

the XRT + C-NAM arm, nausea and vomiting were the most frequent side effects reported by rates of %50 and %24, respectively. Six weeks following completion of treatment, the improvements of performance status and pulmonary symptoms were significantly higher in XRT + C-NAM arm ($p = 0.001$ and $p = 0.019$). There was no difference in late toxicities between two arms in a median following time of 7.8 month ($p = 0.606$). Loco-regional control rate was significantly higher in XRT + C-NAM arm ($p = 0.003$).

Conclusion: Using carbogen and nicotinamide as a radiosensitizer in locally advanced NSCLC seems to be safe treatment with manageable toxicities. Preliminary tumour control rates are encouraging and clinical testing will be continued.

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Total body irradiation in the treatment of myeloma by autologous bone marrow transplantation (ABMT)

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To evaluate the toxicity and the contribution of TBI and high dose Melphalan as conditioning treatment for ABMT.

Methods: Twenty nine patients, mean age 55 years (41–65) with stage II (4 patients) or stage III (25 patients) multiple myeloma were treated after conventional chemotherapy with TBI followed 24 h later by melphalan (140 mg/m²). Before transplantation, 10% of the patients were in complete remission (RC), 34% in partial response (PR), 20% non responders. The prescribed dose of TBI (8 to 12 Gy, 2 fractions of 2 Gy per day at 9.8 cGy/mn dose rate), the dose to the lung (4 to 10 Gy) were adapted to the age.

Results: Median follow-up was 38 months. After transplantation, the overall response rate was 79% with 31% of CR and 45% of PR. Three toxic deaths occurred. Acute lung toxicities occurred in 30%, not correlated to dose. Late toxicity was noted in 6/26 patients (23%). Three-year actuarial survival was 72%, correlated with response to initial chemotherapy (100% in RC versus 56% in PR), response after BMT (81% in RC versus 50% in PR, $p = 0.0049$) and to delay between the diagnosis and BMT higher than 8 months (70% versus 0%, $p = 0.0093$).

Conclusions: Marrow transplantation conditioned by TBI and melphalan is: 1) a promising approach in patients under 65 years, 2) indicated early in the strategy of treatment, 3) needs to be adapted to age to minimize acute and late toxicity.

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Precision of fractionated stereotactic conformation radiotherapy of brain tumours

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Purpose: To assess the geometric accuracy of field alignment in stereotactic conformation radiotherapy of brain tumours.

Methods: In 20 pat. the transfer of the computer assisted 3-D treatment plan to the patient was evaluated by repeated computerscans. The precision during treatment delivery was quantitatively assessed using sequential verification films. Linear discrepancies were measured between treatment plan and repeated CT scans (reproducibility of the isocentre during treatment set-up) and between 20 consecutive verification films per patient (reproducibility during treatment deliv.).

Results: For the total group of patients, the distribution of all deviations showed mean values between 0.5 mm and 1.6 mm $\pm$ 0.7 mm–1.3 mm during treatment set-up and between 1.1 mm and 2.0 mm $\pm$ 0.6 mm–2.0 mm during treatment delivery, resp. For all patients, deviations for the transition to the treatment machine were similar to deviations during subsequent treatment delivery, with 95% of all absolute deviations less than 4.0 mm.

Conclusions: Random fluctuations of field displacements up to 4.0 mm during treatment set-up and delivery prevail. They must be considered when prescribing the safety margins of the planned target volume and should help to determine "cut-off points" for corrective actions in stereotactic conformation radiotherapy of brain tumours.

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Quantitative assessment of early and late postradiation skin reactions in breast cancer patients

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Purpose: In dermatology high-resolution ultrasonic systems are valuable to follow up inflammatory dermatoses. 20 MHz ultrasonic imaging is investigated for quantitative assessment of early and late postradiation skin reactions.

Methods: Between April and November 1996, 96 high resolution ultrasound examinations of the skin in 29 patients treated for breast cancer were analysed. Total doses were between 46 and 60 Gy. The time interval between completion of radiotherapy and ultrasonic examination was up to 135 months. Irradiated and non-irradiated skin were compared.

Results: Changes of thickness and texture of dermis and subcutis were found. There were significant differences between irradiated and non-irradiated skin in early ($p < 0.001$) and late ($p = 0.0018$) reactions. The most pronounced dermal thickening occurred in early skin reactions. During radiation therapy corium thickness correlated with administered dose. Echogenicity of upper and lower corium decreased. In upper corium the greatest reduction of signal intensity occurred in early reactions. Early reactions of lower corium differed significantly from late reactions ($p = 0.001$). Discrepancies between visible skin reactions described by examining physicians, and ultrasonic proved changes were obvious.

Conclusion: There are specific textures of early and late postradiation skin reactions in comparison to non-irradiated skin. In contrast to physical examination, high-resolution 20 MHz ultrasound is a non-invasive and quantitative, easy reproducible method for assessing and documentation of early and late skin reaction during and after radiotherapy.

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POSTER

Clinical experience with cross section imaging based conformal treatment planning procedures at 486 interstitial brachytherapy applications

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Purpose: Quality of a brachytherapy application depends on the choice of the target volume, on the dose distribution homogeneity and radiation injury on critical tissues.

Methods: Basic imaging method for conformal treatment planning is the cross-sectional imaging. The clinical applicability of a new type 3D planning system using CT and/or MRT-simulation or US-simulation for planning purposes was studied. The planning system developed at Kiel University differs from usual brachytherapy planning systems because of the obligatory use of cross-sectional imaging as basic imaging method for reconstruction of structures of interest. Dose distribution and normal anatomy can be visualized on each CT/MRT/US slice and on coronal-sagittal-axial- and oblique reconstructions (3D), as well as dose-volume histogram curves and special colour-coded visualization of dose homogeneity in the target can be analyzed.

Results: We observed on the base of planning procedures on 364 transrectal ultrasound (TRUS) guided prostate implants, 28 TRUS guided perineal implants with the RASHA applicator, 2 implants using surface templates as well as 92 free-hand plastic tube implants a significant input of quality in terms of the better interpretation of target delineation, delineation of critical structures as well as dose distribution.

Conclusion: Conformal brachytherapy treatment planning for interstitial brachytherapy means significant advantages for the clinical routine compared to 2D or semi-3D methods and offers new possible indications for implants.

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POSTER

Hemoglobin levels predict local regional control after postoperative radiotherapy for advanced head and neck cancer

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Purpose: Low hemoglobin (Hb) levels are associated with poor response to primary radiotherapy. This has been established especially for squamous cell carcinomas (SCC) of the head and neck (H&N). The present study