Purpose or Objective: At our center, the need for neck dissection (ND) after radiotherapy (RT) is determined based on the nodal response on the post-RT Computed Tomography (CT) study 4 months after the end of treatment. We want to report the outcome of this approach and investigate whether characteristics on pre- and post- RT CT studies can predict the necessity of post-RT ND.

Material and Methods: Between 2002 and 2012, 183 consecutive patients with lymph node-positive head and neck cancer (HNC) were treated with RT or concurrent chemoradiotherapy (CRT) without planned ND. CT studies pre- and post-treatment were reviewed for lymph node size and presence of necrosis, extracapsular spread and calcifications. At patient level, data were correlated with 3 year regional control (RC), metastasis free survival (MFS), disease free survival (DFS) and overall survival (OS). At nodal level, data were correlated with relapse of the individual lymph nodes (LNR). A stepwise selection procedure was followed to construct a multivariable prediction model for regional relapse (RR) within 3 years. The area under the ROC curve (AUC) was determined for the selected model. Additionally a bootstrap-corrected AUC value was calculated. This AUC value corrects for overoptimism resulting from the fact that model construction and model validation were performed on the same data set.

Results: The median follow-up was 60 months. 3-year outcome rates were as follows: LC of 84%, RC of 80%, MFS of 74%, DFS of 61%, OS of 63%. Pre-treatment nodal size at patient- and nodal level and presence of necrosis at patient level were associated with a poorer outcome. This was also the case for post-treatment lymph node size and presence of necrosis and extracapsular spread (Table 1). Based on our results we developed a multivariate model for RR prediction. After performing a stepwise selection procedure pre-RT T stage (p=0.02), post-RT necrosis (p=0.03) and post-RT largest nodal diameter (p=0.01) were included in the model. The AUC of this model was 0.78 (95% CI 0.63;0.84); the bootstrap-corrected AUC was 0.74 (95% CI 0.67; 0.89). The risk for RR within 3 years can be calculated using the following formula:

$$RR\,(\%) = \frac{e^{\mu}}{1 + e^{\mu}}$$

$$\mu = 0.085 * largest\ axial\ diameter\ (mm) + 0.6749 * (T\ stage) - 4.8482 + (only\ when\ necrosis)\ 1.1384$$

Table 1: Predictive value of post-treatment CT characteristics for outcome

CT characteristic	Outcome	OR/HR (95% CI)	p-value
∑ nodal volume			
	RR	OR 1.262 (1.072;1.486)	0.0051
	MFS	nonlinear trend	
	DFS	HR 1.051 (1.028;1.074)	<0.0001
	OS	HR 1.056 (1.035;1.078)	<0.0001
∑ nodal volume 2cm³ vs 1cm³	MFS	HR 1.152 (1.054;1.259)	0.0018
Largest diameter			
	RR	OR 1.108 (1.047;1.172)	0,0004
	MFS	HR 1.043 (1.014;1.072)	0.0036
	DFS	HR 1.059 (1.035;1.083)	<0.0001
	OS	nonlinear trend	<0.0001
Largest diameter > 31.8 mm	OS	HR 5.764 (2.851;11.651)	<0.0001
Necrosis			
	RR	OR 5.960 (2.410;14.738)	0.0001
	MFS	HR 2.203 (1.186;4.092)	0.0124
	DFS	HR 2.668 (1.671;4.262)	<0.0001
	OS	HR 2.406 (1.529;3.785)	0.0001
Calcifications			
	RR	OR 0.643 (0.167;2.483)	0.5189
	MFS	HR 0.950 (0.373;2.421)	0.9143
	DFS	HR 0.843 (0.404;1.759)	0.6494
	OS	HR 0.863 (0.430;1.729)	0.6772
ECS			
	RR	OR 3.451 (1.056;11.283)	0.0404
	MFS	HR 2.482 (1.144;5.385)	0.0214
	DFS	HR 2.343 (1.275;4.303)	0.0061
	OS	HR 1.800 (0.971;3.337)	0.0620

Abbreviations: CT = computed tomography; OR = odds ratio; HR = hazard ratio; CI = confidence interval; ∑ = sum; RR = regional recurrence; MFS = metastasis-free survival; DFS = disease-free survival; OS = overall survival; ECS = extracapsular spread.

Conclusion: Characteristics on the post-RT CT study can predict the likelihood of residual lymph node disease and outcome. Characteristics on the pre-therapy CT study seem less useful for this purpose. A CT-based multivariate prognostic model based on our findings was developed which can aid in predicting RR.

EP-1041

Evaluation of dysphagia in head and neck cancer patients undergoing Intensity Modulated Radiotherapy

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Purpose or Objective: With the success of Intensity Modulated Radiotherapy (IMRT) techniques in reducing the severity of xerostomia in head and neck cancer (HNC) patients, efforts should be made to improve swallowing dysfunction, which is potentially even more discomforting and incapacitating side effect and adversely affects the quality of life. This is a clinical dosimetric study to investigate the correlation between radiation doses delivered to organs at risk for radiation induced swallowing dysfunction (SWOARs) and severity of dysphagia following concurrent chemoradiotherapy to HNC patients and evaluate various factors which assume importance in determining the risk of dysphagia/aspiration.

Material and Methods: 60 Head and Neck cancer patients (Oropharynx 28, Hypopharynx 12 and Larynx 20) were enrolled between May 2013 and June 2014 for this prospective longitudinal study after prior approval from the hospital ethics and review committee. Patients were treated with curative intent by radiotherapy using IMRT and concurrent chemotherapy using cisplatin (40 mg/m2) on weekly basis. Delineation of SWOARs was done using RTOG guidelines and following structures were contoured: superior, middle and inferior pharyngeal constrictor, cricopharyngeal muscle, esophageal inlet muscle, cervical esophagus, base of tongue, supraglottic and glottic larynx. Dysphagia endpoints included both patient-reported (EORTC Head and Neck Quality of Life instrument and MD Anderson Dysphagia Inventory) and observer-rated scores (Common Terminology Criteria for Adverse Events- CTCAE v4.0 and RTOG/EORTC Late Radiation Morbidity Scoring). Patients were assessed weekly during radiation and at 1 month and 3 months after completion of treatment. Correlation between dysphagia and radiation doses to SWOARs was assessed.

Results: With an increase in the mean dose to the SWOARs, the grades of dysphagia also increased. After 3 months of completion of treatment, 27% patients had persistent dysphagia of grade 3 or grade 4. Significant correlation was observed between patient reported dysphagia scores and the mean doses to the superior and middle pharyngeal constrictor as well as glottic and supraglottic larynx ($p<0.05$). Observer rated dysphagia scores correlated significantly with mean superior pharyngeal constrictor dose and not with dose to other SWOARs. Two patients of carcinoma hypopharynx developed stricture which correlated significantly with dose to esophageal inlet muscle.

Conclusion: Radiotherapy plans sparing SWOARs should be generated and implemented to prevent the problem of dysphagia. The structures whose damage may cause dysphagia and aspiration are the pharyngeal constrictors and the glottic and supraglottic larynx. Further studies are required to evaluate dose constraints to these SWOARs to reduce the incidence of radiation induced dysphagia and thus further improve the quality of life in HNC patients.

EP-1042

Risk-factors in pT1-2N0M0 squamous cancers of the oral cavity and the role of adjuvant radiotherapy

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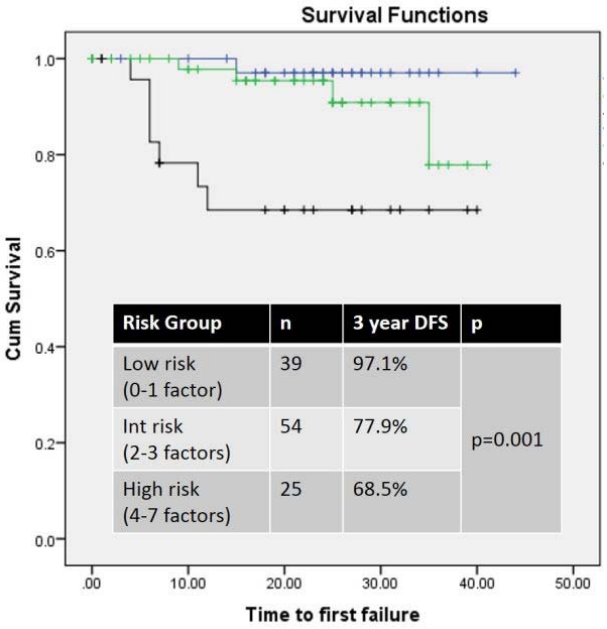
Purpose or Objective: Prognostic factors in early stage resected oral squamous cell cancers (OSCC) are not well understood. The aim of this audit was to identify factors influencing recurrence in pT1-2N0M0 patients with a view to determine the role and indications for adjuvant radiotherapy (adjRT).

Material and Methods: Between Aug 2011 to May 2014, 120 patients were determined to have pT-2N0M0 disease following histopathological examination after primary surgery for oral cancer. Primary sites included oral tongue (66, 55%), buccal mucosa (31, 26%), gingiva (10, 8%), retromolar trigone (9, 7%) and lip (4, 3%). AdjRT was advised to 46 (38%) patients on an individual basis in a multidisciplinary meeting, determined by the presence of one or a combination of known risk factors. Patients with close or positive margins always received chemoradiation. AdjRT was delivered with 3D conformal or intensity modulated techniques to a dose of 60Gy/30Fr/6weeks to the tumor bed and 54-60Gy/30Fr/6weeks to the resected but uninvolved nodal levels. Disease –related outcomes were calculated, and pathological prognostic factors were assessed using univariate and multivariate analyses. The impact of adjRT in reducing disease recurrence was assessed.

Results: The median age was 55 (25-82) years. The median tumor size was 2.2 cm. The median depth of infiltration was 6mm. The incidence of known pathological prognostic factors is listed in Table 1. The median follow up was 23 months (2-44 months). A total of 13 patients had recurrence (local 8; nodal 4, distant 3, including overlapping failures). All locoregional failures were within the RT volumes. The 2yr and 3 year disease-free-survival (DFS) was 89% and 82% respectively. On univariate analysis pT2 tumors, lymphovascular invasion (LVI), perineural invasion (PNI) and depth of invasion >=5mm were statistically significant prognosticators for DFS (Table 1). Primaries of the oral tongue showed a trend towards shorter DFS. None of these factors were independently prognostic on multivariate analysis. A scoring system using the number of risk-factors was created. Patients were grouped as Low risk (0-1 factor); Intermediate risk (2-3 factors) and High-risk (4-7 factors). There was significant difference in DFS of patients in different risk groups (Fig 1). RT was considered unnecessary in Low risk patients (none of 39 received RT, 3 yr DFS 97.1%). In High risk patients, prognosis was poor despite RT (22/25 received RT, 3 yr DFS 68.5%). In the Intermediate risk group, 24/54 patients received RT, but this made no difference to the risk of disease recurrence (2 local failures each in RT vs. no RT cohorts, 3 yr DFS 85.1% vs 72.1%, p=0.75).

Table 1. Incidence and impact of risk factors on disease-free-survival (by univariate analysis)

Factor	n (%)	3 yr DFS	p
Tongue Primary (vs. Others)	66 (55%)	76.0% (vs. 91.7%)	0.1
pT2 (vs. pT1)	67 (56.3%)	72.5% (vs. 95.6%)	0.039
Lymphovascular invasion (vs. absent)	10 (8.3%)	58.3% (vs. 83.6%)	0.024
Perineural invasion (vs. absent)	38 (31.7%)	75.0% (vs. 85.6%)	0.013
Depth of invasion ≥ 5mm (vs. < 5mm)	72 (61%)	73.8% (vs. 97.5%)	0.017
Poorly differentiated cancer (vs. moderately or well-differentiated)	10 (8.3%)	88.9% (vs. 81.2%)	0.956
Close or positive margins (vs. clear margins)	7 (5.8%)	83.3% (vs. 80.9%)	0.854



Conclusion: Several pathological risk factors alone and in combination impact disease related outcomes even in pT1-2N0 OSCC. Standard AdjRT did not have a clear effect on reducing recurrence in our cohort in patients with up to 3 risk factors.

EP-1043

Clinical and volumetric prognostic factors in external beam radiotherapy for head and neck cancer

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Purpose or Objective: To investigate clinical and volumetric prognostic factors in head and neck cancer (HNC) patients (pts) treated with curative external beam radiation therapy (EBRT).

Material and Methods: Sixty-four oropharyngeal squamous cell carcinoma (OSCC) pts and 79 hypopharyngeal squamous cell carcinoma (HSCC) pts treated with curative EBRT were enrolled in this retrospective analysis. No pt had previously undergone surgery for HNC. The median total EBRT dose was 70 Gy (range, 60–72 Gy). For planning EBRT, computed tomography (CT) images were acquired prior to EBRT initiation and at 3–5 weeks after the initiation of EBRT for replanning in each pt. We assessed the gross tumor volume (GTV) reduction rate (GTVRR) on the basis of the results from the initial and replanning CT images. Initial cervical body volume (CBV) was measured from the initial CT images. For induction chemotherapy (IC), seven pts received docetaxel (DOC), cisplatin (CDDP), and 5-fluorouracil (5-FU) (TPF regimen). One course of CDDP plus 5-FU and two courses of TPF regimen were delivered to one pt. In total, 125 pts (87.4%) received concurrent chemotherapy (CC) using the following regimen: TPF in 55 (38.5%) pts; another CDDP-based regimen in 43 (30.1%) pts; another DOC-based regimen in 22 (15.4%) pts; cetuximab in 3 (2.0%) pts; nedaplatin and 5-FU in 1 (0.7%) pt; and S-1 (tegafur, gimeracil, and oteracil) in 1 (0.7%) pt. The disease stage was I in 5 (3.5%) pts, II in 20 (14%) pts, III in 24 (16.8%) pts, and IV in 93 (65%) pts.