PO-0690
Patient weight loss predicts worse overall survival for stage I lung cancer treated with SABR
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Purpose or Objective: As per published guidelines, SABR is the recommended curative treatment option for those stage I non-small cell lung cancer patients (NSCLC) who either cannot or will not have surgery. This study investigates whether patient reported weight loss at presentation is a prognostic factor in a retrospective cohort of biopsy-proven stage I NSCLC patients who received SABR at one institution.

Material and Methods: Between January 2009 and December 2013, 314 consecutive patients with histologically proven T1 or T2A N0 NSCLC treated with SABR were entered in a research ethics board approved database. All patients were reviewed for potential surgical resection by a thoracic surgeon and all had FDG-PET/CT staging. Overall survival (OS) by weight loss was evaluated by Kaplan-Meier and log-rank test. Univariate and multivariate analysis of weight loss was performed using a Cox proportional hazard model; adjustment of potential confounders included age, gender, performance status, histology, T-stage, tumor location, SUV max, smoking status and Charlson Comorbidity Index (CCI). The injectable marker is based on three components; sucrose acetate isobutyrate (SAIB), x-ray SAIB (electron dense SAIB acetate isobutyrate) and marker injection was done by experienced pulmonologists as an outpatient procedure. Standard EUS and EBUS equipment was used for injection. Marker injection was done as an alternative to solid metal fiducial markers, providing a simpler injection procedure and potentially lowering the risk of complications/displacement/marker loss while remaining visible on ultrasound, 2D KV X-ray/CT and MRI images. In this study, we investigated the safety and feasibility of endoscopic (bronchial) ultrasound (EUS/EBUS) guided injection of the liquid gel fiducial marker (BioMark®) as a candidate for use in image guided radiotherapy (IGRT). The injectable marker is based on three components; sucrose acetate isobutyrate (SAIB), x-ray SAIB (electron dense SAIB analogue) and ethanol. After injection, the liquid gel matrix rapidly increases viscosity forming a rigid hydrophobic gel, with minimal degradation over months (animal studies). The marker was developed as an alternative to solid metal fiducial markers, simplifying the injection procedure and potentially reducing the risk of complications/displacement/marker loss while maintaining visibility on ultrasound, 2D KV X-ray/CT and MRI images. In this study, we investigated the safety and feasibility of endoscopic (bronchial) ultrasound (EUS/EBUS) guided injection of the liquid gel fiducial marker into patients with stage III non-small cell lung cancer (NSCLC), and the visibility of the marker throughout the radiotherapy (RT) course.

Conclusion: Although a substantial proportion of moderately central SABR patients received ≥60 Gy to OARs, the 3-year survival was similar to patients with peripheral tumors. OARs tolerance doses continue to be refined and patients should be informed of the potential risks and benefits of central lung SABR. In the meantime, it appears reasonable to limit Dmax in OARs (including inside PTV) and lung doses (e.g. V5), using IMRT/VMAT. It is finally important to note that the outcomes in the present analysis should not be extrapolated to very central tumors, where the toxicity risks may be higher.

PO-0692
A novel endoscopically injected liquid-gel marker for image guided radiotherapy of thoracic tumours
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Purpose or Objective: A novel liquid gel fiducial marker (BioMark®) was developed for use in image guided radiotherapy (IGRT). The injectable marker is based on three components; sucrose acetate isobutyrate (SAIB), x-ray SAIB (electron dense SAIB analogue) and ethanol. After injection, the liquid gel matrix rapidly increases viscosity forming a rigid hydrophobic gel, with minimal degradation over months (animal studies). The marker was developed as an alternative to solid metal fiducial markers, simplifying the injection procedure and potentially lowering the risk of complications/displacement/marker loss while remaining visible on ultrasound, 2D KV X-ray/CT and MRI images.
injection was monitored on real-time ultrasound using the probe on the endoscope. Patients were monitored for two hours before discharge.

Daily cone beam CT (CBCT) images and 2D kV fluoroscopy (FS) images at fractions 2, 16 and 30 were acquired for setup and evaluation of marker visibility.

Safety visits were planned twice during the RT course.

Results: 15 patients were included. A total of 35 markers were injected, 1-3 markers per patient, 0.10-0.30 mL per injection.

The marker injections were performed 9-27 days before start of RT.

No pneumothorax, haemorrhage or other serious complications to the marker injection were observed during or after the procedure.

29 of 35 placed markers were available for evaluation; 2 markers disappeared and one dispersed into a tumour cavity. Another three markers were injected in two patients who subsequently did not receive RT; one patient died (not related to the marker) and one patient developed metastatic disease prior to start of RT.

All 29 examined markers remained stable in position relative to original injection site (based on visual assessment) and one marker showed change in size (26%).

Conclusion: The liquid fiducial marker is a safe and clinically useful alternative to solid metal fiducial markers for IGRT of patients with NSCLC and may also be a good alternative for use in IGRT of other solid tumours.

PO-0693
Primary tumor response of locally advanced NSCLC in PET/CTs during radiochemotherapy

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Purpose or Objective: Standard of care for patients with inoperable, locally advanced non-small-cell lung cancer (NSCLC) consists in combined radiochemotherapy (RCT) with curative intent. Ideally, radiotherapy planning will be performed based on F18-FDG-PET/CT. Additionally, there is great interest in using the biological signal from PET/CT for assessment of treatment response and outcome prediction. Hypothetically, PET/CT may serve as basis for treatment modification such as dose escalation of radiotherapy for poor responders to RCT. The objective of the presented work was the evaluation of the early primary tumor (PT) response during RCT by means of response (R)-PET/CTs during and shortly after radiotherapy and its correlation with survival.

Material and Methods: Between 2011 - 2015, 39 patients with locally advanced NSCLC undergoing conventionally fractionated (2 Gy/day) RCT were prospectively scheduled for three whole-body PET/CT-scans (a radiotherapy planning (RP) PET/CT, a first response PET/CT (1R-PET/CT) 2 weeks after start of RCT and a second response PET/CT (2R-PET/CT) within one week after end of RCT. FDG-uptake of the PT was measured semiquantitatively by means of the maximum standardized uptake value (SUVmax). SUVmax measurements were compared using PERCIST 1.0 criteria. Here, a response to treatment is defined by a decline of SUVmax of at least 30% (partial metabolic response, PMR).

Results: 39 patients (33% female, 67% male) with a NSCLC (59% SCC, 31% adenocarcinoma and 10% other NSCLC) in UICC-stage I-II (14%), IIIa (51%) und IIIB (44%) received an average total dose of median 68 (58-76) Gy during a median duration of 49 (39-66) irradiation days. Median GTV size was 58 (15-923) ml. SUVmax was median 14 (5.5-28.3) in the RP-PET/CT median 15 (2-37) days before start of irradiation. 33 patients had a 1R-PET/CT median 15 (13-29) days after start of irradiation and at median 22 (16-40) Gy, with a SUVmax of median 10.5 (3.4-23.7). 36 patients had a 2R-PET/CT median 4.5 (4 days before, 15) days after end of irradiation, with a SUVmax of median 5.45 (1.4-14.3). A PMR was seen in 14/33 (42%) patients in the 1R-PET/CT (PMR1) (compared to the RP-PET/CT), and in 22/30 (73%) patients in the 2R-PET/CT (PMR2) (compared to the 1R-PET/CT). 9/29 (31%) patients reached both a PMR1 and a PMR2 (double PMR), none of these patients experienced a PT-progression during a median follow up of 18 (1.4-53) months after end of irradiation. The 2-year overall survival rate was 75% as opposed to 54% without a double PMR.

Conclusion: These preliminary data imply that a double PMR measured in response PET/CTs scheduled during and at the end of RCT for NSCLC is associated with a prolonged overall survival rate.

PO-0694
Lung toxicity modelling in thoracic post-operative RT for NSCLC and pleural mesothelioma

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Purpose or Objective: Our hypothesis is that NSCLC patients and malignant pleural mesothelioma (MPM) patients treated with thoracic post-operative RT (PORT) are more prone to develop lung toxicity compared to non-surgical NSCLC RT patients. Main objectives are: 1) To quantify the differences in terms of CT lung density changes after PORT for NSCLC and MPM vs. non-surgical RT patients; and 2) To evaluate the correlation between CT lung density changes, dosimetric factors and clinical symptoms (dyspnea).

Material and Methods: Two groups of patients were analyzed: a) SURGICAL GROUP (n=27): stage I-III resectable MPM treated with extrapleural pneumonectomy (EPP) and PORT (n=22) and stage I-III NSCLC treated with pneumonectomy and PORT (n=5); b) NON-SURGICAL GROUP (n=35): stage I-IV NSCLC treated with chemo-radiotherapy.