Results: Outcome data was available for 10 patients. Local Control rate was 100%. 4 patients (40%) progressed distantly, 2 in the IMC Node group, and 2 in the Sternal group. One of the patients that progressed distantly in the Sternal group had distant disease at the time of CyberKnife. Of those that progressed distantly, 75% had received chemotherapy as their first treatment at the time of Sternal/IMC node recurrence. Median Disease-Free Interval (DFI) in progressing patients was 1.9 years (Range 1-11 yrs), and the compared to a DFI in non-progressors of 3 years (Range 1-13 yrs). Median Progression-Free Survival for the IMC node group, Sternal group, and Cohort as a whole were 6, 2 and 4 months respectively. The follow-up data was, however, less mature for the Sternal group. Overall Survival (OS) rate was 90%. The patient that died was had Sternal recurrence patient with small lung metastases at the time of CyberKnife treatment. She died of lepto-meningeal disease. Median OS for IMC node group, Sternal group and Cohort as a whole were 16, 2 and 6 months respectively. However, follow-up data is less mature for the Sternal group. Treatment was well tolerated with only 25% of the group respectively. However, follow-up data is less mature for the Sternal group. Overall Survival (OS) rate were 6, 2 and 4 months respectively. The follow-up data was, however, less mature for the Sternal group. Overall Survival (OS) rate was 90%. The patient that died was had Sternal recurrence patient with small lung metastases at the time of CyberKnife treatment. She died of lepto-meningeal disease. Median OS for IMC node group, Sternal group and Cohort as a whole were 16, 2 and 6 months respectively. However, follow-up data is less mature for the Sternal group. Treatment was well tolerated with only 25% of the group experiencing acute toxicity (G1). Only 1 patient experienced Late toxicity (fleeting G3 symptoms), the patient had received prior radiotherapy.

Conclusions: SBRT is a feasible treatment approach for patients with Sternal/IMC nodal recurrence of Breast Cancer. The technique is well tolerated, even in those who have received prior Radiotherapy. The outcome data is still immature, but the early Local Control rates (100%), and Overall Survival rates (90%) at a Median follow-up of 11 months are encouraging.

**POSTER: CLINICAL TRACK: TARGET AND VOLUME DEFINITION AND IMAGING**

**PO-0752**

Reliability and feasibility of automatic segmentation in rectal cancer: a perspective study.

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Purpose/Objective: The use of autosegmentation computed systems in clinical setting for locally advanced rectal cancer is time sparing with an acceptable Dice Coefficient for CTV, Mean Dice Coefficient (MDC) of 0.70, while it does not reach an adequate value for small nodal subvolumes (MDC<0.67) (1). In this phase II study the objective is to verify in clinical setting the time sparing and the Dice Coefficient in bigger volumes (CTV and grouped nodal subvolumes) in locally advanced rectal cancer using the Smart Segmentation Knowledge Based Contouring (SS-KBC®) research program.


Materials and Methods: 29 consecutive patients were selected between June and September 2012; images of 14 patients as atlas, 15 for validation. To test the reliability of the system for bigger volumes, the nodal subvolumes were grouped according to clinical stage and site of the tumor (tab1). According to our ongoing QA program two operators were involved: a Delineator and a Reviewer. CTV and pelvic grouped nodal subvolumes were contoured by Delineator In 2 different sequences (A-manual vs B-autosegmentation) of contouring using the same planning CT; all of them underwent to Independent Check by Reviewer. To improve the reliability of the system many anthropometric characteristics where analyzed (including BMI, sex, age, fertility status, sacro-coccygeal distance and the most anterior distance between upper iliac crests). The analysis was conducted to test the reliability of the system using Dice Coefficient and the total time spared by the Delineator to complete the 2 different sequences.

Results: In clinical practice the time spared by operator 1 to complete sequence A and B was of 14min vs 1min respectively; there was a statistically significant better MDC in favor of sequence A vs sequence B. CTV: sequence A (MDC=0.86) vs sequence B (MDC=0.78), p=0.001 (fig.1)

-Subvolume 1: sequence A (MDC=0.86) vs sequence B (MDC=0.77), p=0.001

-Subvolume 2a: sequence A (MDC=0.76) vs sequence B (MDC=0.66), p=0.001
PO-0754

Stereotactic radiotherapy of liver metastases: 4DCT treatment planning and MRI follow-up on normal tissue response

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Purpose/Objective: SBRT is increasingly considered an alternative to surgical resection of liver metastasis or liver related cancers. Our clinical workflow consists of precise target localization; analysis of tumor motion due to respiration; highly conformal dose distribution; and image-guidance at the time of dose delivery. Tumor and normal tissue response is monitored through morphological changes by MRI. Quantitative in vivo data of the hepatic tolerance to irradiation is very limited. However, such knowledge is essential for the treatment strategy in patients with multiple or large tumors or in situations with a small parenchymal reserve after liver resection. In a feasibility study for further healthy liver sparing, four consecutive patients with liver lesions were retrospectively evaluated.

Materials and Methods: Clinical cases consist of (1) solitary metastases/breast cancer; (2) four metastases/cholangiocellular carcinoma; (3) R1-resected gallbladder cancer; (4) multiple metastasis/bladder cancer. For all patients a 4D-CT scan was performed. GTV contours of the single calculated respiratory phases (10 in total) were transferred to the average CT of the 4D-CT data to generate the ITV. Highly conformal dose coverage was achieved by using Varian VMAT using 6 MV photons. Dose prescription ranged from 5 x 7 Gy (60% isodose surrounding the PTV) to 25 x 1.8 Gy (ICRU). MRI was carried out before and 6 weeks/3 month after therapy. MRI-sequences were conducted with T1-w GRE enhanced by hepatocyte targeted Gd-EOB-DTPA. MRI data sets were merged with the planning CT including the dose distribution. Reviewers indicated the border of hypointensity on T1-w images (loss of hepatocyte function) or hyperintensity on T2-w images (edema). The potential of healthy liver sparing was estimated by the threshold dose for these morphological changes.

Results: Analysis of the 4D-CT data resulted in a mean target motion from 5 to 9 mm in magnitude. Kilo-voltage CBCT scans were created before each fraction to verify and adjust the target localization. Image fusion of the average treatment planning CT and kV-CBCT scans resulted in patient repositioning in a maximum of 6 mm magnitude per fraction. The dose to the liver was within accepted guidelines (700 ml healthy liver receiving less than 15 Gy). The minimum dose resulting in visible signal intensity changes (edema/loss of hepatocyte function) or hyperintensity on T2-w images was detected approximately 20 Gy inducing focal loss of liver function. Furthermore, a preliminary retrospective evaluation, a threshold dose of 20 Gy inducing focal loss of liver function was detected after 4 weeks by MRI. Further investigation is warranted to assess the correlation between morphological changes in the mean dose exposure to the liver and clinical outcome.

Conclusions: In SBRT of liver metastases, 4D-CT data is required for target motion management and treatment planning. In this preliminary retrospective evaluation, a threshold dose of approximately 20 Gy inducing focal loss of liver function was detected after 4 weeks by MRI. Further investigation is warranted to assess the correlation between morphological changes in the mean dose exposure to the liver and clinical outcome.