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TARGET VOLUME (TV) RADIATION DOSE HETEROGENEITIES.

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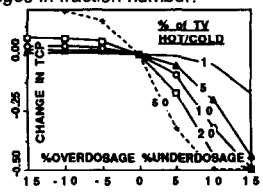
Background: Classic radiotherapy dogma has held that dose heterogeneities within the TV are therapeutically disadvantageous. In practice however, dose heterogeneities are usually present. A mathematical model is described to calculate the theoretical impact of dose heterogeneities on tumor control probability (TCP (TV)).
Model: Tumor clonogens of uniform radiation sensitivity are uniformly distributed throughout the TV. The TCP (TV) is the product of the control probabilities for the sub-volumes within the target. TCP (TV) = $\prod$ TCP (tvi). Dose heterogeneity is assumed to occur either by changes in fraction size or number of fractions delivered to each target sub-volume.
Results: Under-dosages generally result in a greater change in the TCP than over-dosages. However, the detrimental effects of a small cold spot can be offset by similarly sized hot spots elsewhere in the TV. Thus, "boosting" portions of the TV can significantly increase the TCP. Dose heterogeneities resulting from changes in fraction size are always greater than those resulting from changes in fraction number.
Conclusions: The model provides a useful means of assessing the impact of dose heterogeneities on the TCP. In some instances, escalating the radiation dose to only part of the target can be therapeutically advantageous. Radiation dose heterogeneities within the TV are not necessarily disadvantageous.



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FAST NEUTRON THERAPY IN ADVANCED HEAD AND NECK CANCER, A COOPERATIVE NTCWG-MRC RANDOMIZED TRIAL

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The aim of this study was to compare the efficacy of fast neutron radiotherapy with that of conventionally fractionated photon therapy in the management of patients with locally advanced SCC of the H&N. Patients with stage III or IV disease were randomized to receive either 20.4 nGy/12 fractions/4 weeks or 70 Gy/35 fractions/7 weeks (control). Between April 1986 and March 1991, 178 patients were entered, 168 of whom were eligible for analysis. The treatment arms were balanced for age, stage and performance status. Complete response occurred in 71% and 51% with neutrons and photons respectively, p=.002. Sustained local control was 39% for neutrons and 31% for photons, p=.20. Actuarial overall survival curves were virtually identical in both study arms, 36% at 2 years. Acute toxicity was similar in the two arms, but major late toxicity was 19% with neutrons and 9% with photons p=.13. We conclude that any advantage for fast neutron therapy over conventional radiotherapy in this patient population is limited to the logistic benefit of treatment in 12 vs 35 sessions.

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PECULIARITIES OF SUBTOTAL HUMAN BODY IRRADIATIONS TECHNOLOGIES BY TREATMENT OF LYMPHOMAS

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There are analysed merits and demerits of two main approaches to subtotal human body irradiation by use of maximum wide doses fields on standard medical photon irradiating apparatuses. For one of them is used horizontal radiation bunch and another - vertical one. The quality of doses fields in human body forming by treatment lymphomas was checked by study of axis human body dose distributions and critical organ doses ones. There was accomplished the individual dosimetrical planning for making of doses fields forming devices taking into account the anatomical peculiarities of patient.

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RADIOBIOLOGICAL EVALUATION OF DIFFERENT INTERDIGITATED ALTERNATING REGIMENS IN NON SMALL-CELL LUNG CANCER (NSCLC)

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The purpose of this study is compare the different ways in which high-dose hyperfractionation radiotherapy and intense chemotherapy can combine in patients with NSCLC. Promising is the M. Tubiana's interdigitated alternating regimen of chemoradiotherapy J.T. Lyman's et al model has been applied for estimation of radiobiological effects of suggested treatment protocols. This four-parameter model affords the estimation of normal tissue complication probability (NTCP) depending on the dose delivered, and partial volume of normal organ irradiated. Using the data published by B. Emami et al and the algorithm of linear-quadratic model (LQ) and G.W. Barendsen's concept of extrapolated total dose (ETD) we have developed the computer program „RADBIO" providing the estimation of NTCP for partial volumes of normal lung, heart, esophagus, and spinal cord irradiated in various modified fractionation regimens of NSCLC chemoradiotherapy.

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RADIATION THERAPY IN ENDEMIC (AFRICAN) KAPOSI'S SARCOMA (EKS) - A RETROSPECTIVE STUDY

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Between 1978 and 1990, 28 African patients with EKS received radiation therapy as their sole treatment modality. All were male and HIV negative. Mean age at diagnosis was 55 years (range 19-78) and mean follow-up 20 months (range 1-180 months). Localisation : 17 (57%) patients - lower limbs; 10 (36%) patients - multiple skin lesions; 1 (3%) patients - skin and upper GI tract. Radiotherapeutic modalities : Co-60-Unit; Linear Accelerator (± Skin sparing tissue equivalent bolus) small, involved fields800-1000 cGy (Single exposure) or 2400-3000 cGy (Fractionated, over two weeks). Response rate : 9 (32%) patients - complete regression of skin lesions; 15 (54%) patients - partial remission but with complete alleviation of their symptoms. 4 (14%) patients progressed following an initial, symptomatic relief. Age, treatment facility or schedule had no influence on the response rate. Mild side-effects were noted. Conclusion : EKS is a very radio sensitive disease. Radiation therapy is the treatment of choice for early (Stage I/II) disease and should be used with palliative intent for patients with metastatic disease.

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ANALOGIES TO RADIOSENSITIVITY OF THE EPITHELIUM IN THE HUMAN ORAL CAVITY

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The independent change (x) of the colour of the epithelium can be expressed by the capability of the ionizing rays through a transformation (f) to lead to the dependent change (y): x.f=y. If we accept, that the nonkeratotic epithelium in the oral cavity, as more radiosensitivity, has an oscillation period τ, and the more radioresistent keratotic epithelium - τ', then $p\tau_t \approx q\tau_t$. Or if τ is the total radiosensitivity of the mucouse membrane and substantially exceeds the period of the outer oscillations T and T', then $(1/\tau) = (1/T)-(1/T')$. With =10T, then 1% deviation from T will be 10% deviation of τ. Thus the different oscillations in the radiosensitivity of the epithelium (respectively τ/τ'), will have a probability from the appearance of $R_{min} > R$.