radiation in genetic syndromes that predispose cancer development. Our review summarizes found radiosensitive phenotypes.
**Results:** See the table.
**Conclusions:** Radiosensitive phenotypes are important to be recognized in order to avoid severe/fatal adverse effects. In future the challenge is to investigate the optimal fractionation of radiotherapy (RT) in patients with radiosensitive genotype. More research is needed about the hypersensitivity of those who are carriers of a disease gene, e.g. heterozygous ATM mutation carriers (frequency of 1:100) as it is suspected that they have an increased risk of sporadically found breast cancer. In future, gene expression profiles will be used in prediction radiosensitivity.

**2011** POSTER

**Stereotactic Body Radiation Therapy for Spinal Metastasis Using Cyberknife Xsight Spine Tracking System − Feasibility and Efficacy**

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**Background:** Mostly conventional radiation has been used for palliation of spinal metastatic tumours, but its effectiveness is limited by spinal cord tolerance and moreover reirradiation is generally not possible. Stereotactic body radiation therapy (SBRT) causes a rapid fall-off within the cord to overcome this problem. With Cyberknife Xsight™ Spine Tracking System, precise radiation delivery can be provided without fiducial insertion. This retrospective analysis evaluated the efficacy and safety of SBRT using Cyberknife for spinal metastasis.
**Patients and Methods:** A total of 20 lesions with spine metastases in 16 patients were treated wth SBRT cancer were treated with SBRT between July 2008 and April 2010. Fourteen (87.5%) patients were given re-irradiation for their lesions including metastases in the spines adjacent to the site of previous radiotherapy. The gross tumour volume, with a 2−5 mm margin if possible, was treated in 3−6 fractions by Cyberknife Xsight™ Spine tracking system. Patients were evaluated at 4 weeks, 12 weeks, and every 3 months after SBRT.
**Results:** The median tumour volume of 20 spinal metastatic lesions was 18.13 $cm^3$ (range 1.52–39.36 $cm^3$). The SBRT dose ranged from 18 to 35 Gy (median 27 Gy) prescribed to the 73−83% isodose line that encompassed at least 95% of the tumour volume except one re-cyberknife case. The spinal cord volume that received higher than 80% of the prescribed dose was $0.01\pm0.03$ $cm^3$. Follow up durations ranged from 1 to 22 months (median 9 months). Three cases developed local disease progression at 4.5 and 7 months after SBRT. The progression free survival (PFS) rates at 12 months were 79.6%. No neuropathy or myelopathy was observed during follow-up periods.
**Conclusions:** SBRT with Cyberknife Xsight™ system provides a safe and effective treatment modality in spinal metastasis even after conventional radiotherapy.

**2012** POSTER

**A Quantification of Image Artefacts Arising From Prostate Fidicual Markers on 1.5 and 3T Diffusion-weighted MR Images**

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**Background:** Image visualization of prostate tumours utilizing diffusion-weighted imaging (DWI) has demonstrating promising results. However, the echo planar acquisition technique utilized in DWI is prone to susceptibility artefacts. This study has focused on evaluating the fiducial marker (FM) artefacts (FMAs) on DW images (DWIs).
**Material and Methods:** Two cylindrical gold FMs ($1\times3$ mm) were inserted into an Agar-gel phantom. Echo planar DW sequence images (1.5T/3T; TE: 82/79 ms, TR: 2500/3433 ms, acquired resolution: 2.19, 2.19/2.25, 2.32 mm/pxl, slice thickness: 5.5/5.5 mm) were obtained for b-values 0, 150, 600, 1000 s/$mm^2$ at both 1.5T and 3T. Furthermore, reference T1W images (1.5T/3T; TE: 15/76.19 ms, TR: 1020/600 ms, acquired resolution: 1.04, 1.04/1.00, 1.12 mm/pxl, slice thickness: 2.00/2.00 mm) were obtained with similar FOV and in same frame of reference. All images were acquired with the phantom, hence FMs, in three positions: with markers oriented with the long axis parallell to the longitudinal (pos. 1) and the lateral direction (pos. 2) and for markers rotated clockwise 45º relative to position 1 in the horizontal plane (pos. 3). The length and displacement of the center of gravity (CoG) of the segmented FMAs were measured in all three directions based on the intensity variations introduced by the FM image reconstruction. Finally, the similarity of the contoured FMA volumes in the DW- and T1W images were quantified with the Dice similarity coefficient (DSC).
**Results:** For all phantom orientations the mean length of the FMAs on DWIs were considerably increased in the phase-encoding (PE) direction (1.5T/3T; $1.7\pm0.5/1.3\pm0.1$ cm) in contrast to the orthogonal directions (1.5T/3T: $0.9\pm0.3/1.0\pm0.2$ cm). The mean CoG shift of the segmented FMAs in DW images relative to T1W was: 1.5T/3T; $0.3\pm0.1/0.5\pm0.3$ cm. The largest mean shift (8 mm) was obtained for DWIs with FMs positioned with the long axis orthogonal to the PE direction (3T). The results were consistent across all b-values investigated. The mean DSC value for the delineated FMA volumes in the two images sets were 21% (1.5T) and 5% (3T).
**Conclusions:** This study has shown that the length and shift of FMAs on DW images, relative to reference images increased in the PE direction. The larger shifts of FMAs were obtained for FMs oriented with the long axis orthogonal to the PE direction.

**2013** POSTER

**Is the Contouring of Regions of Interest on Cone-beam CT Performed During IGRT Reliable Enough for Adaptive Radiotherapy?**

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**Background:** To assess the interobserver variability for delineation on kV-cone beam CTs (CBCT) and the impact of the different delineations on dose.
**Material and Methods:** 5 prostate cancer (PC) and 5 head and neck (H&N) cancer patients were evaluated. All patients underwent image-guided radiotherapy (IGRT) by CBCT. Two radiation oncologists (Ro1; Ro2) delineated the regions of interest [ROI] (for PC: prostate [Pr], rectum [Rec] and bladder [Bld]; for the H&N: spinal cord [SC], the left and right parotid glands [PG]). The contouring was performed for each patient on the kV planning-CT (P-CT) and on two CBCTs (CBCT1 and CBCT2). For each patient an initial plan was calculated on the P-CT with (InPlanP-CT) and without heterogeneity correction (InPlanP-CThom). For the plans without heterogeneity correction all density values were equalized to water density values. The initial plan was copied on each CBCT and recalculation was performed again with (InPlanCBCT1 and InPlanCBCT2, respectively) and without heterogeneity correction (InPlanCBCT1hom and InPlanCBCT2hom, respectively). We assessed the volume of the ROIs and the Dmean, except for the SC for which we analyzed the Dmax for each of the plans above (normalized to the prescribed dose).
**Results:** The median differences in volume in $cm^3$ between Ro1 and Ro2 were for the P-CT/CBCT1/CBCT2: Pr $5\pm3.4/10.2\pm3.0/5.5\pm2.2$, Rec $40.5\pm15.9/25.7\pm17.2/25.7\pm12.1$, Bld $20.6\pm13.0/21.5\pm22.1/22.5\pm28.1$; leftPG $4.9\pm4.3/9.8\pm5.6/7.4\pm7.0$, rightPG $7.2\pm3.7/10.8\pm5.3/8.5\pm11.2$.
The differences in dose between the plans with and without heterogeneity correction when the same structure set (belonging either to Ro1 or to Ro2) was analyzed were on average of $1.1\%\pm1.2$.
However, the differences between the doses to the ROIs with different structure sets for the same plan (structure set of Ro1 and of Ro2) were significant: on average $3.2\%\pm4.0$ for the plans with and $3.2\%\pm4.1$ for the plans without heterogeneity correction. The largest interobserver dose differences were noticed for Rec and for PGs (dose differences between Ro1 and Ro2 for InPlanP-CT:Rec $6.2\%\pm7.3$, leftPG $2.8\%\pm2.7$, rightPG $3.2\%\pm1.9$; InPlanCBCT1:Rec $5.3\%\pm6.3$, leftPG $4.2\%\pm2.9$, rightPG $3.6\%\pm3.4$; InPlanCBCT2:Rec $3.0\%\pm3.1$, leftPG $6.4\%\pm4.9$, rightPG $10.2\%\pm6.0$).
**Conclusions:** The interobserver variability in contouring on the P-CT or on CBCT seems to be similar, slightly higher for CBCT. Differences in dose to the ROIs are influenced mostly by the contouring variability and less by the heterogeneity of the CT. A CBCT can be used to roughly assess the delivered dose during fractionated radiotherapy; for replanning however we recommend the performing of a new kVCT.

**2014** POSTER

**CT-MR Image Registration and Fusion in Radiotherapy Target Volume Definition − Institutional Experience**

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**Background:** Development of imaging techniques, namely computed tomography (CT) and magnetic resonance imaging (MR), made great impact on radiotherapy treatment planning by improving the localization of target volumes. Improved localization allows better local control of tumour volumes, but also minimizes geographical misses. Mutual information is obtained by registration and fusion of images, and it can be achieved manually or automatically, or by combination of these two techniques. The