patients is very low. To decrease the pain level and to increase QL, hemibody irradiation (HBI) is performed.
Purpose: Evaluation of the frequency and intensity of early adverse reactions after HBI.
Material and Methods: Material was comprised of 59 patients (30 females, 29 males), aged from 37 to 80 (mean 59) with painful, multiple bone dissemination, irradiated for half of the body. Most frequent clinical diagnoses were prostate (22) and breast (26) cancers. Most frequent pathological diagnosis was adenocarcinoma (49). 26 patients were irradiated (6 Gy) for upper (UHBI), 26 (8 Gy) for lower (LHBI) and 7 (6 or 8 Gy) for middle (MHBI) part of the body. All patients in treatment day got 500 ml of intravenous fluid, metoclopramid i. m. and dexaven i. v. 2 weeks after HBI nausea and vomiting, diarrhea, skin changes, leuco and thrombocytopenia were evaluated in 5 degrees scale different for each symptom (from 0 [lack of symptom] to 4 [very intense]). Patient's weight was measured in the treatment day and 2 weeks later. Statistical analysis based on Spearman and Mann-Whitney tests was performed.
Results: Nausea and vomiting appeared in 31, diarrhea in 14, leucopenia in 18 and trombocythopenia in 7 cases. Means of intensity were 0.9, 0.34, 0.47, 0.31 respectively. Only in one case 4 degree reaction appeared (trombocythopenia <25000/mm^3). In 3 cases delicate skin erythema appeared. Average weight in the treatment day was 69.6 kg and 67.7 kg 2 weeks later. Significant correlation between diarrhea intensity and delivered dose was found (R = 0.31). Significant differences between nausea and vomiting intensity after U (mean 1.2) and LHBI (mean 0.5) (p = 0.01) and diarrhea intensity after U (mean 0.008) and LHBI (mean 0.5) (p = 0.02) were found.
Conclusion: Adverse reactions after HBI are on the acceptable level. Diarrhea depends on delivered dose and is more frequent after LHBI and nausea and vomiting appear more frequently after UHBI.

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Dose evaluation of elective nodal region of head and neck cancer in conventional radiation therapy – How much elective nodal region should be included in IMRT?

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Background: To evaluate the irradiated dose of elective nodal region which is recommended in IMRT for head and neck cancers in conventional radiation therapy.
Materials and Methods: In this analysis, 20 patients with head and neck cancers who recievwd conventional radiation therapy at Kagawa University were enrolled (6 patients with laryngeal cancers, 7 with oropharyngeal cancers and 7 with hypopharyngeal cancers). The follow-up at the time of evaluation ranged from 2 to 36 months (median 7 months). We delineated elective nodal region (Level I-V, retropharyngeal space; RP) with guideline 1) in each patients retrospectively, and calculated V50, 80, 95, and D95. We referred to the report of Chao 2) for the extent of elective nodal region. The dose of elective nodal irradiation was 40 to 50Gy in conventional fractionation. All patients were administrated concurrent chemotherapy.
Results: The table shows V95 in each elective nodal region. Though level II and III were involved in irradiated fields in all patients, the dose was low in many patients. Especially, level IV tended to be out of the irradiated fields in the patients with laryngeal and oropharyngeal cancers, and therefore the dose of level IV was especially low. We did not observe any nodal recurrence except in three patients who were performed nodal dissection after radiation therapy as scheduled.

V95 (%)	Ib	IIa	IIb	III	IV	V	RP
Laryngeal		68.3	42.0	93.5	20.3		
Oropharyngeal	84.6	98.9	78.0	78.7	43.4	44.8	85.0
Hypopharyngeal	75.5	88.1	59.3	93.6	70.6		69.7

Conclusions: In conventional radiation therapy, we observed low dose region even in nodal regions which seemed irradiated, and therefore improvement of the dose distribution in IMRT is needed. On the other hand, although the follow up period was short, we did not observe any nodal recurrence in most of the patients and the influence of chemotherapy was considered to be great. We have to discuss how much elective nodal region should be included in IMRT for patients with head and neck cancers who recieve chemotherapy.

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951 POSTER

Survival after radiotherapy of metastatic spinal cord compression

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Background: Prognostic factors predicting for survival of metastatic spinal cord compression (MSCC) patients would be helpful to facilitate the selection of an appropriate radiotherapy (RT) schedule (shorter-course vs. longer-course RT) for the individual patient. This study investigated the prognostic factors and overall survival after radiotherapy for MSCC.
Materials and Methods: In this retrospective analysis, 90 patients irradiated for MSCC between January 1, 1998 and December 31, 2006. Inclusion criteria were confirmation of MSCC by magnetic resonance imaging (MRI). Of the entire cohort, 61 patients (68%) were male and 31 (32%) were female. Median age was 62 years (range 23−82 years). Type of primary tumor was 15 lung, 13 prostate, 14 breast, 7 unknown primary and 38 others. Pain was the earliest symptom of SCC in the majority of patients, being present before neurological signs in 71%.
Radiotherapy was performed with 6−15 MV linear accelerators in 63 patients and 60Co machines in 27 patients.
The prognostic factors investigated were age, sex, location of primary tumor, involved vertebra, other bone metastases, visceral metastases, and pretreatment performance status.
Multivariate analysis was performed using Cox regression analysis. Survival was calculated using the Kaplan-Meier method.
Results: The overall median survival was 121 days (range 6–1219 days). Among the 90 patients, 48 (53%) died within 6 months after RT and 60 (60%) died within 12 months after RT. Comparing survival and location of primary tumor, we found a median survival time of 6, 7 and 4 months for prostate, breast and lung carcinomas, respectively. The number of involved vertebra is a prognostic factor (p = 0.012). Also, the age and location of primary tumor has a slightly trend (p = 0.057 and p = 0.90, respectively); while, the sex, other bone metastases, visceral metastases, and pretreatment performance status was not statistically significant.
Conclusions: Prognostic factors predicting for survival of MSCC would be helpful to facilitate the selection of an appropriate RT schedule for the individual patient. In this study, survival only was associated with number of involved vertebra. For patients with a very poor expected survival (lung carcinoma) or few number of involved vertebra, shorter course appear appropriate because they are associated with less discomfort for the patients.

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Single-dose radiotherapy in the treatment of heterotopic ossification in patients with spinal cord injury: results of a prospective study

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Background: Heterotopic ossification is a common complication in spinal cord injury, characterized by the formation of ectopic bone in soft tissue surrounding peripheral joints. Heterotopic ossification always occurs below the level of the spinal cord injury, most commonly at the hip. It may cause a severe reduction of hip joint movement and lead to loss of sitting position, pressure sores, and also compromise activities of daily living. The aim of our prospective study was to evaluate the efficacy of radiation therapy for the treatment of heterotopic ossifications in the hips in spinal cord injured patients.
Patients and Methods: Between 4/2000 and 9/2006, 13 spinal cord injured men (median age 34.9 years) with heterotopic ossifications in the hips who underwent primary rehabilitation received radiotherapy at the Department of Therapeutic Radiology and Oncology Graz, Austria. The mechanisms of injury were: motor-vehicle accident (n = 7), fall incidents (n = 3) and miscellaneous (n = 3). At the start of rehabilitation, Alkaline phosphatase was elevated in 10 patients, and in 9 men heterotopic ossification was verified on x-ray. In the remaining patients, elevation of Alkaline phosphatase as well as heterotopic ossification became evident during rehabilitation. After three-dimensional treatment planning, photon beam radiotherapy was delivered to the hips (unilateral, n = 2; bilateral, n = 11) with a single dose of 8 Gy. Six patients received additional non-steroidal anti-inflammatory drugs.

Results: Radiotherapy was performed after a median time of 4.2 months following spinal cord injury. After a mean follow up of 15.8 months (median 10.5 months) x-ray showed a sharply outlined ossification without increase in heterotopic bone formation. In all patients, normalization of Alkaline phosphatase was obtained. No relevant adverse effects were observed.
Conclusion: Our results suggest that single dose irradiation is an effective local treatment option for spinal cord injured patients with heterotopic ossification in the hips. In all patients an adequate sitting position could be achieved.

953 POSTER

The effect of melatonin on radiation-induced hepatic damage in rats

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Background: The present study was undertaken to investigate the possible protective effect of melatonin against radiation-induced hepatic toxicity in rats.
Materials and Methods: Irradiation consisted of a single dose of 8 Gy (source to skin distance 80 cm) to the total body of the animals. Melatonin or vehicle (ethanol, %20) was administered immediately before, right after and 24 h after irradiation to the rats (melatonin dose: 10 mg/kg, 20 mg/kg and 10 mg/kg, ip, respectively) (The experimental groups are shown in Table 1). 48 h after irradiation, all animals were sacrificed using ketamine. Tissue samples were obtained to determine hepatic malondialdehyde (=MDA; a marker of lipid peroxidation), glutathione peroxidase (=GPx; antioxidative enzyme) and glutathione S-transferase (=GST; antioxidative enzyme) activities.
Differences between groups were statistically analysed by one-way analysis of variance (ANOVA). Post-hoc tests were done by using a multiple comparison procedure (Tukey Test). Statistical significance was accepted as $p < 0.05$.
Results: The MDA levels in the hepatic tissue were found to be significantly higher in group 2 when compared to control group ($p < 0.05$). Treatment with melatonin significantly decreased the MDA levels compared to group 2 ($p < 0.05$).
There was no significant difference in hepatic GPx activity between the control group and the irradiated group (group 2). After melatonin administration to the irradiated rats (group 3), hepatic GPx activity was found to be increased significantly when compared to group 2 ($p < 0.05$).
GST activity in the hepatic tissue was found to be significantly higher in the irradiated group 2 and 3 when compared to control group ($p < 0.05$).
Conclusion: The increase in MDA levels demonstrate the role of oxidative mechanisms in irradiation-induced hepatic tissue damage. On the other hand the activities of GPx and GST were elevated after melatonin administration. Melatonin has beneficial effects on hepatic damage in total body irradiation through the oxidative process.

Groups	Total Body Irradiation (8 Gy)	Ethanol 20%	Melatonin
1(control)	−	−	−
2	+	+	−
3	+	−	+

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The palliative effect of endobronchial brachytherapy for previously irradiated lung cancer patients

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Background: To evaluate the palliative effect of endobronchial brachytherapy (EBB) for patients who previously received the external beam radiotherapy (EBRT).
Materials and Methods: From July 1992 to May 2003, 29 patients with recurrent or persistent non-small cell lung cancer (NSCLC) were treated with palliative EBB at our institute. EBB consisted of 3 fractions (once a week) of 5 Gy, delivered 1 cm from source using the high dose rate remote afterloader. The symptomatic response rates were assessed. And the factors, such as age, performance status, previous EBRT dose, elapsed time from EBRT to EBB, the extent of endobronchial tumor, and the degree of occlusion were compared between symptomatic responders and non-responders.
Results: Median age was 62 years (46−71 years). Eastern Cooperative Oncology Group (ECOG) performance scale 1, 2, 3 was 13, 15, 1 patient respectively. Total dose of previous EBRT was median 54 Gy (45−63 Gy) with daily dose of median 2.5 Gy (1.8−3 Gy). Elapsed time from EBRT to EBB was median 7 months (1−102 months). 22 patients complained of 2 or more symptoms caused by endobronchial tumor. Type of symptoms were cough (n = 22), dyspnea (n = 16), hemoptysis (n = 11), obstructive pneumonia (n = 3) and chest pain (n = 1). The extent of tumor was to the distal trachea in 15 and to the main bronchus or lobar bronchus in 14 patients. 19 patients (66%) had nearly total (more than three quarter of the lumen) or total occlusion by tumor at first EBB. Median follow up was 6 months (1−34 months). Only 2 patients could not complete the scheduled treatment. The overall symptomatic response rates were 51% (27/53). Response rates as to the type of symptoms were 41% for cough, 50% for dyspnea, 82% for hemoptysis, and 33% for obstructive pneumonia. Of the type of symptoms, hemoptysis was better relieved than cough (Fisher's exact test, $p < 0.05$). The median time to symptom relapse was 6 months (3−31 months). 17 (59%) patients (symptomatic responders) were relieved from all or part of symptoms after or during EBB and 12 (41%) patients (non-responders) were not relieved from their symptoms at all. The symptomatic responders had better performance status (ECOG 1) or more tumor extent to distal trachea than non-responders. And the difference was significant statistically (Fisher's exact test, $p < 0.05$). Bronchopleural fistula was developed in 2 patients (7%) and one of them died of the complication.
Conclusions: The overall symptomatic response rates were 51% and the response maintained for 6 months. Palliative EBB, even though EBRT was given previously, could be effective especially if a patient has the symptom, such as hemoptysis caused by distal tracheal lesion.

955 POSTER

Management of CNS malignancies treatment outcome in patients referred to CRP

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Background: The author characterise central nervous system malignancies population refered to radiation treatment in Clínica de Radioterapia do Porto – Portugal.
Material and Method: This cohort represents all patients with CNS malignancies submited to radiotherapy between March 2002 and November 2005. The cohort was retrospectively analyzed for gender distribution, age, initial KPS, tumour grade, extent of surgical resection, time between surgery and radiotherapy, radiation treatment, survival, and toxicity.
Results: 163 patients (95 females and 68 males) with CNS malignancies (118 high grade tumour, 17 low grade tumour and 28 other tumour), were treated in adjuvant setting after surgery. The median age was 58 years (13−85) and 115 patients had a KPS $\geqslant$ 70 before treatment. 149 patients underwent major tumour resection (31 complete, 119 partial resection) and 14 biopsy (2 stereotatic). The median time between surgery and radiation was 27 days (ranging 8 to 176). 124 patients received radiotherapy, 5 of which followed by adjuvant temozolomide (30 cycles), and 38 received radiotherapy plus concomitant and adjuvant temozolomide (181 cycles). Median radiation dose was 56 Gy (ranging 4−76). 103 received 3D radiation technique and 58 2D. 6 patients had grade III/IV haematological toxicity (2 leucopoenia during single radiotherapy, 2 leucopoenia and 1 thrombocytopenia during radiation and chemotherapy treatment and 1 anaemia).
Conclusions: Radiation treatment is a feasible therapy option with acceptable toxicity levels. Good compliance to radiotherapy was observed in this cohort. Response to treatment is consistent with previous reported data.