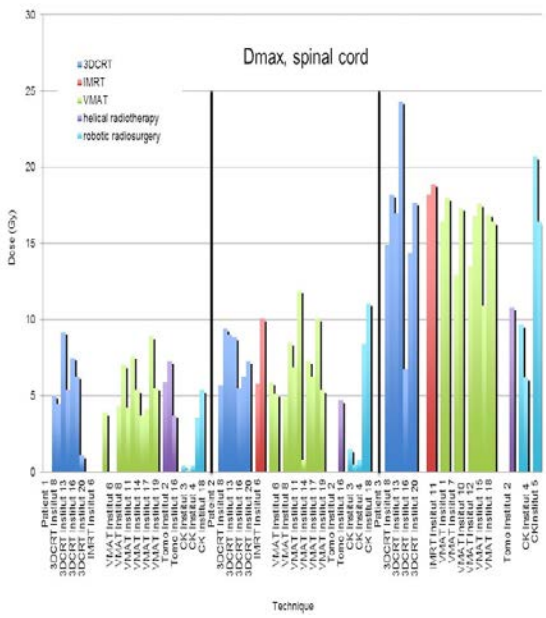
Purpose or Objective: SBRT is a novel treatment procedure, which is used for the particular localization of the tumor to deliver targeted high doses with greatly precise fields. Different irradiation techniques provide a wide spectrum of therapy options. The aim of this work was to evaluate the clinical benefits and potential dosimetric of different planning methods against each other for the treatment of NSCLC.

Material and Methods: In this study, three diagnosed patients with NSCLC metastasis, were chosen. One had a peripheral metastasis in the left lung , the other had a metastasis in the right lung, and the last one had a central metastasis located near to vertebral body. The delineated structures (PTV and OARs) on CT were shared among 22 clinics with the request to generate an irradiation plan with their own internal criteria. Three fractions of 15 Gy were prescribed to the PTV-enclosing 65%. All together it was assembled 78 treatment plans, that they were generated, 36 IMAT, 18 3DCRT, 3 IMRT, 9 helical irradiation and 12 robotic radiosurgery. All gathered data were finally imported into one treatment planning system for evaluating different planning strategies.

Results: In all plans, the dosimetric coverage of the target volume and the dose to OARs were within clinical limits. The coverage of the PTV were disclosed: CICRU =1.0(0.9-1.1); CI65 =0.7(0.4-1.0); HI=0.3(-0.3-0.5); Dmin/Dmax=0.6(0.5-0.7); D2%,=64.6(47.5-71.3)Gy; D98%=47.2(39.5-68.6)Gy; Dmiddle=57.8(47.3-65.8)Gy.
In the 3DCRT Plans, the mean dose in the PTV was on average, 3 Gy higher than dynamic techniques; MU and irradiation time were by the factor of 2-3 higher in the dynamic techniques. Dose to the OARs for the 1st and 2nd patient is as bellows: Dmedi, ipsilat. lung = 4.9 (3.2-8.8)Gy; Dmax, esophagus =7.7(0.4-16.1)Gy. V35Gy, rips =10(0.6-43.7). For the 3rd one: Dmedi., ipsilat. lung = 8.3(6.8-10)Gy; Dmedi.,contralat. lung = 2.3(1.4-4.7)Gy Dmax, esophagus=20.7(11.3-27.7)Gy.
Picture shows the Dmax for the spinal cord.



Conclusion: All irradiation techniques were applicable for clinical use, the resulting dose distribution were quite similar. By comparison, the statistically significant differences between the users were greater than the differences between the techniques. This demonstrate that strict constrains and works like the DEGRO reference paper (Guckenberger et al) are necessary to homogenize the SBRT planning at a national level.
This study reports the results of the irradiation planning for the treatment of NSCLC with SBRT depends largely on the user.

PO-0865
Developing sciatic nerve-sparing stereotactic radiotherapy for re-irradiating the pelvic sidewall

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Purpose or Objective: Management of pelvic sidewall recurrence in gynaecological cancers is a challenging clinical scenario. Sciatic nerve involvement may exclude surgery and cause intractable symptoms that are difficult to palliate. In the context of re-irradiation, high doses of radiation without consideration of the sciatic nerve can cause irreversible nerve damage, yet this has not traditionally been included as an OAR.
The aims of this study were to develop dose target constraints for re-irradiation of the sciatic nerve, and to assess the impact of nerve-sparing optimisation on target volume coverage and OAR sparing with stereotactic radiotherapy techniques.

Material and Methods: Cumulative dose constraints for re-irradiation were derived assuming prior pelvic radiotherapy of 50Gy (EQD2) and allowing nerve recovery values of 50% and 100%. Treatment plans were produced for 10 patients with recurrent gynaecological cancer delivering 30 Gy in 5 fractions. Two normalisation methods were assessed: ICRU 83 type normalisation and prescription (ICRU); and stereotactic radiosurgery convention of prescribing to the isodose covering 95% PTV allowing maximum doses of ~125% (SRS). For each method, plans were optimised with and without sciatic nerve sparing targets. Sciatic nerve roots were contoured from sacral foramina until the nerve exits the pelvis. Nerve sparing plans were optimised to minimize dose to nerve PRV while maintaining PTV coverage. Doses to GTV, PTV, OAR and sciatic nerve were compared.

Results: All 40 plans met the PTV targets with >95% PTV coverage by the specified isodose. The sciatic nerve was involved in 3 patients, close proximity (<5 mm) in 4 patients and more than 5 mm distant from PTV in 3 patients. The dose targets were Dmax 32 Gy when there was nerve involvement and 21.9 Gy when the nerve was distant from tumour. For all patients, the sciatic nerve dose was reduced with each technique: median Dmax with ICRU from 28.8 Gy to 22.3 GY and with SRS from 28.7 Gy to 19.9 Gy. For patients with overt nerve involvement, median Dmax was reduced from 34.9 Gy to 32.1 Gy with SRS. Nerve sparing was achieved without significantly decreasing GTV mean doses or increasing bowel doses.

Conclusion: The sciatic nerve should be an OAR for re-irradiation of sidewall recurrence. Optimisation using a sciatic nerve PRV can significantly reduce dose to nerve by up 40% (EQD2-2) while having minimal effect on GTV coverage or bowel doses. Feasible dose targets depend on proximity of nerve to GTV and clinical scenario.

PO-0866
Evaluation of three planning RT techniques for boost phase in pediatric medulloblastomas

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Purpose or Objective: Over the last half century we have seen remarkable improvements in the survival of pediatric cancer patients. Therefore, the impact of cancer and its treatment must be assessed. Furthermore, the radiotherapy technique must be well selected in order to minimize the secondary effects. Since hearing loss is a common late effect of radiotherapy, the purpose of this study was to compare three different treatment techniques and to evaluate the dose to the cochleas and supretentorial brain, in children treated with radiotherapy for medulloblastoma.

Material and Methods: A total of 121 children were treated in our department with radiotherapy for CNS tumors, between January 2000 and December 2014. Those who were diagnosed with medulloblastoma were included. A total of 29 children fulfilled these criteria. The adopted treatment plan consisted of a first phase with three-dimensional conformal radiotherapy (3D-CRT) to the craniospinal region (prescribed doses from 23.4 to 36.0 Gy) followed with a boost to the PTV (posterior fossa/tumor bed) with prescribed doses of 18.0 or 31.6 Gy depending on the clinical risk-group, high or standard risk respectively . For each child, three different treatment plans were prepared for the boost phase: one with conventional 2 parallel opposed fields (CRT), one more complex with 3D conformal radiotherapy (3D-CRT) and