most patients. However, adequate supportive care is necessary for the toxicity during the period of cetuximab-based radiotherapy.
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Response of NC, BRT, and the best overall response

	NC	BRT	Overall
Evaluable patients (N)	47	39	ITT (Total N = 47)
CR	1	3	3
PR	22	26	30
SD	22	3	12
PD	2	7	2

8514 POSTER DISCUSSION

Should Elderly Patients With Locally Advanced Oropharyngeal Squamous Cell Carcinoma Be Offered the Same Curative Treatment Options as Younger Patients?

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Background: Elderly patients with head and neck cancer are less likely to receive aggressive anti-cancer therapy than younger patients due to concerns over their ability to tolerate such treatments. There is now increasing evidence suggesting that treatment decisions should not be based on chronological age alone. Most of these studies however are not site-specific. The aim of this report is to compare treatment compliance and outcome between the elderly (defined as 65 years and above) and younger patients with locally advanced oropharyngeal squamous cell carcinoma.
Materials and Methods: In our institution, treatment decisions for patients with locally advanced oropharyngeal squamous cell carcinoma are based on disease characteristics, performance status and co-morbidity score, not chronological age. Treatment protocol consists of 3 cycles of induction chemotherapy (IC) with cisplatin and 5-fluorouracil followed by radical radiotherapy (RT) with concomitant weekly carboplatin (CC). Patients with histologically confirmed AJCC stage III-IVB squamous cell carcinoma of the oropharynx who received non-surgical therapy with curative intent were identified from our electronic database and included in this study.
Results: 144 patients were identified, 113 males and 31 females. 50 patients were elderly. Median follow-up was 24 months. The following table shows the disease characteristics, compliance data on IC, RT and CC and treatment outcomes expressed as recurrence-free survival (RFS), disease-specific survival (DSS) and overall survival (OS).

	Younger	Elderly	p-value
Number of patients in the study	94 (65%)	50 (35%)	
Median age (years)	54	74	
Age range (years)	26–64	65–89	
AJCC stage			
III	18%	26%	
IVA	82%	64%	
IVB	0%	10%	
Disease subsite			
Tonsil	66%	64%	
Base of tongue	29%	24%	
Soft palate	2%	10%	
Posterior pharyngeal wall	3%	2%	
Planned IC cycles delivered	91%	89%	
Planned CC cycles delivered	79%	74%	
Completed radical RT with no prolongation of treatment duration by more than 2 days	96%	82%	
Did not complete radical RT	2%	8%	
Estimated 5-year RFS	79%	70%	0.213
Estimated 5-year DSS	82%	76%	0.160
Estimated 5-year OS	70%	53%	0.006

Conclusions: Treatment compliance of elderly patients is comparable to that of the younger cohort. There is no statistically significant difference in estimated 5-year RFS and DSS between the two groups. The difference in estimated 5-year OS is due to more non-cancer-related deaths among the elderly patients. Elderly patients with locally advanced oropharyngeal squamous cell carcinoma should be offered the same curative treatment options as their younger counterparts.

8515 POSTER DISCUSSION

A Dose Escalation Study With Intensity Modulated Radiation Therapy (IMRT) in Moderately Advanced (T2N0, T2N1, T3N0) Squamous Cell Carcinomas (SCC) of the Oropharynx, Larynx and Hypopharynx Using a Simultaneous Integrated Boost (SIB) Approach

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Background: The simultaneous integrated boost technique with dose per fraction slightly higher than 2 Gy offers the advantages of shortening the treatment time and increasing the biologically equivalent dose to the tumour. The aim of this study was to evaluate the feasibility of a dose-escalating radiotherapy treatment by using a SIB-IMRT approach in patients treated for moderately advanced head and neck cancers.
Materials and Methods: Between September 2004 and May 2008, 57 consecutive patients with T2N0, T2N1 or T3N0 pharyngo-laryngeal SCC were included. The therapeutic PTVs were treated according to three dose levels ie, 69 Gy in 30 fractions of 2.3 Gy (Level I), 72 Gy in 30 fractions of 2.4 Gy (Level II) and 75 Gy in 30 fractions of 2.5 Gy (Level III). The prophylactic PTVs received a dose of 55.5 Gy delivered in 30 fractions of 1.85 Gy. The overall treatment time was 6 weeks for all patients. The primary endpoint of the study was acute toxicity assessed during treatment and during the first 3 months following the completion of radiotherapy. The secondary endpoints included loco-regional control, disease-free survival, overall survival and late toxicity at 2 years of follow-up. The study design allowed patients to be enrolled in the second dose level group if no more than 10% of grade 4 acute toxicity was observed on the first dose level group within 3 months after the completion of IMRT, and so on for the third level group.
Results: Forty four men and 13 women with a median age of 61 were included in the trial. The majority of them presented with oropharyngeal cancer (53%) and laryngeal cancer (33%). Most patients had T2N0 (61%) staged tumours, followed by T2N1 (21%) and T3N0 (18%). Only 3 patients developed grade 4 acute mucositis during treatment, one in each dose level. Thirty two patients experienced grade 3 toxicity (56%) during IMRT, mostly dermatitis and mucositis, without any significant difference between the groups. Late grade 1 and 2 xerostomia was seen in 51% and 35% of patients respectively. Transient grade 4 late toxicity was observed in 12% of all patients and was equally distributed among the groups. The 2-year loco-regional control was 82% for all 3 groups, without any substantial difference between them (79% dose-level I, 88% dose level II, 79% dose-level III). The 2-year overall survival was 89% for dose-level I and II, and 95% for dose-level III.
Conclusions: This dose escalation SIB-IMRT protocol was safe and highly effective as the sole treatment of moderately advanced SCC of head and neck. No toxicity or outcome difference was observed between groups. A phase III trial should be initiated to assess a dose-response relationship on tumour control with such SIB technique.

8516 POSTER DISCUSSION

Predictive Factors of Critical Weight Loss During Radiotherapy of Head and Neck Cancer

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Background: Critical weight loss during radiotherapy (RT) is common in head and neck cancer (H&N). Despite of preventive strategies to maintain adequate protein and energy intake, weight loss in H&N undergoing RT is still a serious problem. PEG tube insertion has been reported to be associated with a mortality rate of a few percent, and minor complications in over 30%, which calls for strict selection criteria for appropriate nutritional interventions. We explored patient-specific and treatment-related factors that predicted weight loss and need for feeding tube during RT.
Methods: 490 consecutively irradiated H&N patients were investigated retrospectively. Standardized registrations of patient-specific data before and during primary RT as reported to the database of DAHANCA were obtained and correlated to nutritional observations. All patients had received individual institutional dietary counseling followed by weekly nutritional assessments. Patients with pretreatment feeding tubes were

excluded. All patients received definitive RT of >60 Gy, predominantly with 6 fractions per week concomitantly with the radiosensitizer nimorazole, but without chemotherapy. Weight loss was expressed by the relative weight change per week as fitted by linear regression from observations during week 0−7 of RT. For the statistical analysis, critical weight loss was defined as weight loss of >1.0% per week. Multivariate linear regression analysis was applied.

Results: The average weight loss during RT for the whole group was 5.65 kg corresponding to an average absolute weight loss of 7.3% over $7\frac{1}{2}$ weeks. 245 patients (50%) experienced a critical weight loss of more than 1% per week which on multivariate analysis was significantly associated with accelerated RT (OR=2.6; CI 1.1−5.7), BMI (OR=2.5; CI 1.2−4.8), non-glottic tumour sites (OR=3.6; CI 2.2−5.7), and disease stage (OR=1.9; CI 1.2−2.9). Tube feeding was prescribed for 24% (119/490) which was significantly related to non-glottic tumour sites (OR=2.6; CI 1.2−5.5) and disease stage (OR=3.6; CI 2.0−6.7), as well as to lower age (OR=0.6; CI 0.5−0.8) and poor performance status (OR=1.8; CI 1.1−3.0), but not to BMI.

Conclusion: Accelerated RT, BMI, disease stage, and non-glottic tumour sites predicted critical weight loss during RT. Of these factors, only disease stage and non-glottic tumour sites were linked to the prescription of tube feeding besides age and performance status; the latter indicating clinicians' preferences.

8517 POSTER DISCUSSION

Comparison of Clinical Outcome Between Proton and Carbon-ion Radiotherapy in the Same Treatment Protocols

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Purpose: To compare retrospectively our treatment results after proton radiotherapy (PRT) or carbon-ion radiotherapy (CiRT) in patients with malignant tumours originated in the H&N, the lung and the liver.

Methods: From June 2005 to December 2010, 699 patients, aged from 26 to 98 (median 71), with H&N (n = 122), lung (208) and liver cancer (369) were treated by PRT (330) or CiRT (369) with radical intent. All patients except for liver cancer were fresh cases. The RBE values for protons and carbon-ions were determined as 1.1 and 2.0−3.7, respectively, by in vivo and in vitro studies. Three protocols consisting of 70.2 GyE/26Fr (BED_{10}=89.2), 66 GyE/10Fr (109.6) and 52.8 GyE/4Fr (122.5) were employed for either proton or carbon-ion therapy (Table). The selection of protons or carbons was made for all patients based on the DVH analysis (D95 of CTV and PTV, V20−60 of OAR). Overall survival (OS) and local control (LC) rates were calculated by Kaplan–Meier and Log-rank test.

Results: The median follow-up periods were 22.2 months. As for LC and OS rates, there were no significant differences between PRT and CiRT in the same treatment protocols (the same total dose and the same fractionation) in patients with H&N, lung and liver cancer (Table).

Discussions: Our clinical experiences suggested that GyE calculated by the above described RBE values was equivalent for tumours with different histological types.

Conclusions: There were no significant differences of LC and OS rates between PRT and CiRT in the same treatment protocols.

		H&N			Lung			Liver		
		n	2 year OS (%)	p value	n	[1] 2 year OS (%)	p value	n	2[3] year OS (%)	p value
52.8 GyE/4Fr	proton	0	–	–	18	94.4	0.669	26	83.9[74.6]	0.61
	carbon	0	–		55	86.1		82	80.3[65.5]	
66.0 GyE/10Fr	proton	0	–	–	57	74	0.34	154	63.0[60.3]	0.194
	carbon	0	–		54	78.5		107	80.2	
70.2 GyE/26Fr	proton	66	61	0.389	9	72.9	0.399	0	–	–
	carbon	56	83.1		15	[92.3]		0	–	
			2 year LC (%)	p value		[1]2 year LC (%)	p value		2[3] year LC (%)	p value
52.8 GyE/4Fr	proton	0	–	–	18	87.4	0.908	26	95.0[95.0]	0.819
	carbon	0	–		55	89.6		82	93.0[89.2]	
66.0 GyE/10Fr	proton	0	–	–	57	76.9	0.186	154	94.3[94.3]	0.253
	carbon	0	–		54	100		107	83.5	
70.2 GyE/26Fr	proton	66	66.9	0.425	9	[65.6]	0.225	0	–	–
	carbon	56	81.9		15	100		0	–	

8518 POSTER DISCUSSION

Genetic Factors and Late Adverse Effects of Tissue After Radiotherapy in Breast Cancer Patients − Results From the German MARIE(RAD) Study

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Background: After breast conserving surgery (BCS), breast cancer patients are routinely treated with radiotherapy (RT) to reduce the rate of local recurrences. However, late adverse effects such as telangiectasia and fibrosis can occur as a consequence of RT. The risk of these events can be modified by individual genetic susceptibility. As RT leads to increased levels of oxidative stress, we assessed the association of polymorphisms in genes related to oxidative stress and RT-induced late adverse effects.

Methods: For this analysis, breast cancer patients from the study region Rhein-Neckar-Karlsruhe of the German MARIE study were eligible if they received RT after BCS (2002–2005) and had no chemotherapy, no metastases at diagnosis or any previous cancer(s). 414 patients participated (participation rate: 84%). Late adverse effects were evaluated by physical examination and classified according to standardized EORTC/RTOG scoring (0=none to 4=severe adverse effects) by an experienced study physician. 109 common single nucleotide polymorphisms (SNPs) were genotyped using Illumina Golden Gate and 22 SNPs for replication using iPlex application. Associations of genotype with skin alterations (e.g. telangiectasia) and with fibrosis, respectively, were assessed in up to 363 patients, excluding individuals who received intraoperative or interstitial boost to achieve a homogeneously exposed population. Multivariate logistic regression was used to adjust for potential confounding factors. A dominant model was assumed, comparing carriers of the variant allele to non-carriers. An independent study of 390 breast cancer patients (RT after BCS in 1998–2001, same study region) was used for replication.

Results: After a median follow-up time of 67 months, 46 of 414 patients (11%) developed skin alterations of grade 2 or 3. A total of 43 patients developed fibrosis, of whom 23 also experienced telangiectasia. None of the patients presented with grade 4 toxicities. Two SNPs in *NQO1* in high linkage disequilibrium were associated with a significant risk reduction for skin alterations (OR 0.3, 95% CI 0.1−0.9) that was replicated in the independent study (OR 0.4, 95% CI 0.2−0.8). For fibrosis, SNPs in *TXN, TNF* and *NQO1* showed significant associations in one study.

Conclusion: Polymorphisms in oxidative stress-related genes might influence the occurrence of RT-induced late adverse effects. Our findings need further replication by larger studies and support from functional studies.

8519 POSTER DISCUSSION

Setup Margins in a Thermoplastic Shell Can Be Reduced to Those of a Stereotactic Frame Using Daily Online Correction − a Prospective Comparison Between Shell and Frame

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Background: Patients undergoing fractionated stereotactic cranial radiotherapy (SCRT) who cannot tolerate a relocatable frame may be immobilised in a thermoplastic shell but larger CTV-PTV margins are applied to account for the reduced relocation accuracy. This prospective study compares the setup accuracy and intrafraction motion achieved using daily online correction with the ExacTrac (ET) system for frame and shell based treatment. The primary endpoint is to evaluate whether margin reduction to 3 mm (as used in a frame) is safe in shell patients.

Methods: Approval was granted by the Committee for Clinical Research, Royal Marsden Hospital. Margin reduction will be considered safe in the shell if $\geqslant$168 of 179 fractions are accurate (defined as maximum error <2 mm on post correction *and* post treatment imaging).

All patients undergoing SCRT for benign brain tumours were included. For each fraction, stereoscopic kV image pairs were acquired using the ET system:

- pre-correction (at initial setup)
- post-correction pre-treatment
- post-treatment
- additional image pair acquired after floor twist to 90° for the first 5 fractions

Population systematic & random errors were calculated for each image sets.