	Younger	Elderly	p-value
Number of patients in the study	128 (66%)	66 (34%)	
Did not receive all planned cycles of IC	21.1%	21.2%	1.00
IC dose reduction	26.6%	34.8%	0.180
Unplanned hospitalisation during IC	5.5%	12.1%	0.153
Proceeded to radical RT following IC	99.2%	97.0%	0.267
Completed radical RT with no prolongation of treatment duration by more than 2 days	95.3%	89%	0.442
Unplanned hospitalisation during RT	7.1%	20.3%	0.014
Did not commence planned CC	10.3%	20%	0.172

8548 POSTER

Induction Chemotherapy Followed by Concomitant Chemo-Radiation in Locally Advanced Nasopharyngeal Carcinoma − a Single Institution Experience

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Background: Nasopharyngeal Carcinoma (NPC) is the commonest Head & Neck cancer in Saudi Arabia. Concomitant Chemo-radiotherapy (CRT) with cisplatin followed by 3 cycles of adjuvant Cisplatin based chemotherapy is the standard of care in patients with locally advanced disease (LANPC). However, the compliance with adjuvant chemotherapy has been unsatisfactory.
Material and Methods: Between August 2002 and July 2010, fifty-four patients (37 males: 17 females) with locally advanced (AJCC Stage III & IV), non-metastatic NPC were treated using Induction Chemotherapy (IC) with Docetaxel, Cisplatin, and 5-FU (TPF) for 3 cycles, followed by Concomitant chemo-radiation using weekly Carboplatin with conventionally fractionated 3-D conformal radiotherapy to a total dose of 65−70 Gy.
Results: Median age was 42 year (15 to 72). Twenty-six patients (48%) had stage IV disease, and 17 (31%) had T4 tumours. Undifferentiated Carcinoma Nasopharyngeal Type accounted for 96% of the cases. Forty-six patients had more than 12 months follow-up (median 42) and are the subject of the following analysis. Two patients died during induction chemotherapy. Of the remaining 44 patients, IC resulted in 25% Complete Clinical Remission, and 72% Partial Remission, an overall Response Rate of 97%. Hematological toxicity was frequent, but manageable. In total, there were 2 local and 2 distant relapses, 2 of them appearing beyond 3-years of follow-up. Two patients died of progressive disease, one is alive with disease, and one local relapse was successfully salvaged with further radiotherapy. For the entire series (46 patients) the 4-year Kaplan–Meier Overall Survival (OS) rate is 88%. For the 44 patients who completed the protocol, the 4-year Disease Free Survival (DFS) rate is 84%. All 8 patients under 23 year of age remain disease-free at more than 6 years median follow-up. One patient developed a suspected grade 3 neurologic toxicity, and another had a cerebral-vascular accident one year following salvage local re-irradiation.
Conclusions: Sequential therapy as used in this group of patients seems well tolerated and yields high remission rate and an encouraging DFS and OS in patients with LANPC. Future development should focus on better risk stratification, and systematic use of Intensity Modulated Radiation Therapy-like techniques. Young adults with LANPC may need a different treatment approach that would include IC followed by response-adjusted chemo-radiotherapy.

8549 POSTER

Influence of Performance Status, Hemoglobin Level, Body Mass Index and Presence of Feeding Tube on Treatment Outcomes and Toxicities in Locally Advanced Head and Neck Cancer Patients Treated With Induction Chemotherapy and Chemoradiation

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Background: Induction chemotherapy followed by chemoradiation (IC-CRT) is a treatment option of LAHNC, but it is associated with significant toxicities. We studied the impact of performance status (PS), hemoglobin level (HB), body mass index (BMI) and the presence of feeding tube (FT+) on overall survival (OS) and toxicity in LAHNC patients (pts) treated with IC-CRT.
Materials and Methods: It is a retrospective study on 100 pts consecutively treated in 2 institutions with CDDP 75 mg/m^2 in combination with paclitaxel 175 mg/m^2, every 21 d, as induction chemotherapy (IC), followed by concurrent chemoradiation (CRT): 70 Gy (2 Gy/d, 35 fractions, 5 times/week) and CDDP 100 mg/m^2 d1, d22 and d43. Pre-treatment ECOG-PS, HB, BMI and FT+ were analyzed as predictors of IC- and/or CRT-related toxicities as categorical variables. OS was estimated by the Kaplan–Meier method and curves were compared with log-rank. A multivariable Cox proportional hazards model was used to control for prognostic factors.
Results: 94 pts were staged as T3−4 and 70 pts as N2−3. Oropharynx (50 pts) and larynx (30 pts) were the most frequent primary sites, and 71 pts had ECOG-PS 0−1. The median number of IC cycles was 3 (1−6) and the response rate to IC was 81%. 79 out of 94 pts completed CRT (14 pts were under treatment and one pt died). The median delivered RT dose in primary tumour was 70 Gy in 61 d, and the median number of concurrent CDDP cycles during RT was 2. There was no association between PS, HB, BMI and FT+, and IC-related G3+ toxicities, and during CRT, ECOG-PS 0−1 pts presented significantly higher rate of G3+ toxicities ($p = 0.040$). The median OS was 17.7 months. In a mean follow-up of 12 months, 31 pts were alive and disease-free. Estimated 2-year OS was significantly better for pts with ECOG-PS 0−1 vs. 2−3 (50% vs. 0%, HR 0.35, $p = 0.002$), HB > 12 vs. <12 g/dL (55% vs. 12%, HR 0.39, $p = 0.007$), BMI > 22 vs. <22 kg/m^2 (70% vs. 27%, HR 0.21, $p = 0.005$) and no FT vs. FT+ (48% vs. 9%, HR 0.38, $p = 0.005$). BMI > 22 kg/m^2 and no FT at the beginning of IC remained significant as favorable prognostic factors in terms of OS in a multivariate analysis.
Conclusions: Our results suggest that LAHNC pts presenting with good PS, high HB levels, high BMI and no FT present better OS rates when treated with IC-CRT, and if confirmed in other studies, these prognostic factors must be taken into account in treatment selection.

8550 POSTER

Moderately Accelerated Radiotherapy Using Intensity Modulated Radiotherapy With Induction and Synchronous Chemotherapy in Treatment of Nasopharyngeal Carcinoma − Early Toxicity and Dosimetry

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Background: Treatment for stage III-IV non-nasopharyngeal head and neck cancer includes induction chemotherapy with docetaxel, cisplatin, 5FU (TPF), radiotherapy and synchronous cisplatin. Induction chemotherapy is recommended for locally advanced nasopharyngeal carcinoma (NPC) and those with bulky nodal disease to treat micro-metastatic spread and reduce tumour volume to allow radiation dose escalation using intensity modulated radiotherapy (IMRT). IMRT also permits coverage of parapharyngeal space disease. We report acute toxicity and dosimetry data in patients with NPC treated with moderately accelerated radiotherapy using IMRT plus induction and synchronous chemotherapy.
Material and Methods: 10 patients, median age 51 years (range, 27−74) with stage IIb-IVc NPC (7/10 bilateral cervical nodal disease) received 3−4 cycles induction chemotherapy (TPF n = 8; PF n = 2), IMRT and up to 2 cycles synchronous cisplatin. CTV1 included primary and nodal disease with a 5 mm and 10 mm margin, respectively; CTV2 and CTV3 areas at intermediate or low risk of microscopic disease. Each CTV was expanded 3 mm to form PTV. Prescribed doses to mean PTV1, PTV2 and PTV3 were 70 Gy, 63 Gy and 56 Gy, respectively, in 33 fractions. Planning organ at risk volumes (PRV) were defined for spinal cord and brain stem with 5 mm margin; optic nerve and optic chiasm with 3 mm margin. Superficial and deep lobes of parotid were delineated. Inverse planning was performed and dose-volume histograms of target volumes and normal structures evaluated. Acute toxicity was assessed by RTOG scoring criteria.
Results: All patients completed induction chemotherapy and radiotherapy; 6/10 completed 2 courses synchronous chemotherapy. One patient received 4 cycles TPF and 1 planned cycle of synchronous cisplatin. 8/10 developed grade 3 mucositis and 7/10 required enteral tube feeding. There was no grade 4 toxicity. Doses to 99% and 95% of mean PTV1 were 65.0±1.0 Gy and 67.3±0.4 Gy, respectively. Doses to 1 cc of critical structures' PRV were within target dose limits in all patients. Mean dose to contralateral cochlea was 50.3±9.0 Gy, exceeding target dose of 50 Gy in 7/10 patients; and to contralateral parotid 41.1±7.2 Gy, exceeding target dose of 26 Gy in all patients.
Conclusions: Treatment of NPC with induction TPF, moderately accelerated radiotherapy and synchronous cisplatin is feasible, although 3/10

patients tolerated only 1 cycle synchronous chemotherapy. IMRT allowed excellent target coverage and spared critical structures but did not meet dose constraints to cochlea or parotid gland, partly due to the high proportion of patients with bilateral cervical nodal disease.

8551 POSTER

Comparison of Acute Toxicities in Head and Neck Cancer Patients Receiving Radiation as Adjuvant Therapy With Surgery Versus Radiation With Concurrent Chemotherapy

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Background: Patients with locally advanced head and neck carcinoma have two options of combined modality treatment namely either surgery and postoperative radiotherapy [S-PORT] or concurrent chemoradiation [CRT]. During the last ten years, chemoradiation is considered a suitable curative approach with organ preservation. Yet, poor compliance and toxicity remain a deterrent to successful treatment completion. The intent of this study is to perform a cohort analysis of such patients at this regional centre.
Materials and Methods: 59 patients of locally advanced head and neck carcinoma were chosen for the study. Twenty nine of them had had surgery and postoperative radiotherapy while thirty had concurrent chemoradiation. All of them were monitored during the course of radiotherapy at weekly intervals. Toxicity grading was done using RTOG Acute Radiation Morbidity Scoring Criteria. Dermatitis, oral mucositis, pharyngitis, laryngitis and salivary gland toxicity were observed. Pearson Chi-Square test was used to compare different toxicities in S-PORT and CRT groups at both second and last week of radiotherapy course. Comparison was done between individual grades in both groups as well as between combined grades (low grade including grades1, 2 and high grade including grades 3, 4). A value of $p < 0.05$ is taken as statistically significant in our study.
Results: The median age was 50 years in S-PORT group and 55 years in CRT group. Site wise distribution of cancer in S-PORT and CRT groups were 1 and 14 patients in oropharynx, 19 and none in oral cavity, 3 and 6 in larynx and 2 and 6 in hypopharynx respectively. No difference was noted in the groups for all of the toxicities assessed [$p = 0.584$ for dermatitis, $p = 0.901$ for oral mucositis, $p = 0.349$ for pharyngitis, $p = 0.136$ for laryngitis, $p = 0.532$ for salivary gland toxicity].

Table 1. Distribution of toxicities in two treatment groups (all values are in number of patients)

Acute toxicities	RTOG Grades 1 & 2		RTOG Grades 3 & 4	
	S-PORT (n = 29)	CRT (n = 30)	S-PORT (n = 29)	CRT (n = 30)
Dermatitis	25	25	3	4
Oral mucositis	23	25	4	3
Pharyngitis	15	17	9	11
Laryngitis	17	24	3	2
Salivary gland toxicity	26	28	0	0

Conclusions: The toxicities due to radiotherapy are comparable in patients of locally advanced head and neck carcinoma receiving either surgery with adjuvant radiotherapy or concurrent chemoradiation. Comparison in individual primary cancer sub site needs to be done to know the potential difference in treatment tolerance in both these treatment groups.

8552 POSTER

Phase 2 Trial of Total Mucosal and Bilateral Neck Intensity Modulated Radiotherapy in Squamous Cell Cancer of Unknown Primary

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Background: Squamous cell carcinoma of unknown primary (SCCUP) 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 (50−70 Gy). The aim of this study was to assess safety and feasibility of total mucosal and bilateral neck intensity modulated radiotherapy (TMI/BN-IMRT).
Methods: We performed a single arm phase 2 prospective trial (RMH CCR2823). All patients (pts) had imaging (PET-CT 9 pts, CT 10 pts), 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) LN. CTV2 was the mucosa of nasopharynx, oropharynx, larynx, hypopharynx and contralateral cervical level 2 to 5 and RP LNs. Prescribed dose to PTV1 and PTV2 in 30 fractions were 60−65 Gy (depending on resection status R0−60 Gy, R1/R2−65 Gy) and 54 Gy, respectively. Five patients received 65 Gy to PTV1. No prophylactic enteric feeding tubes were inserted.
Results: Nineteen pts (10 male) with a median age of 53.7 years (range 43.5–66.6 years) were treated between July 2007 and May 2010. Histology was SCC (18 pts) and undifferentiated carcinoma nasopharyngeal type (1 pt). Twelve pts received chemoradiotherapy with concomitant platinum and 7 pts had RT alone. The median treatment time was 41 days (range 39−43 days). All pts received the prescribed dose with no clinically significant delays. The acute toxicity (CTCAE v2.0) rate for grade 3 and 4 oropharyngeal mucositis was 31.6% and 0%, respectively, and grade 3 and 4 pharyngeal dysphagia was 36.8% and 0%, respectively. A nasogastric tube was inserted in 6 of these 7 patients with a median tube dwell time of 30 days (range 22 to 170 days). At a median follow-up of 23.7 months (range 2.5−43 months) no primary head and neck cancers were seen. Two-year overall survival, loco-regional recurrence free survival and distant metastasis free survival rates were 72.7%, 84%, and 94.4%, respectively.
Conclusion: This trial shows that primary or adjuvant TMI/BN-IMRT delivering 60−65 Gy to ipsilateral neck LN and 54 Gy to TM/contralateral neck LN is feasible and well tolerated. No primary head and neck cancers developed and the grade 3 or 4 dysphagia rate was low compared to previously reported TMI-IMRT regimens.

8553 POSTER

The Risk of Fatal Aspiration Pneumonia in Patients Treated With Curative Radiotherapy for Head and Neck Cancer

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Background: Severe dysphagia leading to penetration of food to the larynx and manifest aspiration is a common side effect after radiotherapy (RT) for head and neck cancer[1]. The aim of this study was to investigate the incidence and mortality of aspiration pneumonia in head and neck cancer patients treated with curative RT.
Materials and Methods: Patients treated with curative radiotherapy for head and neck cancer in Aarhus from Jan. 1st 2006 to Dec. 31st 2008 were included. Data on patient, tumour and treatment characteristic were obtained from the DAHANCA database. Data on hospital admissions with infectious diseases, airway infections, pneumonia, other diseases in the airway and dysphagia were obtained from the National Patient Registry. Data from the National Registry of Causes of Death on all deaths and causes of death in the cohort were obtained and merged by the unique id number given to all Danish citizens at birth.
A total of 341 consecutive patients with cancer of larynx, pharynx and oral cavity were included; median age at 63.8 years and 76% were men. Most patients had Stage IV disease (55%). No patients received chemotherapy as a part of the curative treatment.
Results: In the first year after RT there were 68 hospital admissions in 46 (13%) patients. A total of 17 patients were diagnozed with dysphagia. One patient was diagnozed with aspiration pneumonia, 23 patients were diagnozed with pneumonia and 11 patients were diagnozed with other airway infections or unspecified symptoms like fever, respiratory failure etc. 40 patients (12%) died during the first year after RT, 1 from lung cancer, 1 from unknown causes, 1 with infection and 3 from other diseases unrelated to infection or pneumonia.
Of the 128 patients who died, 85 had died with uncontrolled head and neck cancer. The 43 deaths occurring in relapse-free patients were unrelated to aspiration and pneumonia in 30 cases (20 died from other cancers (primarily lung cancer); 6 from cardiac diseases;and 4 from haemorrhage). In 13 cases aspiration and/or aspiration pneumonia could not be ruled out as contributing cause of death: 6 pneumonia and 7 unexplained causes. Of these, 4 had dysphagia, 3 had PEG tubes and 2 had been diagnozed with pneumonia within the last months.
Conclusion: Up to one third of all deaths in relapse-free patients after radical RT may be associated with dysphagia-related aspiration and pneumonia.

8554 POSTER

Helical Tomotherapy as a Treatment for Tumours Involving or Close to Optical Structures − Single Institution Initial Experience

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Background: Intensity modulated (IMRT) and image guided radiotherapy (IGRT) possibly enable an adequate dose with good coverage in head and neck tumours, reducing the toxicity in the organs at risk (OAR). Helical tomotherapy (HT) provides an integrated IMRT-IGRT system.