Conclusions: Contralateral metastatic lymph nodes are located more caudal than ipsilateral metastatic lymph nodes, in case of oropharyngeal or hypopharyngeal carcinoma. The position of the most cranial ipsilateral metastatic lymph node can not be used as a prognostic factor for the location of the most cranial contralateral metastatic lymph node. In elective irradiation, lowering the border of the contralateral irradiation field with 20mm below the base of the skull might be considered. Lowering the border at the ipsilateral site is not advised.

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Quantitative description of late normal tissue complications after radiation therapy

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Purpose: An increasing number of patients survive cancer after having received radiation therapy. Therefore, the occurrence of late normal tissue complications among long-term survivors is of particular concern.

Methods: Based on the analysis of our own data (Svoboda et al., Radiother. Oncol. 1999; 53: 177-187) and numerous data sets from published reports it was shown, that three types of kinetics might be identified for the incidence of late normal tissue complications occurring after radiation therapy, provided the percentage of patients being free from late effects is plotted as function of time after treatment (Jung et al., Radiother. Oncol. 2001; 61: 233-246): Type 1, purely exponential kinetics; type 2, exponential kinetics, the slope of which decreased exponentially with time; type 3, curves composed of two components, a fast initial decline followed by an exponential decrease.

Results: Analysis of further data showed, that the curves of type 2 may also be described by one exponential component and a constant fraction, in particular when the total doses applied were relatively inhomogeneous. The constant fraction may indicate, that a portion of the patients received relatively small doses for which the risk of developing late effects was virtually zero. Thus, type 2 kinetics may be regarded as a special case of type 1 kinetics. In one subgroup of the patients, late effects occurred at exponential kinetics, whereas in the second subgroup total radiation dose was so small that late side effects did not occur even for longer observation periods.

Conclusion: Our results indicate that the risk for the occurrence of late complications after irradiation may remain constant for many years, either for all patients treated or for a subgroup exposed to doses exceeding the tolerance limit of the tissue under consideration. – Supported by Roggenbuck Foundation, Hamburg.

493 POSTER

Three-dimensional conformal radiotherapy (3D-CRT) planning for prostate cancer: 3 vs 4 vs 6 fields plans

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Introduction: Radiotherapy is an effective treatment for localized prostate cancer. 3D-CRT planning makes it possible to increase the tumor dose and decrease the local toxicity. The optimal 3D-CRT plan for prostate cancer has not yet been determined.

Aim of this study: To define the optimal 3D-CRT plan for localized prostate cancer, i.e., the plan that gives the lowest dose to the rectum, urinary bladder and hip joints

End Points: % of critical volume irradiated and the % of critical volume that received 75% of prescribed dose

Material and methods: 10 consecutive pts with T1-2,N0,M0 prostate cancer scheduled to receive radiotherapy underwent evaluation to define the optimal 3D-CRT. The first part of radiotherapy consisted of small pelvis volume, the prostate + seminal vesicles with 2 cm margins, usually 12 X 12cm, given by box technique for a total dose of 50Gy. The second part consisted of the prostate and base of seminal vesicles and was given by 3D CRT planning. Pts were CT-scanned in a supine position at 5-mm interval, 2 cm inferior to ischial tuberosities to the bottom of sacroiliac joint. Neither immobilization device nor contrast medium was used. No specific guides concerning the status of urinary bladder and rectum were given to the patients. Three different treatment plans were generated for each patient: 1) three-fields plan: one anterior and two posterior oblique (0^0, 115^0, 245^0) with wedge 30^0 in oblique fields; 2) four-fields plan: anterior, posterior and two lateral fields (0^0, 90^0, 180^0, 270^0) without wedges and 3) six-fields plan: 2 lateral, 2 anterior in oblique and 2 posterior in oblique fields (40^0, 90^0, 140^0, 220^0, 270^0, 320^0) with wedges 30^0 in oblique fields. DVH of the prostate and seminal vesicles and of the critical structures was generated and presented numerically and graphically.

Results: The mean critical volume irradiated by 3, 4 and 6 fields plans for the rectum was 66%, 63% and 63%, for urinary bladder 57%, 56% and 45% and for the femoral heads 20%, 31% and 27%, respectively. The % of critical volume that received 75% of the prescribed dose by 3, 4 and 6 fields plans for the rectum was 54%, 35% and 37% and for the urinary bladder 40%, 335 and 27%, respectively.

Conclusion: Six-fields 3D-CRT plan is recommended to reduce the irradiation dose to the urinary bladder and rectum. Three-fields 3D-CRT is recommended to reduce the irradiation dose to femoral heads.

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Combination of ibandronate and radiotherapy in metastatic bone disease – final results of a randomized phase II trial

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Background: This randomized phase II trial investigated the synergistic effects of local radiotherapy combined with intravenously infused ibandronate with different application schemes.

Material and methods: 52 patients with lytic bone metastases from various solid tumors were included in the study (28 female and 24 male patients with a median age of 56 years). Baseline ECOG-PS was 02. The minimum follow-up period was 10 months.

A total dose of 36 to 40 Gy was locally applied on painful metastases. Treatment group A received ibandronate 4mg i.v. on the first day of irradiation plus 3 mg i.v. every 28 days for one year. Group B received ibandronate 1 mg i.v. on day 1, 8, 15, and 22 of radiotherapy, and an additional 3 mg i.v. every 28 days for one year. The patients were randomly assigned to treatment groups A and B. Stratification was done according to histology.

Pain intensity was measured using a visual analogue scale (VAS). The need for analgesics was documented and recalcification was analyzed semi-quantitatively.

Results: The median baseline VAS score for all patients in the study was 8 (range 104) [group A: 8 (range 9-4); group B: 7 (range 10-4)]. Eight weeks after treatment initiation, the median VAS score was 1 (range 5-0) [group A: 0 (range 5-0); group B: 1 (range 5-0)]. At the time of final data analysis (minimum follow-up period 10 months), the median VAS score was 0 (range 5-0) [group A: 0 (range 5-0); group B: 0 (range 3-0)].

The median WHO analgesic score before treatment was 3 (range 51) [group A: 3 (range 4-1); group B: 3 (range 5-1)]. After 8 weeks of treatment, the median analgesic score was 1 (range 4-0) [group A: 1 (range 4-1); group B: 1 (range 3-0)]. At the time of final data analysis, the median analgesic score was 1 (range 3-0) [group A: 1 (range 3-0); group B: 0 (range 3-0)].

In group A, 7/26 patients demonstrated complete recalcification, 13/26 patients had a partial recalcification, and recalcification had begun in 6/26 patients. In group B, the numbers for complete, partial and initiation of recalcification were 9, 11 and 6 (out of 26) patients, respectively. The total recalcification rate was 40/52 (77%). Median survival in both groups was 11 months. There were no statistically significant differences between treatment groups in pain scores, analgesic scores, or recalcification rates. No side effects due to infusion of ibandronate were observed.

Conclusions: The combination of local radiotherapy and intravenously applied ibandronate leads to a fast and substantial pain relief, which is maintained in the long-term.

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Targeted delivery of radioactive magnetic carriers in a rabbit liver tumor model

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Magnetic targeted delivery of the radionuclide, ^{90}Y, was investigated in liver-implanted rabbit tumors as a means of localized radiotherapy. CT scans and fluoroscopy were used to confirm VX2 tumor development. Rabbits were anesthetized and the left hepatic artery was selectively catheterized to within 2 cm of the tumor for a single intra-arterial infusion of either ^{90}Y labeled Magnetic Targeted Carriers (MTC-^{90}Y) or MTCs alone. The 5 ml infusions consisted of the radionuclide irreversibly bound to 25 mg MTCs