

Only 1 patient showed a transient grade 3 toxicity (pneumonitis), and there were no grade 4 acute/subacute side-effects. Two patients with stage III A central tumors in close proximity to the large vessels died due to a pulmonary hemorrhage 2 and 4 months after therapy, respectively. No patient developed esophagitis. Antimycotic prophylaxis for esophagitis and posttherapeutic steroid prophylaxis for pneumonitis (by turbobaler) for several weeks are used routinely.

Conclusions: This method allows to reduce radiation doses to normal tissues significantly and enables dose escalation in radiotherapy of lung cancer.

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POSTER

A simple technique for the optimization of the dose distribution in the lower neck and upper thoracic area

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Propose: Caused by the changing anatomy and tumor localisation, it is not easy to reach a conformal dose distribution in the lower neck and upper thoracic area. A simple technique with three blocked fields makes it possible to fit the dose to the planning target volumes.

Materials and Methods: For tumors of the cervical esophagus and the trachea three to four CT-scans are required. The planning target volumes in these planes are drawn and superimposed at the central plane. Computer planning is done for a three-field technique with one ventral and two ventral-oblique fields. Special blocking and collimator rotation gives a conformal dose distribution in all planes with different contours. With the proper choice of the central plane a optimal dose is reached in all planes.

Results: With this three-field technique it is possible to reach excellent dose distributions in tumors of the lower neck and upper thoracic region inspite of the big difference of body contours.

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POSTER

Subcutaneous amifostin during fractionated radiotherapy: A randomized phase II study in pelvic tumours

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Purpose: In the present study we investigated the radio-protective efficacy of a schedule of amifostin delivered subcutaneously.

Methods: A total of 40 patients undergoing radiotherapy for locally advanced pelvic cancer (bladder 14 pts, gynecological 12 pts, rectal 11 pts, sarcomas 3 pts) were enrolled in a randomized phase II trial. 20 patients received amifostin 500 mg rejected sc. 15–20 min before each fraction of conventionally fractionated radiotherapy. Amifostin was diluted in 5 ml of NS and rejected in 2 different sites. The toxicity was recorded daily following the WHO scale.

Results: Local rejection of the drug caused mild pain and bruises while grade 1 erythema was noted in 2/20 (9%) patients. Mild nausea was the main side-effect. Severe vomiting and asthenia that enforced amifostin interruption (after 4–15 rejections) was observed in 3/20 (9%) patients. One allergic episode with fever and generalised rash was observed. The incidence of intestinal radiation toxicity and the delays of radiotherapy were significantly reduced in the group of patients receiving amifostin ($p = 0.04$). Cystitis never occurred in the amifostin group. A substantial protection of the pelvic skin and perineal area was also observed.

Conclusions: Subcutaneous administration of Amifostin during fractionated radiotherapy is feasible and well tolerated. The profile of tolerance seem to be better than the iv. administration. The efficacy of the regimen in terms of radioprotection of pelvic tissues is confirmed.

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POSTER

Total body irradiation (TBI) before bone marrow transplantation (BMT): Technique and acute toxicity

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Purpose: to evaluate the TBI methods in the National Institute of Oncology between January 1984. and February 1998.

Patients and Methods: 124 patients underwent TBI prior to BMT in the last fifteen years. A special cobalt unit has been used, the dose rate was

6–8 cGy/min. The source-midline distance (SMD) was 340 cm and the field size was 80 × 200 cm. The dose calculation was done on the basis of Tissue-Phantom Ratio curve measured in TBI conditions and effective tissue thickness (ETT). Between 1984 and 1992 the beam direction was horizontal, the patients lay in lateral position. In 11 cases the total dose to the abdominal midline was 10 Gy, in one fraction. From 1986 the fractionation changed to 4 × 3 Gy in 4 days. With individual lung shielding the average lung dose was 8.5 Gy. In 44/124 cases the order of conditional treatment was chemoradiotherapy. Since 1992 vertical beams were used, and the patients (80/124) laid in prone/supine position. The fractionation remained the same but radio-chemotherapy regime has been used.

Results: The irradiation in prone position proved to be safer than lateral because of smaller patient motion and it resulted in a more accurate positioning of lung shielding too. In all cases, the acute side effects (headache, nausea, vomiting) were moderate. Using radio-chemotherapy the acute side effects during the TBI were uncommon, and well tolerable.

Conclusion: Our technique with the large SMD, vertical beam direction and the supine/prone position is stable, convenient and safe to produce homogenous dose distribution and ensures accurate and reproducible lung shielding.

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POSTER

External beam radiotherapy of intraocular metastases

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Purpose: We tried to assess if the use of lens-sparing irradiation is justifiable in patients with intraocular metastatic disease. As the results of primary cancer therapy are improving and life expectancies are increasing, the incidence of late distant metastatic tumors is growing. Several patients develop metastatic tumors at previously unexpected sites such as choroidal metastasis with serous retinal detachment, accompanied by visual impairment. This can cause a significant worsening of quality of life.

Methods: From February 1994 to September 1998 the radiotherapy of 14 patients with intraocular metastases was performed at our department. Breast, lung and bladder were the primary tumor sites. Diagnosis and follow-up was based on ophthalmologic, ultrasonography, CT and/or MR examination. Rectangular wedged-pair or moving field therapy was applied first, then we switched to a modified lens-sparing method, of Schipper's technique.

Results: 3 patients are alive after 5 months with excellent visual acuity, useful vision was preserved in the other 11 patients, for a mean survival time of 6 months. No radiation cataract was observed during the follow-up period (1 to 29 months, mean: 6 months.)

Conclusion: The use of lens-sparing radiotherapy techniques results in improved or maintained visual acuity and so the quality of life of selected patients with intraocular metastases can be significantly improved.

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POSTER

Procedures of radiotherapy with boron neutron capture reaction at the Petten irradiation facility

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Purpose: to establish standard procedures for a complex radiation modality according to the accepted rules of radiotherapy assuring the safety, good reproducibility and high quality of the performance.

Method: The different steps of the preparation for the treatment planning, procedures of the planning using the RTPE/RTT_MC treatment planning system, patient positioning, blood boron content monitoring, irradiation at HFR, reporting on BNCT the quality control and documentation of these procedures have been established for the first European clinical trial.

Achievements: The agreement on the special definitions for patient radiotherapy with BNCT, the detailed description of the preparation and treatment performance procedures proved their applicability during the BNCT of the first patient cohort. The boron neutron capture absorbed dose DB is defined for the group of patients in a physically defined point, where the thermal fluence is a maximum for a given treatment plan. The doses in the organs at risk, dose distribution in the volume of interest together with the dose-volume histograms for the target and the healthy brain are calculated. The positioning to the fixed horizontal beam under special conditions was solved. The blood boron concentration is measured by prompt gamma ray

spectroscopy at HFR. The reporting of the absorbed dose of each dose component and a biologically weighted dose is based on the actual blood boron concentration and applied monitor units.

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POSTER

The elekta multileaf collimator (MLC). A universal soldier made to conform

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Purpose: To reduce the limitation imposed by the 1.0 cm leaf width to a level analogous to customised blocks. Apply techniques to small fields (2.0 cm), where block manufacture is most difficult and inflexible.

Methods: The MLC was originally investigated using a water tank and small 0.125 ion chambers. For small fields diodes and film were used. The leaf was investigated as a stand alone device over its full range of travel and all locations. Combinations of leaves and a range of geometric shapes were investigated. The leakage between leaves as applied to the patient was measured for both simply and worst case scenarios, using the test shapes.

Results: The effect of small penumbrae changes over the leaf travel, were considered negligible for clinical purposes. No field joins were used thus no hot or cold spots were introduced.

Conclusion: The basic techniques have been used clinically since 1994. Dose escalation and a head/neck trial using a stereotactic frame and small conformal MLC fields is now in progress.

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POSTER

HDR boost brachytherapy with flexible implants in breast cancer

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Purpose: Brachytherapy is undergoing a resurgence based on new radiobiological concepts. The purpose of this study is to report the preliminary findings with a technique of high dose rate (HDR) boost brachytherapy with intraoperative implantation of flexible catheters following breast cancer conservative treatment.

Methods: Between August 1996 and August 1998, 43 cases with pathologically staged I-II breast cancer were treated with breast conserving surgery and intraoperative placement of 6 french hollow plastic catheters in the tumor bed under direct control. All patients received at least two sessions of 400 cGy each of them, starting 6 at 24 hours after surgery with a microSelectron HDR unit. This was followed by external beam irradiation to the whole breast at 200 cGy/day for 25 fractions.

Results: With a minimum follow up of 6 months and a maximum of 30 months, ninety three per cent of the patients had no radiogenous skin changes in the boost area. In 6.9% (3/43) minimal punctiform hypochromic lesions appeared at single puncture sites. Eighty nine per cent of the patients judged the cosmetic result as excellent or very good. There have been only one (2.3%) local recurrence presented as inflammatory breast cancer 23 months after treatment.

Conclusions: Perioperative irradiation has the radiobiological advantage of delivering high dose rate immediately upon removal of gross tumor to residual microscopical disease. Intraoperatively implantation increases the accuracy of placing the boost dose, avoiding geographical error. This technique seems to be a safe method to boost the tumor bed, without severe acute effects, eliminating the need of rehospitalization and anesthesia and shortening the overall treatment time. In conclusion, in spite of short follow up, perioperative HDR boost brachytherapy with flexible implants appears as a promising technique. A longer follow up is required to analyze the local control rates.

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POSTER

Past, present and future trends of boron neutron capture therapy (BNCT)

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The authors intend to provide an overview on the development of BNCT, to summarize the study design and the results of the ongoing clinical trials and to present the trends of preclinical and clinical research activities. The analysis of the disastrous clinical experiments in the 1950s and the reports on intraoperative BNCT in Japan led to a revival of the interest toward the promising principle of BNCT. Development of ¹⁰B delivering drugs, tissue uptake and toxicity studies, facility design, physical characterization of thermal, epithermal and fast neutron beams, radiobiological studies, and early clinical trials have been performed in the last years. The status of BNCT research is summarized, focusing the clinical studies in USA and in Europe. The widening of investigations at the enhancing of fast neutron therapy by BNCT will be analyzed. Necessary steps to develop standards for BNCT are suggested. Proposals for integrated efforts for future research, activities are addressed

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POSTER

Hyperfractionated body stereotactic radiosurgery (BSR)

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Purpose: BSR is a non-invasive approach using an external stereotactic frame to deliver precision radiation most anywhere in the body. Like brain radiosurgery, treatment is directed at the defined target using multiple finely collimated radiation beams while minimizing dose to healthy, normal, surrounding tissues. The objective of this analysis is to determine the control rate of stereotactically treated primary and metastatic cancers in patients (pts) not amenable or not successfully treated with standard therapy.

Method: In the Western Hemisphere's first location in the first two years Of BSR, 834 pts completed therapy. 194 pts aged 23 to 86 years (mean 62) with 261 tumors having a volume range of 0.07 to 5,240 cc (mean 208.9 cc) were evaluable. Dose per fraction ranged from 250 to 1000 Centigray (cGy) (mean 767.6 cGy) delivered in 4 to 8 (mean 5.06) fractions. 38% of cancers were pulmonary with 38% metastatic and 62% primary. 29% of cancers were hepatic with 89% metastatic and 11% primary.

Results: Control is defined as cessation of growth, shrinkage or disappearance. 108 cancers (41%) ceased growing while 120 cancers (46%) decreased in size. 33 cancers (13%) increased in size. The overall extracranial control rate for BRS was 87%. Therapy was administered with little untoward effects.

Conclusion: BSR results in a high control rate especially considering pts had extensive previous treatment with surgery, radiation and chemotherapy. BRS is well tolerated and warrants further investigation for those seeking high dose precision radiation. Improvement to patient care should be expected to include better local control and palliation of symptoms.

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POSTER

Advanced on-time treatment planning for Intraoperative radiotherapy (IORT)

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Purpose: In IORT with electrons, it is common to use iso-ionisation catalogues acquired from water phantom measurements directly for the estimation of dose distributions. However, the actual surface of a treated region frequently differs significantly from the plain conditions in a phantom. This leads to large uncertainties in real dose delivery, especially when beveled cone applicators are used on curved contours.

Methods: A dedicated IORT planning system was developed, allowing for on-time calculation of the dose distribution beyond curved surfaces before treatment. Geometric information of the surface contour and tissue inhomogeneities (bones, lung) are acquired by a simple mechanical device