Follow up was with CXR at 6 months followed by CT at 6 months and clinical follow up, 3 monthly.

Results: 167 patients with stage Ia-Iib disease treated. 55% histologically proven. There were 4 (2.4%) radiotherapeutically confirmed local recurrences giving a local control rate of 97.6%. Median survival was 43.2 months. 3 year Overall Survival was 56.4% (see Fig 1). Treatment was well tolerated with minimal G3 toxicity (5 patients).

Conclusion: Our results suggest that SABR for medically inoperable NSCLC can be safely and effectively implemented in a non-academic institution with appropriate equipment and training. Clinical outcomes are comparable with internationally published series [3], with encouraging 3yr OS rate of 56%. Toxicity is minimal. Longer term follow up is required to confirm findings and provide data regarding long term toxicity.

References:

EP-1213
Changes in pulmonary function after single-fraction carbon-ion radiotherapy for stage I NSCLC
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Purpose or Objective: In patients with inoperable stage I non-small cell lung cancer (NSCLC) or for those refusing surgery, stereotactic body radiotherapy and particle radiotherapy have become therapeutic options. We conducted a Phase I/II study on single-fraction carbon-ion radiotherapy (SF-CIRT) for stage I NSCLC that yielded a 3-year survival rate of 75.5% for 218 patients. Until now, the effect of hypofractionated CIRT on pulmonary function (PF) has not been well documented. The purpose of this study was to assess the long-term impact of SF-CIRT on PF in stage I NSCLC patients.

Material and Methods: A review of prospectively collected data from SF-CIRT-treated patients was performed. Patients underwent PF tests (PFT) (or: underwent a PF test) immediately before, and at 6, 12, and 24 months after irradiation. Patients who relapsed or needed adjuvant treatment were excluded as these events might affect PF.

Results:

<table>
<thead>
<tr>
<th>Patient characteristics (n = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median age</strong></td>
</tr>
<tr>
<td><strong>Male/Female</strong></td>
</tr>
<tr>
<td><strong>Stage</strong></td>
</tr>
<tr>
<td>T1 (2A)/T2 (1B)</td>
</tr>
<tr>
<td><strong>Histology</strong></td>
</tr>
<tr>
<td>Adeno/Squamous/NSCLC</td>
</tr>
<tr>
<td><strong>Location</strong></td>
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<tr>
<td>Left upper/Lower</td>
</tr>
<tr>
<td>Right upper/Middle/Lower</td>
</tr>
<tr>
<td><strong>Medical inoperability</strong></td>
</tr>
<tr>
<td>19 (47.5%)</td>
</tr>
<tr>
<td><strong>COPD</strong></td>
</tr>
</tbody>
</table>

*PFV/FVC ratio < 70%*

Forty patients treated between 2007 and 2012 fulfilled the inclusion criteria. According to the dose escalation study protocol, a median prescribed single-fraction dose of 46 GyE (range, 44-50 GyE) was delivered. All treatment-related complications were self-limited, without any grade 3-5 toxicities. Two years post-CIRT, the mean values of forced expiratory volume in 1 sec (FEV1) [8.4% ± 11.9% (p < 0.001)] and the FEV1 per unit of forced vital capacity (FEV1/FVC) [-8.9% ± 11.7% (p < 0.001)] were less than the pre-CIRT values. There were no significant overall changes in total lung capacity, vital capacity, FVC, and residual volume before SF-CIRT and 2 years after SF-CIRT. At 6 months post-treatment, the diffusion capacity of the lung for carbon monoxide (DLCO) was significantly less than the pretreatment value (86.7 ± 32.7% vs. 78.1 ± 31.1%; p = 0.002); however, at 24 months post-treatment, the mean DLCO recovered to pretreatment levels (86.9 ± 30.5%). This might have been due to recovery from non-symptomatic radiation pneumonitis and/or smoking cessation.

Conclusion: We found stage I NSCLC patients had good long-term preservation of PF after SF-CIRT. Follow-up PFT revealed the following: Declines in FEV1 and FEV1/FVC were statistically significant but clinically trivial, DLCO decreased temporary, thereafter it tended to recover to pretreatment levels within 2 years.

EP-1214
Radiotherapy as adjuvant or definitive treatment method in thymic tumours
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Purpose or Objective: An evaluation of thymic tumours patient radiotherapy results.

Material and Methods: 93 patients (54F [58%], 39M [42%]) aged from 3 (6 children) to 77 (median 48) treated for thymic tumors since 1981. 84 patients (90%) were diagnosed with thymoma, 9 (10%) with thymic carcinoma. Masaoka stage was assessed in 93% (56% stage II, 31%-III, 6% - IV). All patients were irradiated. In 76 cases radiotherapy (RT) followed surgery in 41 patients after radical and in 35 after incomplete resection. In 17 cases RT was definitive treatment, combined in 14 patients with chemotherapy. Patients were irradiated with fraction dose of 1.1-4.0Gy (median 2.0) to the total dose of 20-68Gy (median 49.5). Patient- and treatment-related factors potentially affecting survival and local control (LC) were evaluated with log-rank test. Survival analysis was performed with Kaplan-Meier method.

Results: Tumors relapsed in 17 patients. Metastases occurred after 6-129 months (median 10.1) in 12 patients (in 8 in lungs). During the follow-up 17 patients died due to progression (13) or recurrence (4) of the disease. Median overall survival (OS) in the whole group (since diagnosis) was 140.2 months. OS was significantly longer in patients with WHO B1 type (p=0.02), in good performance status (PS) (p=0.0005), without radiation-induced pulmonary fibrosis (p=0.02) or second cancer (p=0.03). Difference in OS between patients treated with radical surgery+RT, non-radical surgery+RT and definitive RT was of borderline significance (p=0.065). Factors significantly decreasing LC were: male sex (p=0.04), WHO B2 type (p=0.01), bad PS (p=0.0007), presence of metastases (p=0.03) and second cancer (p=0.03).
Conclusion: Obtained results do not permit to form robust conclusion concerning role of RT in the management of thymic tumors patient. Besides clear, unquestionable bad prognostic factors as bad PS, low differentiation, presence of local relapse, lung fibrosis, second malignancy or distant metastases, we found only one more - male sex, decreasing LC.

EP-1215
Do higher doses of palliative radiotherapy still prolong survival in stage III/IV NSCLC?
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Purpose or Objective: In a UK Medical Research Council trial carried out before the widespread use of chemotherapy or CT-PET, palliative thoracic radiotherapy delivering 39 Gy in 13 daily fractions conferred an overall survival (OS) benefit when compared to 17 Gy in 2 weekly fractions in good performance status patients with radically treatable NSCLC. To determine whether this benefit persisted with contemporary standards of staging and systemic therapy, we studied the outcomes of patients with locally advanced/metastatic NSCLC receiving palliative radiotherapy in our centre over a 2 year period.

Material and Methods: The case records of 176 patients who received palliative thoracic radiotherapy in 2011 or 2012 were reviewed retrospectively. Data collected included age, stage, performance status, dose/fractionation, additional treatments and survival.

Results: 36 patients received high dose thoracic radiotherapy (HDRTT, 36-40 Gy in 12-15 fractions) and 140 received a lower dose (LDTRT), 20 Gy in 5 fractions. Median OS in the HDTRT group was 8.5 months and 5.5 months in the LDTRT group (hazard ratio 0.6, p <0.01). 12 patients received chemotherapy and HDTRT with median OS 12 months (thereafter annually). Using a chest CT scan radiological aspects according to Huang et al. classification (Huang et al., Radiother Oncol 2013;109:51-57) were evaluated. 18% FDG-PET was used in case of suspected tumor recurrence.

Results: Forty-five patients were included, 34 males and 11 females; mean age was 75.7 years (range, 60-86 years); 77.8% of patients had stage IA disease and 22.2% stage IB with a mean follow-up of 21 months, local control was 69%. Benign acute CT changes (up to 6 months after SBRT) were observed in 34 patients (patchy consolidation was the most frequent) and late changes (after 6 months) in 44 patients (mass-like fibrosis was the most frequent). HRFs were identified in 20 patients, enlarging opacity at primary site in 9 patients, enlargement after 12 months in 20 patients, bulging margin in 7 patients, disappearance of linear margin in 2 patients, loss of air bronchogram in 18 patients and cranial-caudal growth in 15 patients. These HRFs were individually significantly associated with local recurrence of the disease. The better predictor of relapse was enlargement opacity at 12 months (p <0.001) with SE: 84.6% and SP: 71.8%. The presence of > 1 HRFs demonstrated a higher survival (93.3%) (p <0.02) with SP: 59.4%.

Conclusion: Detection of HRFs is predictive of relapse with a SE increasing with the number of observed HRFs. This observation allows to better define the diagnostic algorithm in follow-up, suggesting to perform further exams only in patients with > 1 HRFs.

EP-1217
Effect of overall treatment time in dose escalation for radiotherapy of NSCLC. BED-time analysis
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Purpose or Objective: Because there is a positive correlation between radiation dose and local control (LC) in non-small cell lung cancer (NSCLC) although with no impact on overall survival (OS) our institutional protocol allowed moderate radiotherapy dose escalation up to 70 - 74 Gy (BED: 84 - 88.8 Gy) on the standard 60-66 Gy (BED: 72 - 79.2 Gy) providing that organs-at-risk are keep in tolerance. This retrospective study aims to assess the impact of dose escalation in clinical outcome when the duration of radiotherapy is taken in to account through the use of BED model corrected by time (tBED)

Material and Methods: 78 consecutively patients with unseetable NSCLC were retrospectively analyzed. All were PET-CT staged and were treated with platinum-based chemotherapy (either concomitant or sequential) and 3D-CRT. Two groups were compared according to prescribed dose level: Standard Dose Group (SD) n = 38 those receiving nominal prescribed BEDs 79.2 Gy and Escalated Dose Group (ED) n = 40 those receiving > nominal prescribed BED >79.2 Gy. For both groups actual administered dose corrected for the duration of treatment (tBED) was calculated using the formula tBED (GY) = n d (1+ d/ a/b) - KT (Sinclair, IJROBP 1999. 44:381) Multivariate Cox regression analysis was performed to identify significant predictors of OS, Disease Free Survival (DFS) and Thoricic Progression Free Survival (TPFS). For purposes of comparison a nominal prescribed dose of 60 Gy @2Gy in 39 days have a tBED = 44, 7 Gy.