Methods and Materials: Between September 2009 and march 2011, we treated 13 patients with sinonasal tumours and 7 with nasopharyngeal tumours through HT in our institution. 14 patients were males and 6 females, with a mean age of 55 (range 40−81).
Sinonasal tumour location was: 6 nasal cavity, 5 ethmoid cells, 1 maxillary sinus and 1 multiple location. Pathologically, there were 4 squamous cell, 3 adenoid cystic, 3 intestinal-type adenocarcinoma, 2 small cell neuroendocrine and 1 undifferentiated neuroendocrine large cell. 12 patients of them presented locally advanced disease (cT3−4) with nodal involvement in only 2 patients. Partial resection was performed in 10 prior to radiotherapy.
Nasopharyngeal tumours were UICC stage I in 1 case, stage II in 2 and stage III in 4. All of them were pathologically lymphoepithelial carcinoma.
11 patients received concomitant platinum-based chemotherapy and 2 concomitant cetuximab.
Results: For sinonasal tumours, the median prescribed dose was 64.8 Gy (range 56−70) reaching a coverage of 90%. Elective nodal irradiation has not been performed in any patient. The median maximum dose values in the OAR were: ipsilateral optic nerve 57.7 Gy (range 34.58−62); contralateral optic nerve 52.5 Gy (range 23.5–58.4); optic chiasm 49.4 Gy (range 21.3–56.2); ipsilateral lens 12.4 Gy (range 8.1–51.5); contralateral lens 12.4 Gy (range 7.93–20.3); brainstem 52.4 Gy (range 27.3–61.6), spinal cord 30.3 Gy (range 13.9–41.2) and 20% oral cavity received 45 Gy. Should be noticed that dose level admitted to ipsilateral optical structures has been over the known tolerance in order to achieve control dose in PTV when previous blindness.
For nasopharyngeal tumours the median prescribed dose was 69.6 Gy (range 68.5−70) reaching a coverage of 95% of the PTV. Elective nodal irradiation was performed in every patient, reaching a coverage of 96% of PTV by 55 Gy. The median maximum dose values in the OAR were: spinal cord 37.15 Gy (range 31.2–45.6); brainstem 56.41 Gy (range 41.13–64.2); ipsilateral and contralateral optic nerves: 50.8 Gy (range 41.5–55.7) and 50.7 Gy (range 34.2–54.2) respectively.
14 patients presented grade 2−3 acute mucositis and 2 patients presented grade 1 conjunctivitis. With a median follow up of 7 months: 6 patients presented complete response; 3, partial response; 5 stable disease; 1 patient died. No available follow up for 5 patients.
Conclusion: Helical tomotherapy provides an accurate and reasonably tolerated treatment for tumours that involve the optical structures or are close to them. Further experience and protracted follow up is needed in order to evaluate late neurological toxicity.

8555 POSTER

Radiotherapy for High-risk Thyroid Malignancies − Report of Acute Toxicities of a Phase I Sequential Cohort Dose-escalation IMRT Study

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Background: The primary objective of this Phase I sequential cohort study was to determine the feasibility of delivering modest acceleration and dose-escalated IMRT in locally advanced high-risk thyroid cancers. We report the incidence and prevalence of acute toxicities of 2 dose fractionation regimens.
Methods and Materials: Patients with high-risk locally advanced thyroid cancer (medullary, differentiated and Hurthle) who required post-operative radiotherapy (RT) were recruited. Dose level 1 (DL1) delivered 58.8 Gy/28 fractions (F) (daily) to the primary tumour bed and involved nodes and 50 Gy/28 F to the elective nodes. Dose level 2 (DL2) delivered 66.6 Gy/30 F (daily) to the primary tumour bed, 60 Gy/30 F to the involved nodes and 54 Gy/30 F to the elective nodes. Acute toxicities (NCI-CTCAE v.3.0) were collected weekly during radiotherapy and weeks 1−4 and week 8 after RT. Late toxicities (RTOG and LENTSOMA) were recorded at 3, 6, 12, 18, 24 months and yearly to 5 years. Each DL recruited 15 patients with expansion of the cohort to 30 patients if one patient experienced high grade (G) ($\geqslant$G3) at 1 year. Dose limiting toxicity was defined as >2/30 patients experiencing $\geqslant$G3 at 1 year.
Results: Between 02/2002 and 12/2010, 15 patients were enrolled to DL1 and 30 patients to DL2. Indications for RT were: locally advanced disease with positive resection margins and/or extensive nodal disease. Incidences of G2 and G3 toxicities in DL1 were: dermatitis (29%, 36%), dysphagia (64%, 29%), fatigue (50%, 7%), mucositis (50%, 29%), pain (43%, 21%) and xerostomia (23%, 8%). For DL2, incidences of G2 and G3 toxicities were: dermatitis (52%, 21%), dysphagia (62%, 17%), fatigue (38%, 0%), mucositis (45%, 10%), pain (55%, 14%) and xerostomia (55%, 10%). All patients completed RT without treatment breaks. Peak prevalence of G3 dysphagia was at 6 weeks post IMRT for DL1 (29%) recovering to 0% at 8 weeks post-RT and at 1 week post RT for DL2 (17%) recovering to 5% at 8 weeks post-RT.
Conclusions: Modest acceleration and dose-escalation is safe and feasible. The incidence and prevalence of acute toxicities are similar in both cohorts. Longer follow-up is required to determine if dose-escalation continues to be safe at 1 year post-RT and whether there is any impact on local control.

8556 POSTER

Laryngeal Carcinoma in Young Adults Under Forty Years Old

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Background: Larynx cancer represents 5% of all the male cancers and 25% of the upper digestive airways. These cancers are mainly noticed men (95% of the cases), from 45 years to 70 years old. They are rare before the age of 40 (5%). Laryngeal cancer often occurs in alcoholic-smoking patients leading to a late diagnosis problem.
Material and Methods: This is a retrospective study involving a series of larynx cancer in the subject under 40 years old over a period of 10 years. We report the findings of our experience as well as a review of literature. The overall survival was calculated according to Kaplan–Meier method.
Results: During this period, 880 patients were treated for larynx cancer. Among them, 23 patients were under the age of 40 years, but only 13 patients were evaluable. The mean age of our patients was 35 years with extremes of 25 to 40 years. 69.5% of the patients were smokers. Dysphony was the most frequent motive behind consultation. It was noticed in 19 patients (82.6%). The affection of three floors of the larynx has been reported in 15 patients.
The extra laryngeal extension was noticed in 10 patients. Nine patients underwent whole laryngectomy combined to lymph dissection; 4 of them bilateral and 4 were homolateral, one patient underwent saving laryngectomy without lymph dissection.
Among the 8 nodes samplings, 3 were metastatic with capsular rupture. The chemotherapy–radiotherapy association with curative aim was used in 9 patients.
8 patients are in complete remission. 4 patients had therapeutic failure and one is lost to follow-up.
Conclusion: Larynx epidermoïd carcinoma, despite its rareness has to be evoked whenever there is a chronic dysphony in the young subject even in the absence of risk-factors. This allows diagnosis and precocious treatment. The biologic behaviour of the larynx epidermoid carcinomas in young adult patients does not seem to be worse than larynx cancers of comparable size in older patients. The treatment must lead to a compromise between the aggressive character of larynx epidermoid carcinomas and the importance of the psychological impact of the functional sequels caused by radical surgical treatment.

8557 POSTER

The Characteristics of Tumour and Involved Lymph Nodes in Human Papilloma Virus (HPV) Related Oropharyngeal Carcinoma Determined by Gross Tumour Volumes (GTV) Defined for Radiotherapy Planning

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Background: HPV-related [HPV(+)] oropharyngeal carcinoma (OPC) has well described differences in epidemiology and prognosis compared to HPV-unrelated [HPV(−)] OPC. The differences in the distribution of gross disease are less well described. This study compared the characteristics and distribution of primary tumour and involved lymph nodes (LNs) between HPV(+) and HPV (−) OPCs based on gross tumour volumes (GTVs) defined for radiotherapy (RT) planning.
Methods and Materials: All OPC patients treated with IMRT from 2005–2009 were included. HPV status was ascertained by p16 staining. GTV of primary tumour (GTV-T) and LN (GTV-N) were delineated on planning CT for treatment by Radiation Oncologists blinded to HPV status. GTV-N was defined as a nodal GTV designated to receive full RT dose. Clinical and radiological features (location, dimensions, number and volume) were determined for GTV-T and GTV-N and compared between HPV(+) and HPV(−) OPCs.
Results: HPV status was evaluated in 230/499 (46%) OPC cases, revealing 180 (78%) HPV(+) and 50 (22%) HPV(−). HPV(+) OPC arose almost exclusively in tonsil or base of tongue compared to HPV(−) (96% vs. 66%, $p < 0.01$), for whom 34% arose in soft palate, or pharyngeal walls. HPV(+) OPC was less likely to be T4 (16% vs. 30%, $p = 0.03$) with smaller GTV-T (81% <6 cm vs. 70%, $p = 0.03$) and (70% $\leqslant$30 cc vs. 54%, $p = 0.03$). A GTV-N was defined in 90% of HPV(+) cases in contrast to 76% of HPV(−) cases ($p = 0.01$). The largest GTV-N was larger for HPV(+) cases (82%

⩾5 cc vs. 50%, p < 0.01). There was no difference between HPV(+) and HPV(−) with respect to the presence of multiple GTV-N (69% vs 72%, p = 0.82), involvement of level II (98% vs. 97%, p = 0.76) or retropharyngeal nodes (12% vs 16%, p = 0.50). Frequency of bilateral neck involvement was similar for all cases (35% vs. 39%, p = 0.57), however, HPV(+) OPC not extending to midline had less bilateral GTV-N (9% vs. 36%, p = 0.013). More LN had cystic appearance for HPV(+) OPCs (52% vs. 24%, p < 0.01). **Conclusions:** HPV(+) OPC rarely arises beyond tonsil or base of tongue and more frequently has gross nodal involvement compared to HPV(−) OPC. Involved nodes tend to be larger and more often (though not exclusively) cystic than HPV(−). The number, level and laterality of involved nodes are similar between the two groups with the exception of relatively rare bilateral involvement in HPV(+) OPC without primary tumour midline extension.

8558 POSTER

An Open, Multicenter Clinical Study of Cetuximab Combined With Intensity Modulated Radiotherapy Plus Concurrent Chemotherapy in Locally Advanced Nasopharyngeal Carcinoma

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Background: To evaluate the safety and efficacy of cetuximab combined with IMRT + concurrent cisplatin chemotherapy in patients with locoregionally advanced NPC in a Chinese multicenter clinical study.
Methods: Patients with primary stage III − IVb non-keratinizing NPC were enrolled. The planned dose of IMRT to gross tumour volume (GTV) was 66–75.9 Gy in 30−33 fractions. Cisplatin (80 mg/m^2, q3week (w)) and cetuximab (400 mg/m^2 one w before radiation, and then 250 mg/m^2/w) were given concurrently for 6−7 weeks. The response rate was evaluated according to RECIST 1.0, and adverse events (AEs) were graded according to CTCAE v3.0.
Results: From July 2008 to April 2009, 100 patients were enrolled. With a Medium follow-up time of 13.1 months, No patients withdrew from the study. With the exception of one patient who experienced a grade 3 acne-like skin rash which developed in the 4th cycle and which did not recover to grade 2 skin rash in two weeks. Actual median dose to GTV and positive cervical lymph nodes were 69.96 Gy and 68 Gy, respectively. Median dose of cisplatin was 133.17 mg/cycle. 99% of all included patients finished the planned treatment. No toxic deaths were observed during the treatment. AEs of this combined modality treatment mainly consisted of acneiform skin eruptions, dermatitis, mucositis, xerostomia, leucopenia and slight ALT elevations etc. Typical skin rash toxicity (grade 2/3) was observed in 64/100 patients (64%) mainly starting at the third week of cetuximab treatment. Only one patient had a mild infusion related reaction, which happened in the first week of cetuximab therapy. From the third week of radiotherapy, 58% and 90% of the patients began to suffer from grade 1 dermatitis and ⩾ grade 2 mucositis, respectively, while grade 4 mucositis (spontaneous bleeding) was observed in 2% of the patients. 40% of patients experienced ⩾ grade 2 xerostomia. Besides 2 cases of mucositis, no other grade 4 AEs were observed. Bone marrow suppression was mild, and only 8%, 4% and 5% patients had ⩾ grade 2 decreased ANC, Plt and Hb, respectively. Locoregional control rate at 3 months after the stop of chemoradiotherapy was 100% (n = 93). With a median follow-up of 330 days, no local recurrence occurred (both nasopharyngeal site and positive lymph nodes) in any patient. Within the follow-up period, distant metastasis occurred in 4 patients (4%), out of these, 3 cases were lung metastasis. 5 patients died during the follow-up period (5%), 2 patients from tumour progression, 1 hemorrhage in nasopharynx, 1 hemorrhage in abdomen and 1 non-tumour related death.
Conclusions: The combined treatment modality of IMRT + concurrent chemotherapy + cetuximab in loco-regionally advanced NPC was well tolerated, with a very encouraging loco-regional control rate and metastasis-free survival rate at 1 year. Further investigation of this combination in treatment in Loco-regional NPC is warranted.

8559 POSTER

Single Vocal Cord Irradiation − a Competitive Treatment Strategy in Early Glottic Cancer

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Introduction: The treatment of choice for early glottic cancer is still being debated. Although most groups agree that good local control (LC) can be obtained with both laser surgery or radiation therapy (RT), the treatment modality of choice ultimately relies on best functional outcome. In order to optimize the quality of voice, a novel 4D conformal technique for single vocal cord irradiation (SVCI) was designed.
Material and Methods: For reference purposes, the records of all patients with newly diagnosed squamous cell carcinoma of the vocal cord (164 T1a), treated between 2000 and 2008 in the Erasmus MC by RT only, were analyzed. All patients were irradiated to a total dose of 60−66 Gy, using conventional RT techniques (i.e. 6 MV wedged parallel-opposed photon beams, mean field sizes of ⩽ 36 cm^2 [6x6], fraction sizes varying between 2−2.3 Gy). Patients were analyzed for local control (LC). The Quality of Life (QoL) was determined by the EORTC H&N 35 questionnaire (investigating dry mouth, swallowing problems & speech). Also the VHI (Voice Handicap Index), as well as the thyroid function status (measuring TSH [Thyroid stimulating hormone] blood levels), were established. Finally an on-line image guided SVCI technique was developed (Osman et al., R&O 2008).
Results: For the 164 T1a patients, a LC rate at 5-years of 93% and a VHI of 12.7 (0−63) was determined. Using the SVCI technique it was feasible to irradiate one vocal cord within 1 mm accuracy. This way, sparing of the contralateral (CL) vocal cord and CL normal tissues at risk (e.g. the strap muscles, constrictor inferior muscle, carotid arteries, thyroid gland, laryngeal cartilages and arytenoids), could be achieved.
Conclusions: This paper first analyzes T1a vocal cord lesions when treated by conventional P-O external beam RT techniques. Planning studies using on-line image guidance demonstrated the feasibility of irradiating a single vocal cord with significant sparing of the CL normal tissues at risk. First few patients using cone beam CT have been treated and results will be discussed (e.g. voice, VHI, clinical photographs). A feasibility study of using a Cyberknife with large fraction sizes for SVCI in case of T1a lesions (5x8.5 Gy, prescribed to 80% isodose in overall treatment time of 2 weeks), is currently underway. It is argued that SVCI is a save and competitive alternative to laser surgery.

8560 POSTER

Dosimetry, Clinical Outcome and Quality of Life in Postoperative Image-guided Intensity Modulated Radiation Therapy in Sinonasal Cancer

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Background: This study is aimed to assess the dosimetry, clinical outcome and quality of life in patients of locally advanced sinonasal cancer undergoing surgery followed by adjuvant image-guided intensity modulated radiation therapy (IGIMRT).
Materials and Methods: We enrolled 5 patients (pts) of sinonasal cancer(stage III-IV, age ⩽70 years, KPS ⩾70, R0/R1 resection) for IGIMRT in a project. Clinical target volume (CTV) comprised high risk (HR) CTV: surgical bed and low risk (LR) CTV: retropharyngeal, level IB and II lymphnodal site(only in T3/T4 squamous or poorly differentiated carcinoma). An isotropic 3 mm expansion was given around CTV to generate planning target volume (PTV). Prescribed dose was 60 Gy/30#/6 weeks to HRPTV and 50 Gy/30#/5 weeks to LRPTV (simultaneous integrated boost). IMRT was planned by 7−9 coplanar equally spaced beams (step & shoot multileaf collimator) with 6 MV photons with dose prescribed at 95% isodose (Pinnacle TPS v8.0m). Treatment verification was performed with kilo-voltage cone beam CT(KVCBCT) on first 3 days of treatment and subsequently twice a week (Elekta Synergy S). Positional correction was done when translational error was >3 mm. Toxicity charting was done weekly using RTOG criterion. Quality of life was assessed pre-RT, immediate post-RT & 3 month post-RT using EORTC QLQ-C30 version3 & QLQ-H&N35module.
Results: The median age was 45 years with male: female ratio of 2:3. Primary site was nasal cavity-2 pts, maxilla-2 pts and eithmoid-1 pt (stage T4N0M0 in all). Histology was squamous, adenoid cystic and adenocarcinoma in 2, 2 and 1 pt respectively. Median D95 PTV was 58.75 Gy. Median conformity & homogeneity (D2/D98) indices were respectively 1.17 & 1.13. Median value of dose maximum to organs at risk (OAR) were- brainstem: 51.67 Gy, spinal cord: 33.66 Gy, optic chiasma: 54.45 Gy, optic nerve: 55.16 Gy (left) & 51.84 Gy (right), eye: 50.9 Gy(left) &