(10%–90%) were by 41% (487 ccm) and 29% (747 ccm), respectively, smaller using PRT as compared to the photon plan. PRT was able to restrict liver irradiation to its postero-medial aspects. At the 95% isodose level, only 11% and 6% of liver volume were included with PRT versus 37% and 40% in the photon plan.

Conclusion: Using its unique, physical characteristics of beam stopping PRT to the retroperitoneum can achieve excellent target dose conformity with significant dose reduction of abdominal organs.

323 POSTER

Photodynamic therapy (PDT) in superficial malignomas using visible light and various photosensitizers plus minus hyperthermia

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Purpose: To treat superficial malignomas with PDT plus minus Hyperthermia to overcome hypoxia, especially in pretreated areas using various photosensitizers of the second generation.

Methods: PDT using visible light from a halogen source was applied in 9 patients in up to 5 sessions each. Superficial lesions were mostly basaliomas and chest wall recurrencies after pretreatment with radiotherapy. Photosensizers were Hypericin (Hyp), Delta-Amino-Levulinic Acid (ALA) and Folinic Acid (FA). To overcome hypoxic effects in pretreated areas Hyperthermia was intended adjusting the light source accordingly. The sensitizers were applied topically for ALA and FA and topically or subcutaneous for Hyp.

Results: Remissions were evaluated clinically and by means of our home made photodiagnostic method (presented in another presentation of our working group at this congress). At least partial remissions were achieved in all lesions treated. Hyperthermia up to 44.5 degrees C was observed. Remissions are permanent in lesions down to a depth of 3 mm, in deeper regions PDT as done in the mentioned method is not sufficient.

Conclusion: topical PDT using second gereration photosensitizers like ALA, FA and Hyp and non-coherent light from a halogen source is successful in treatements of superficial lesions such as basaliomas or lenticuli. To overcome hypoxic areas Hyperthermia may be added in heavily pretreated patients. For deeper (than 3 mm) lesions new sensitizers are to be explored.

324 POSTER

Intensity modulated radiotherapy (IMRT) for carcinoma of the thyroid and parotid gland

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Purpose: Using IMRT it is possible to deliver a radical radiation dose to a concave target volume while sparing radiosensitive normal tissues within the concavity. We have applied this technology to tumours in the head and neck region to estimate the potential benefits of IMRT over conventional radiotherapy.

Patients and Methods: Conventional radiotherapy plans were compared to IMRT plans from the CORVUS inverse planning system (NOMOS Corporation) for 4 patients treated for carcinoma of the thyroid and parotid gland.

Results: For patients with thyroid cancer the goal was to deliver 60 Gy to the thyroid bed and upper deep cervical lymph nodes (a concave target volume). The conventional treatment in two phases achieved a minimum target dose of 48 Gy limited by a maximum spinal cord dose of 44 Gy. IMRT could have achieved the goal target dose with a spinal cord dose of less than 30 Gy.

For patients with malignant parotid tumours 60 Gy was delivered to the parotid bed. For conventional treatment the mean dose to the cochlear, contralateral parotid gland, oral cavity and spinal cord were 48 Gy, 2 Gy, 20 Gy, 20 Gy. Using IMRT they were 27 Gy, 2 Gy, 16 Gy, and 20 Gy.

Conclusion: The dose that can be delivered to the thyroid bed and adjacent nodes with conventional radiotherapy is limited by its proximity to the spinal cord. IMRT improved the dose distribution and could allow dose escalation. For parotid gland tumours, IMRT conformally avoids radiosensitive normal tissues which may reduce complication rates.

325 POSTER

Patient diode dosimetry for electron beam treatments: Clinical implementation and dosimetric considerations

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Purpose: To implement a clinical electron diode dosimetry program and quantitatively assess the effect of using diodes on patient prescribed doses.

Methods: A commercial diode dosimetry system was used for dose measurements. Film dosimetry was used to study the magnitude of beam perturbations caused by diodes. Beam profiles at 90% iosdose depths were measured with and without the diode on the beam central-axis for 6–20 MeV electron energies and for electron applicator/insert sizes from a 3 cm circle to a 25 × 25 cone. A total of 809 in-vivo dose measurements were performed on 360 patients treated on our Clinac-2100C/D. Deviations larger than ±6% were investigated and corrective measures were taken, if necessary.

Results: Patient dosimetry revealed the following range of deviations from the prescribed dose: Breast (222 patients, 461 readings) −20.3 to +23.5% (median 0%); Head and Neck (63 patients, 167 readings) −21.5 to +14.8% (median −0.7%); Other sites (75 patients, 181 readings) −17.6 to +18.8% (median +0.5%). Eighty-one measurements (10%) in 69 patients (19%) showed deviations larger than 6%, but in every case the difference was found to be due to diode positioning, which was the most difficult in areas with rapidly changing contours and/or sloping surfaces. In 38% of the head and neck (posterior neck) patients initial dosimetry resulted in false readings compared to breast (15.8%) and other sites (13.3%). The diodes themselves caused beam perturbation and dose reduction, particularly with small fields and low energies. The dose reduction at the depth of 90% isodose along the beam central axis ranged from 16% (for a 6 MeV/3 cm diameter circular field) to 4% (for a 12 MeV/10 × 10 field).

Conclusion: With some caveats, diode dosimetry for electron therapy was found to be valuable for verifying the accuarcy of dose delivery in real-time. Electron diode dosimetry appears unreliable in situations where the surface contours are irregular and action levels must be modified accordingly. Frequent use of diodes on a small field treated by low energy electrons is undesirable because it might result in appreciable underdosage due to perturbation of the isodoses.

326 POSTER

Pulsed dose rate brachytherapy in the treatment of head and neck carcinoma

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Purpose: PDR BT is a new treatment that combines radiobiological advantage of LDR BT with advantages of HDR BT due to the use of stepping source.

Methods: From 6/94 to 2/99, 38 pts. received 41 treatment for head & neck carcinoma. Indications: 1. boost after EBT (12 pts.), 2. primary BT (4), 3. recurrence after prior RT (25). Localisations 1. tongue (14 T2N0; 9 T3N1), 2. floor of the mouth (5 T2N0; 2 T3N0; 1 T3 N2), 3. soft palate (1 T1N0; 4 T2N0), 4. buccal mucosa (2 T2N1; 1 T3N1), 5. maxillary gingiva (2 T2N0). Interstitial plastic tube technique was used for 39 and mould for 2 applications. 2–8 tubes were inserted with 12–20 mm spacing. CTV encompassed GTV with about 10 mm safety margins. 3D-CT planning was done for 37 and 3D-MRI for 5 applications according to the Paris rules. One pulse/hour was given continuously with prescribed dose of mean 0.5 Gy (range 0.4–1.0). The mean treated volume was 21 ccm (11–62). Total dose for boost has been 25 Gy (9–30), 60 Gy for primary BT and 30 Gy (20–60) for recurrences. Follow-up is median 32 mts. (1–57).

Results: BT was tolerated well, no major problems with BT equipment occurred. CR had 27/41 (65.8%) and PR 14/41 (34.2%) pts. 6 weeks after BT. 15/41 (36.5%) developed recurrence (all have received PDR BT for recurrence after prior RT). Side effects: acute (RTOG score): mucositis-grade II 8/41 (19.5%), III 6/41 (14.6%), IV 3/41 (7.3). Late side effects: mucosa-grade II 8/41 (19.5%).

Conclusion: Although the number of patients in our study is small, we can conclude that PDR BT enables good local tumor control for both curative and palliative intention with acceptable side effects.