before and after RT.
Methods: Taste acuity tests and taste questionnaires were performed in 73 patients with a head and neck cancer, treated with RT. The patients were divided into 4 groups. Group 1 (n=17) was analyzed before the start of RT. Group 2 (n=17), group 3 (n=17) and group 4 (n=22) were at 2, 6 and 12-24 months after RT, respectively. A cross-sectional analysis was performed between the 4 groups.
Results: In group 1 (tested prior to RT), partial taste loss was observed in 35, 18, 6 and 0% of patients for bitter, salt, sweet and sour, respectively. In group 2 (2 months after RT), taste loss (partial to total) was seen in 88, 82, 76 and 53% for bitter, salt, sweet and sour, respectively. In group 3 (6 months after RT), partial taste loss was seen in 71, 65, 41 and 41% (bitter, salt, sweet, sour) and in group 4 (12-24 months after RT) in 41, 50, 27 and 27% (bitter, salt, sweet, sour). The difference in the incidence of taste loss between the 4 groups was statistically significant (p<0.001; Kruskal-Wallis test). Distress caused by taste loss was most pronounced in group 2 (82%).
Conclusions: Different tastes are lost after radiotherapy during different time periods. Bitter and salt qualities are most impaired. The sweet taste shows the quickest recovery after RT. Gradual recovery is seen during the first year after treatment. Partial taste loss still persists 1-2 years after RT and is responsible for slight to moderate discomfort.

817 Poster

Trismus as a presenting symptom in nasopharyngeal carcinoma: its prognostic and response to treatment

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Background: nasopharyngeal carcinoma (NPC) patients presenting with initial trismus, were analysed in terms of general characteristics, response of trismus to the treatment and prognostic role of it.
Methods: between 1993-2001, 232 patients (166 male, 66 female) with NPC were treated. Their ages ranged from 9 to 82 years. Histopathological diagnosis was WHO type II & III in 214 (91.4%) patients. All patients were treated with definitive radiotherapy (XRT) and ± chemotherapy. Patient charts were retrospectively analysed and all initial symptoms, signs and physical findings were documented. Of these 232 patients, it was found that 20 (8.6%) patients had trismus, dental gap narrower than 3 cm, at initial diagnosis. These patients were analysed for response of trismus to the treatment and prognostic role of trismus. Median follow-up time for patients without trismus was 29 months (Range: 12-95 months) and for patients with trismus was 58 months (Range: 5-85 months) for surviving patients.
Results: there were significantly more patients with young age (p<0.0001) and advanced T status (p<0.0001) in patients with trismus. Overall 3 (37.5%) out of 8 patients were responded to the neoadjuvant chemotherapy. Trismus was partially responded in 1 (12.5%) and completely responded in 2 (25%) patients. overall response rate after chemotherapy and XRT was found to be 88.2%. We found that 10 (90.9%) out of 11 patients with complete response at the completion of treatment were alive with no evidence of disease at their last control. It was found that 9 (80%) out of 11 patients with complete response after treatment were trismus free at their last follow-up. 3 year loco-regional relapse free survival rates were 85.1% and 67.5%, for patients with and without trismus, respectively (p=0.66). our univariate analysis have shown male gender and advanced nodal status to be the significant unfavorable factors for OS, LRRFS & DMFS and after multivariate analysis advanced nodal status remained as the single unfavorable independent prognostic factor for all endpoints analysed. No significant prognostic role of trismus was observed in both uni- and multivariate analysis.
Conclusions: trismus is a more common symptom in NPC patients with young age and an indicator of advanced primary tumour. Trismus recovered in majority of patients at the end of treatment and patients with complete recovery of trismus may have a better survival. However, no prognostic significant role of trismus on survival was found in uni- and multivariate analysis.

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The influence of the cranial border of the level II lymph node regions on xerostomia, for conformal and intensity-modulated irradiation of oropharyngeal cancer

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Purpose: To investigate the influence of the cranial border of the level II lymph node regions when irradiated electively on xerostomia, in case of oropharyngeal cancer, for both conformal and intensity-modulated radiation therapy techniques (CRT and IMRT).
Materials and Methods: The target volumes of the elective and boost volumes and the organs at risk -parotid glands, spinal cord, brain- were delineated on planning CT scans of 12 patients. The cranial border of the lymph node regions was delineated up to the cervical vertrebrae1 (C1), and up to the cervical vertrebrae2 (C2), which is in general the surgical border in case of neck dissection, resulting in two elective volumes. The CRT and IMRT planning was performed using a commercial system (PLATO RTS 2.5 and ITP 1.0). Prescribed dose to the elective volumes was 50Gy in 25 fractions and to the boost volume 70Gy in 35 fractions for CRT plans and the biologically equivalent dose in 30 fractions for IMRT plans. Normal tissue complication probability (NTCP) for xerostomia one year after radiotherapy was calculated, using the parotid mean dose.
Results: When irradiating level II nodes up to C2, the mean dose to the parotid glands is decreased for both techniques, compared to irradiation up to C1. Results for the contralateral parotid gland are:

	Mean Dose (Gy)(sd)		NTCP(%)(sd)	
	C1	C2	C1	C2
CRT	52(7)	49(7)	76(13)	69(18)
IMRT	34(6)	27(5)	41(12)	25(7)

For the ipsilateral parotid glands relatively similar results are obtained but the mean dose is higher due to the vicinity of the boost volume. For irradiation up to C1, it is 62Gy for CRT and it is reduced to 38Gy for IMRT. NTCP for xerostomia decreased approximately 7% and 16% in absolute values for CRT and IMRT plans respectively. Comparing the two techniques, the dosimetric advantage of IMRT is illustrated by a relative NTCP reduction up to 64% for the same irradiated lymph node region.
Conclusions: Lowering the cranial border of the level II lymph node regions to C2 could be consider, especially in IMRT techniques, since NTCP for xerostomia is reduced up to 70% relatively to conformal irradiation up to C1.

819 Poster

Chemoradiation alone controls the majority of neck nodes including bulky disease

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Purpose:To evaluate the rate of neck nodes control achieved by primary chemoradiation
Patients and methods: From March 1996 to April 2002 64 patients with head and neck cancer (9 stage 3, 55 stage 4) were treated by a chemoradiation regimen already described (Int J Rad Oncol Biol Phys 2001, 50 (1): 47-53). The regimen was composed of 2 fractions a day. Each fraction consisted of 115 cGy+ 5mg/m² of carboplatin with carbogen breathing. Treatment was given 5 days a week up to total doses of 350 mg/m² of carboplatin+8050 cGy in 7 weeks. Five patients presented with N0,10 with N1,7 with N2A,14 with N2B, 12 with N2C and 16 with N3.Bulky disease was very common (node dimension up to 16 cm of diameter). In one patient a neck dissection was performed after completing chemoradiation for a node rest. The rest of patients were treated with chemoradiation only.
Results:For a median follow-up of 44 months, actuarial locoregional control, cause-specific survival and overall survival were 84%, 67% and 58% respectively. Actuarial node control for chemoradiation alone was 97%. Including the case of neck surgery, actuarial node control was 98%. No node recurrence has been seen more than 6 months after therapy.
Conclusion: Chemoradiation alone is able to control de majority of neck nodes, including bulky disease, provided that an appropriate regimen is used. This is in contrast with a common opinion according to which, clinically positive neck nodes, especially bulky disease, must be treated with surgery even if prior chemoradiation has been employed. The regimen described here is among the most active treatment schedules for head and neck cancer, and, possibly has achieved the highest rate of node control including all surgical series

820 Poster

Decreased local control following radiation therapy alone in early larynx cancer with anterior commisure extension

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Objective: To assess the patterns of failure in the treatment of early stage squamous-cell carcinoma of the glottic larynx.
Materials and methods: Between 1983-2000, 122 consecutive patients

treated for laryngeal cancer (UICC T1N0 and T2N0) by radiation therapy (RT) alone were retrospectively studied. Male to female ratio was 106/16, and median age 62 years (35-92). There were 68 patients with T1a, 18 with T1b, and 36 with T2 tumors. Diagnosis was done by biopsy in 104 patients, laser vaporization or stripping in 18. Treatment planning consisted of 3D conformal RT in 49 (40%) patients including 9 patientsirradiated using arytenoid protection. A median dose of 70 Gy (60-74) was given (2 Gy/fr) over a median period of 46 days (21-79). Median follow-up period was 85 months.
Results: The 5-year overall, cancer-specific, and disease-free survival was respectively 80%, 94%, and 70%. Five-year local control was 83%. Median time to local recurrence in 19 patients was 13 months (5-58). Salvage treatment consisted of surgery in 17 patients (one patient refused salvage and one was inoperable; total laryngectomy in 11, and partial laryngectomy or cordectomy in 6 patients). Six patients died because of laryngeal cancer (ultimate larynx preservation rate: 95%). Univariate analyses revealed that prognostic factors negatively influencing the local control were anterior commissure extension, arytenoid protection, and total RT dose (< 66 Gy). Among the factors analyzed, multivariate analysis (Cox model) showed that anterior commissure extension, arytenoid protection, and male gender were the worse independent prognostic factors in terms of local control.
Conclusion: For early stage laryngeal cancer, RT alone offers an excellent outcome. In case of anterior commissure extension, surgery or higher RT doses are warranted. Because of high relapse risk, arytenoid protection should not be attempted.

821 Poster

Patients with tonsillar carcinoma: a comparison of stereotactic intensity modulated radiation therapy with brachytherapy

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Introduction: Meta-analyses (Pignon, 2000) for cancers in the H&N have shown that radiation therapy (RT) and concomitant chemotherapy result in improved tumor control at the cost of more toxicity. Thus it becomes of paramount importance to reduce toxicity by implementing optimal sparing RT techniques. Cancer of the tonsillar fossa was taken as a model. In Rotterdam, external beam radiotherapy (ERT) followed by brachytherapy (BT) is routinely implemented in T1-2(3) tumors with excellent clinical results. One way of optimizing the treatment is by sparing normal tissues, implementing IMRT from the start.
This paper focuses on the boost: BT is compared with 3DCRT, IMRT, stereotactic radiation therapy (SRT), and IMRT combined with SRT (S-IMRT).
Methods and Material: For 9 treated N0 patients with tonsillar fossa carcinoma, a pre-treatment CT and a CT scan after implantation of afterloading catheters was obtained. The clinical target volume (CTV) and critical structures (NT) were contoured on the pre-treatment CT. For the boost, a 3DCRT, an IMRT (Cadplan - Helios module) with MLC, a SRT and a S-IMRT treatment plan (XPlan 2.0 and X knife RT 2.0 β 2) with mini MLC were generated. The CTV to planning target volume (PTV) margin was 5 mm for 3DCRT and IMRT, and 2 mm for SRT and S-IMRT. Using PLATO BPS version 14.2, the original BT treatment plan was reconstructed on CT. NT contours were copied to the post-implantation CT scans, and subsequently the dose in critical structures was computed.
Results: The median dose to the ipsilateral parotid gland was 9.8% (BT) and ranged from 14.1% (S-IMRT) to 58.3% (3DCRT) for ERT. For minor salivary glands (mucosa) the median dose was 17.1% for BT and varied from 19.6% (IMRT) to 29.5% (3DCRT) for ERT. The dose contribution to other critical structures will be discussed at the meeting.
Conclusion: Depending on institutional policy, equipment and expertise, one can opt for BT or S-IMRT when boosting T1-2(3) N0 tonsillar carcinomas. Besides specific advantages and limitations, with both modalities optimal sparing can be achieved. Some of the disadvantages with regard to target, can be partly eliminated by using either CT/MRI treatment planning (e.g. with BT) or placing tumor markers (e.g. with S-IMRT). Finally, for sparing major and minor salivary glands, it remains pivotal to implement IMRT in the first series of ERT (neck and primary).

822 Poster

Radiotherapeutic management of patients with head and neck cancer, the influence of join up change on dose uniformity across photon field junctions by means of matching half block fields using independent jaws

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Independent collimation conveniently allows for the junctioning of abutting fields with non-diverging beam edges leading to a theoretical dosimetric match. The actual dosimetry, at the central match plane as well as the influence of join up changes, has been tested in this study.
Dose uniformity modeling was performed using the Theraplan Plus version 3.5 treatment planning system (TPS). Using a unit density phantom, two types of modeling were performed: In the first, two half fields were abutted at one of the two principal axes. One of the fields was kept constant and the other varied at 1 mm steps. In the second,the junction were moved once or twice by 1 cm. Off-axis ratios (OARs) at various depths were obtained. Siemens Mevatron accelerator was used to verify the accuracy of the TPS simulations using identical photon energies and setups. Films were scanned and in-house software was used to convert optical density to dose. In the first type of TPS simulation we have found that dose non-uniformity to be a linear function of gap - overlap sizes with a slope of - 12 ± 2 % for all depths evaluated. In the corresponding accelerator measurement the same slope was obtained. The off-set of the line is at 0% (in the TPS case) and ranging from a minimum of - 4 ± 1 % to a maximum of - 14 ± 1 % for five Mevatron beams evaluated. In the second type of TPS simulation we have found that the dose uniformity improved by 2-fold when the junction is moved once and by 3-fold when moved twice.
The offsetting of the linear function in the case of measurement revealed a systemic jaw overlaps with all the accelerators, well within the jaw calibration tolerance limits. This error could not be improved further as 1 mm was the smallest possible digital readout value. On the other hand an under-dosing of -14 ± 1% was unacceptable.
Dosimetric evaluation of abutted junction reveal that dose non-uniformity can be as high as ~ 14%. It is possible that the error can be corrected with collimator jaw calibration but this combine jaw error is within machine specification and quality assurance standard. The non-uniformity can be reduced using a small "gap". The required "gap" size can easily be determined using film measurement Out of the six linacs evaluated, five of them require 1 to 2 mm gaps and 1 requires 0 to 1 mm gap for optimal field matching. Further improvement in dose uniformity can be achieved by moving the junction ± 1 cm within a fraction or between fractions.

823 Poster

IMRT for head and neck cancer: comparison of different optimized irradiation techniques and first results of a QA program

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The main goal of modulated-beam conformal therapy is to reduce the dose to healthy tissue and sensitive structures around a uniformly irradiated target volume. This concept is even more complicated in head and neck cancers where several challenges occur for the optimization algorithm (i.e. the complicated curvature of the patient external contour, the inhomogeneities structures inside the patient, the concave shape of the planning target volume around the spinal cord and the adjacent critical organs such as the spinal cord and parotids). As a result, complex treatment plans have to be achieved with a total dose of 70 Gy to be delivered to the planning target volume and strict constraints had to be respected concerning the organs at risk.
Different treatment plans were obtained with the MDS Nordion-TMS version 6.0.2 treatment planning system using intensity modulated fields of 6 MV from an ELEKTA linear accelerator, and intensity maps will be delivered employing the step and shoot technique.
The aim of this study is then to analyze the different IMRT plans proposed for the head and neck cancers as a function of the different ballistics proposed, i.e. different combinations of intensity modulated fields, different organs at risk with different constraints to their DVH in terms of isodose distributions and dose volume histograms.
This is conducting to a typical intensity modulated radiotherapy treatment of advanced head and neck cancers that will be specific for our department. An optimized intensity modulated treatment solution is then proposed and will be validated through a complete quality assurance program. Results of