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POST-IRRADIATION HEARING LOSS

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Radiotherapy plays an important role in the management of head and neck tumours. Acute and late side effects of normal tissue within the irradiated volume occur. In case of the ear, conflicting results are published. We studied patients with an unilateral parotic tumour, irradiated after surgery with total dose of 50 to 60 Gy with a daily dose of 2 to 2.5 Gy. Since radiotherapy involved only one ear, the contralateral ear served as control. Hearing was assessed in two groups of patients: a retrospective group studied 1 to 10 years after the radiotherapy and a prospective group tested before and at regular intervals after radiotherapy. Hearing tests included pure tone audiometry, tympanometry and auditory brain stem evoked potentials. In both groups a clinical relevant hearing loss was noted (resp. 44% and 49%). This ototoxic effect will be studied further in detail.

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ACCURACY OF HELMET TECHNIQUE IN THE IRRADIATION OF THE BRAIN : THE ROLE OF CT EXAMINATIONS AND VERIFICATION FILMS

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Introduction: As the helmet technique in the irradiation of the brain is an important part in curative treatment concepts, accuracy in treatment delivery is of particular importance. The standard technique is using osseous landmarks to encompass the clinical target volume (brain).
Methods : In 24 patients the coverage of the clinical target volume was chequed with a CT in irradiation position (head fixation with face masks). The reproducibility of field alignment was determined with sequential verification films.
Results : In 4 cases (16,6%) CT examinations showed that the clinical target volume was not covered by the field alignment assigned under simulation. The systematic error of field alignment between simulation and start of treatment was 3.8mm +/- 3.4mm The random error during treatment delivery was 2.2mm +/- 1.0mm.
Conclusions : Designing field alignment under simulation is inadequate to cover the clinical target volume whereas CT - examinations can detect anatomic variations to assure a reliable coverage. The systematic and random error should be quantitatively considered when determining the safety margins.

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POST RADIATION HYPERPROLACTINEMIA

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Post radiation induced hyperprolactinemia is a matter of debate. We investigated 50 patients receiving multiple external beam radiation to the pituitary area with varying doses (3600-6600 cGy). These were 30 women and 20 men ages 22-74 years, 11 acromegalias, 3 adenomata, 20 astrocytomas, 3 nasopharynx Ca, 3 brain lymphoma, 2 meningioma, 2 brain mets., 1 germinoma, 1 craniopharyngioma. Follow-up 6 months-10 years. Results: Hyperprolactinemia detection 18 (36%) (10/11 acromegaloma) (vs 1% in general population). Prolactin rose gradually to max. level 215ng/ml at 6-7 years with blunt TRH tests. Symptoms were galactorrhea, amenorrhea and male impotence. 9/18 pts. received dopo amino agonists.

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RANDOM ERRORS IN PATIENT SETUP IN DAY TO DAY FRACTIONATED RADIOTHERAPY TREATMENT OF THE PELVIC REGION

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Purpose: A group of 15 patients undergoing radiotherapy in the pelvic region were studied to determine the extent and incidence of placement errors in day to day fractionated treatment. The need for objective measurment is investigated.
Methods and Materials: The positioning errors were quantified using a visual comparison method followed by adjustment through a remote couch controller. The comparison was made according to a first treatment image that served as a gold standard. The verification image was objectively measured for residual errors with a home made interface (OPIDUM).
Results: Shifts were detected in the transversal direction over a range of 43 mm with a Standard Deviation (SD) of 6.5mm and a maximal shift of 24mm. The incidence of correction was 168/259. In the longitudinal direction the incidence was much lower 45/241, showing a range of 20mm with a maximal shift of 10mm. The SD was 4.3mm. There was only one correction for rotational errors (6°). Residual errors estimated the accuracy of this method. In the transversal direction it amounted to a 2.6mm SD. In the longitudinal direction 4.5mm was found, comparable to the SD of the shifts themselves. Rotations were measured between 3° and -3°. Individualised patient data illustrates the impossibility for determining the systematic errors from the first fraction of treatment.
Conclusions: The data in this study show that the use of simple algorithms can enhance the accuracy of patient positioning in pelvic radiotherapy. Also an unforeseen incidence and extent of rotational errors have been detected and quantified.

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TOBACCO SMOKE DECREASES RADIATION-INDUCED PNEUMONITIS

A bronchoalveolar lavage and morphological study in man and rat.

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BACKGROUND: Bronchoalveolar lavage makes it possible to sample material from the lower respiratory tract. Recently it was suggested that smoking markedly suppressed the radiation-induced lung reaction in women treated for breast cancer as evaluated by brochoalveolar lavage.
AIM: To investigate further the effect of exposure to tobacco smoke on the development of radiation-induced pneumonitis with special regard to observations in rat.
METHOD: Four groups of animals were used; controls (C), exposed to tobacco smoke (S), irradiated but /not exposed to smoke (RNS), irradiated and exposed to tobacco smoke (RS). The rats were exposed to a diluted main stream of cigarette smoke at the concentration of about 0.4 mg/l in a nose-only exposure system for 1 h/day, 5 days/week for 10 weeks. Exposure to tobacco smoke started 3 weeks before irradiation. The basal one third of both lungs were exposed to a single radiation dose of 28 Gy (6 MeV photons). All animals were killed 7 weeks after irradiation. Patient subjected to lung irradiation were also investigated.
RESULTS: The alveolar tissue showed less inflammation in the RS-group than in the RNS-group and alveolar septa were thickened in the RNS rats. Mast cells were increased one hundred-fold in the lung interstitium and 30-fold in the peribronchial area in the RNS-group whereas no increase was found in the RS-group or in the controls. In BAL, neutrophils and to a lesser extent lymphocytes, were increased both in the RS but most markedly in the RNS-group.
CONCLUSION: This study further supported the suppressive effect of smoking on radiation-induced pneumonitis.

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CALCULATION AND EVALUATION OF α/β VALUES FOR LATE REACTING TISSUES FROM CLINICAL TRIALS

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Values of α/β ratios for teleangiectasia, late pulmonary reactions and late laryngeal edema were evaluated and calculated from three large clinical trials (Turesson 1989, Cox 1991, Deore 1991/92). Late effects were investigated in dependance of total dose D, single fraction dose d and extrapolated response dose ERD. The linear-quadratic formula for calculating α/β values: $\alpha/\beta = (d_2D_2 - d_1D_1)/(D_1 - D_2)$ is compared with the correlation coefficient or regression r. Instead of one value, a range of α/β values are obtained with correlation coefficients. A time factor allows the calculation for early reacting normal tissues and tumors. As an example the α/β ratios of teleangiectasia have a maximum $r = 0.53$ ($\alpha/\beta = 1.9 - 2.4$ Gy) for the 3 year's group and a maximum $r = 0.67$ ($\alpha/\beta = 3.0 - 3.2$ Gy) for the 5 year's group. Especially $r = 0.53$ for the 3 year's group indicates that no strong correlation exists between clinical and α/β values.