Conclusion: We documented eye motion well below the applied safety margins. Future activities will focus on quantifying the effect of intrafraction eye motion on dose deposition.

EP-1766
Factors influencing on intrafraction variation in lung Stereotactic Body Radiation Therapy
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Purpose or Objective: In the present study we compare three different treatment-delivery techniques in terms of treatment time (TT) and its relation with intrafraction variation (IFV). Besides that, we analyzed different clinical factors that could influence on the IFV. Finally we appreciated the soundness of our margins.

Material and Methods: Patients diagnosed of stage I lung cancer and lung metastases up to 5cm treated with SBRT in our centre were included in this study. All patients went through a 4DCT scan to create an internal target volume (ITV) and a 5mm margin was added to it to create a PTV. Each patient had a pretreatment Cone Beam CT (CBCT) and a posttreatment CBCT. We compared the CBCTs with their reference 4D-CT to quantify the translational tumor shifts as well as the 3D composite vector. For our patients three different treatment-delivery techniques were employed: fixed fields (FF), arcs dynamically collimated (AA) or a combination of both (FA). We studied if TT was different among these ways of treatment and we search if there were any correlation between TT and IFV. We analyzed the influence of patients’ clinical characteristics (age, sex, performance status, pulmonary function, treatment time) and tumours’ characteristics (location, nature, size) on IFV.

Results: A total of 45 patients with 52 lesions were studied from which 147 fractions could be analyzed. Mean IFV for x, y and z axis were 1 ± 1.16mm, 1.29 ± 1.38mm and 1.17 ± 1.08mm, respectively. 96.1% of the displacements were encompassed by the 5mm margin given. TT was significantly longer in FF therapy (24.76±5.4 min), when compare with AA (15.30±3.68 min) or FA (17.79±3.52 min) (p<0.001). Despite that, IFV did not change significantly between the three groups (p=0.471). Age (p=0.003) and left vs. right location (p=0.005) were related with 3D shift ≥ 2mm. The multivariate analysis showed that only age significantly influenced on IFV (OR=1.07, p=0.007).

Conclusion: The election of AA, FF or FA does not impact in the IFV although FF treatments take significantly more time. Our 5 mm margin can be considered acceptable as it accounts for more than 95% of tumor shifts. Age is the only clinical factor that influence significantly on the IFV in our analysis.

EP-1767
Deep Inspiration Breath Hold - a promising technique in patients with left-sided breast cancer.
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Purpose or Objective: Clinical data suggest that every 1 Gy of the mean dose to the heart increases the risk of major coronary events by approximately 3% and the risk of coronary arteries damage by approximately 7%. The literature data show that the radiation dose delivered to the heart can be reduced by applying the Deep Inspiration Breath Hold (DIBH) technique. The aim of this study was to evaluate dose delivered to the heart and coronary arteries for a group of patients after breast conserving surgery (BCS) irradiated with 3D-CRT-SIB (3D Conformal Radiotherapy Simultaneous-Integrated Boost).

Material and Methods: For 10 left-sided breast cancer patients, computed tomography-based treatment planning were performed at FB (Free Breathing) and DIBH mode. The CTV (Clinical Target Volume) covering the whole left breast and the post-lumpectomy tumor bed (boost). Important organs at risk (heart, territory of coronary arteries and lungs) were delineated. To form the PTV (Planning Target Volume) from CTV, the margin of 6 mm was added. For both DIBH and FB, treatment plans were prepared by medical physicist. The prescribed doses were 54 Gy (2.7Gy/fraction) to PTV boost and 45 Gy (2.25 Gy/fraction) to PTV breast. The mean dose
delivered to the heart and the volume of heart receiving the dose of 20 Gy or more were evaluated. Volume of the territory of the coronary arteries receiving the dose of 20 Gy or more was also assessed. All 10 patients were treated with the DIBH technique.

Results: DIBH compared to FB reduced the mean dose delivered to the heart (average 4.4 Gy vs. 2.1 Gy). The heart volume receiving the dose of 20 Gy or more was reduced to almost zero (average 0.1% vs. 6%). DIBH allowed to diminish to zero the volume of coronary arteries receiving 20 Gy or more (average of 0% vs. 16.9%). The early treatment tolerance was good - no toxicity higher than Grade 1 skin toxicity according to RTOG Acute Radiation Morbidity Scoring Criteria was observed.

Conclusion: DIBH technique reduces the dose delivered to the heart in comparison to FB, thus it may reduce the late cardiotoxicity of radiotherapy. In each patient with the left breast cancer qualified to postoperative radiotherapy, the DIBH technique should be taken into consideration.

EP-1768
The impact of interplay effect in SBRT lung treatments for 6 MV and 6 MV-FFF beams using EBT3 film.

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Purpose or Objective: In hypofractionated stereotactic body radiotherapy (SBRT) for lung tumors, the interplay effect between tumor respiratory motion and multileaf collimator (MLC) motion can play an important role in dynamic plans. This study was designed to investigate the interplay effect for Rapidarc (RA) SBRT lung treatments, using GafChromic EBT3 film and a respiratory motion phantom.

Material and Methods: A heterogeneous programmable respiratory motion phantom (Quasar, Modus Medical Devices Inc.), with a “tumor” (30 mm diameter) inside a cylindrical “lung” insert, was used to simulate a breathing motion in the superior/inferior direction. Two amplitudes (10 mm, 20 mm) and two breath rates (BRs) (period: 6 s, 4 s) were investigated. RA plans were created, based on the 4D CT scans of the phantom, one for each amplitude and beam quality investigated a) 6 MV (600 MU/min) and b) 6 MV-flattening filter free (FFF) (1400 MU/min). All plans were optimized to keep the MLC modulation about 200 MU/Gy. The internal target volume (ITV) was prescribed a fractionation dose of 22.5 Gy, where the planning target volume (5 mm margin to ITV) was covered by 67%. Each plan consisted of four half arcs, each measured individually. Measurements were carried out both in static condition and with motion for the two BRs. GafChromic EBT3 film were placed centrally in the treatment field is irradiated.

Results: All static measurements were in good agreement with the calculated dose, with a mean local gamma (LG) passing rate (3%/2 mm) above 96.8% (±0.9%) for all fields. With 10 mm motion, the mean LG passing rate (3%/2 mm) for all fields in one plan was, with period 6 s: 88.4% (±2.4) for 6 MV and 82% (±3.5) for 6 MV-FFF, and with period 4 s: 78% (±12.6) for 6 MV and 73.9% (±7.1) for 6 MV-FFF. Worst case observed was with 20 mm motion, period 4 s and 6 MV-FFF, with a mean LG passing rate (3%/2 mm) of 50.7% (±15.2). Only the 6 MV plan with amplitude 10 mm and period 6 s passed a typical clinical acceptance criterion of 90% using 3%/3 mm LG passing rate.

Conclusion: The impact of interplay effect was highest for the largest motion amplitude (20 mm), fastest BR (4 s) and for the shortest delivery time (6 MV-FFF beam). Although the results illustrate LG per field, the motion blurring may become dosimetrically significant when the fields are summarized, particularly for motions above 10 mm.