Transient problems mainly occurred after high dose to the laryngeal and lower pharyngeal regions, combined with moderate dose to the upper pharyngeal region. The progressive pattern was mainly seen after moderate dose to the upper pharyngeal region.

**Conclusions:** After definitive RT or CRT, five different patterns of swallowing dysfunction can be identified over time. This could reflect different underlying radiobiological mechanisms of radiation-induced damage and recovery. These results may improve identifying patients who are at the highest risk for developing severe persistent swallowing problems and who may benefit most from different preventive measures, such as swallowing sparing IMRT.

**PO-0649**

Total mucosal irradiation for head and neck cancer of unknown primary: a combined analysis of 2 prospective studies


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**Purpose/Objective:** Head and neck carcinoma of unknown primary (HNCUP) metastatic to cervical lymph nodes (LNs) constitutes about 2% of all head and neck carcinomas. There is no consensus on a standard radiotherapy clinical target volume (CTV) (ipsilateral neck only vs bilateral neck and mucosal tube) or dose to the CTV (50-70Gy). The aim of this combined analysis was to assess the safety and feasibility of total mucosal and bilateral neck intensity modulated radiotherapy (TM-IMRT).

**Materials and Methods:** We performed a combined analysis of 2 single arm, phase 2 prospective trials (CCR2823 and CCR3301). All patients (pts) had PET-CT or CT staging, pan-endoscopy and tonsillectomy or biopsy to exclude an occult primary. Patients with stage T0, N1-3, M0 (AJCC TNM 2002) disease were treated using a 5- to 7-field IMRT technique. CTV1 was the ipsilateral level 1b-5 and retropharyngeal (RP) LNs. CTV2 was the mucosa of nasopharynx, oropharynx, larynx, hypopharynx and contralateral cervical level 2 to 5 LNs. CTV2 was the mucosa of nasopharynx, oropharynx, larynx, hypopharynx and contralateral cervical level 2 to 5 and RP LNs. Prescribed doses to PTV1 and PTV2 in 30 fractions were 60-65 Gy (depending on resection status R0 - 60Gy, R1/R2 - 65 GY) and 54 Gy, respectively. No prophylactic enteric feeding tubes were inserted.

**Results:** Thirty-six pts (53% male) with HNCUP, median age of 54.2 years (range 43-86.9 years), were treated between July 2007 and December 2012. Histology was squamous cell carcinoma (SCC) in 35 pts or undifferentiated carcinoma nasopharyngeal type in 1 pt. Twenty-five (69%) pts were p16-positive (surrogate for HPV) and 18 (50%) pts had a ≥10 pack year smoking history. Eighteen (50%) pts received chemoradiotherapy with concomitant platinum and 18 (50%) pts radiotherapy (RT) alone. The median treatment time was 41 days (range 39-46 days). All pts received the prescribed dose with no clinically significant delays. The 2 year locoregional control rate was 89.8% (95% CI, 78.4-100). The 2 year primary mucosal and local nodal control rates were 97.1% (95% CI, 91.4-100) and 89.8% (95% CI, 78.4-100) respectively. One mucosal primary (oropharynx) was detected 7.3 months (m) after RT and 2 patients died from recurrent metastatic SCC at 5.7m and 16.4m after RT. Twelve pts (33%) had acute (<3m after RT) grade 3 (LENT-SOMA) dysphagia. The 1 year enteric tube feeding rate was 1 of 36 (2.7%) pts. Rates of high grade, subjective xerostomia (LENT-SOMA, ≥grade 2) at 12m and 24m after RT were 17% and 15% respectively.

**Conclusions:** At a median follow up of 33.5 months the use of TM-IMRT treating the total mucosal tube to an elective radiation dose of 54 Gy was associated with good local control rates. Toxicity is improved compared to previously reported TM-IMRT regimens encompassing similar mucosal volumes.

**PO-0650**

Dynamics of tumor hypoxia in serial 18F-Misonidazole PET for SCCHN during chemoradiation and correlation to outcome

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**Purpose/Objective:** Tumor hypoxia is a common feature of locally advanced head and neck cancer (HNSCC) that is associated with higher malignancy and increased radioresistance. The resolution of tumor hypoxia during fractionated radiation treatment is assumed to be pivotal for treatment success. 18F-fluoromisonidazole PET (F-MISO PET) allows noninvasive assessment of hypoxia during treatment. The purpose of the present study was to noninvasively assess the time course of tumor hypoxia and its correlation with additional imaging modalities and outcome.

**Materials and Methods:** A prospective serial imaging study was conducted in patients undergoing definitive radiochemotherapy (RCTx, total dose 70Gy) for locally advanced HNSCC, accompanied by Cisplatin in weeks 1, 4 and 7. Tumor hypoxia was assessed by F-MISO-PET by static scans, response on MRI scans (complete reponse (CR), partial...
response (PR) or stable disease (SD)) and local tumor control. Indices of SUVmax in tumors/SUVmean in muscle were calculated for individual patients. Normalized SUV FDG (SUVmax tumor/SUV mean muscle) was plotted against normalized baseline SUV F-MISO1 (SUVmax tumor/SUV mean muscle) and the correlation was calculated. Follow-up included MRI every 3 months.

Results: Patients undergoing definitive RTx for SCCHN (n=16) were included. Tumor hypoxia was present in >90% of patients at baseline whereas at subsequent examinations hypoxia was sharply diminished in incidence (36% and 27%) and extent. On quantitative analysis the mean SUVmax indices decreased from 1.9 (week 0) to 1.6 (week 2) and 1.3 (week 5). No correlation was found for normalized SUV FDG and the corresponding normalized baseline SUV F-MISO1 (Pearson correlation coefficient 0.32). MRI scans obtained at treatment week 5 showed CR in 8 %, PR in 77 % and SD in 15 % of patients. Kaplan-Meier analysis of local recurrence against time after treatment for a mean follow up of 39 months showed significantly worse local tumor control for tumors hypoxic on F-MISO PET 1 and 2 (p<0.05) compared to non-hypoxic-tumors.

Conclusions: Stable reduction of tumor hypoxia was found in the majority of patients. A significant correlation between tumor hypoxia obtained by F-MISO PET (F-MISO 1, 2) and local control was found.

Poster: Clinical track: Lung

PO-0651
Long-term change in pulmonary function after definitive radiotherapy for non-small cell lung cancer

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Purpose/Objective: Radiotherapy (RT) for non-small cell lung cancer (NSCLC) may cause late toxicities, such as heart toxicity, changes in pulmonary function (PF) and lung fibrosis, but late toxicity data are scarce in the literature for this category of patients. The objective of this study was to analyze long term PF changes after definitive RT for patients with NSCLC. PF was measured by FEV1 and FVC as assessed by spirometry.

Materials and Methods: This is a single institution study of patients receiving definitive RT for NSCLC between 1996 and 2010. A total of 556 consecutive treated patients with 3063 pairs of pulmonary function test (PFTs) were screened for eligibility for inclusion in the analysis of late changes in PF. To be eligible, patients had at least 3 PFTs after baseline. In this study, baseline was defined as 12 months after RT commencement to overcome a possible effect of tumor shrinkage and the acute side effect, radiation induced pneumonitis. PFT within 6 months prior to thoracic progression were excluded. The final study group comprised 106 patients with 1286 pairs of PFTs. For each patient complete dosimetric data, including GTV, PTV, mean lung dose, V12 for total lung volume were available as well as patient specific pretreatment factors such as age, gender, smoking status, performance status, and pretreatment PF. Multivariable regression analyses were performed with patient, treatment, and dose-volume metrics as covariates to investigate their possible impact on long term PF. FEV1 and FVC were analyzed separately.

Results: The long-term change in PF relative to the 1-year baseline was estimated by linear regression. Relative to the 1-year-FEV1, most patients experienced a decrease in FEV1 over time. The change in FEV1 per year, varied considerably among patients (Fig 1). Treatment year and V60 were the only covariates having a significant impact on FEV1, deterioration. Patients treated early in the period experienced a larger functional decline. Also for FVC a linear relationship with the follow-up time was found, again with large inter-patient variation. An unsuspected finding was that high V60 was associated with less decline in FVC, but FVC may be a less reliable parameter for pulmonary damage.

Figure 1. Data on pulmonary function expressed in FEV1 from 2 patients. The straight lines are the estimated loss, λ in the model. Zero denotes baseline, i.e. 12 months after start of radiotherapy.

Conclusions: Patients experience a decline in FEV1 after the 12-month value following definitive RT for NSCLC. In a multivariable analysis, deterioration of FEV1 was significantly associated with V60 of the lung (risk factor) and treatment year (risk factor). Early calendar year of treatment was associated with higher risk of deterioration. The yearly decline in FVC was less than in FEV1. A large V60 was, somewhat puzzling, associated with a lower FVC decline in a multivariable analysis.

PO-0652
Stereotactic body radiotherapy for metastatic lung tumors with emphasis on the difference in oligometastatic state

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Purpose/Objective: The state of oligometastases was divided into sync-oligometastases and oligo-recurrence, the