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Proliferation during fractionated irradiation of lung cancer cell lines

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Purpose: Hyperfractionated, accelerated radiotherapy has been successful both in small cell (SCLC) and non-small cell lung cancer (NSCLC). Is it optimal in all lung tumours?

Methods: Single dose and fractionated irradiation was delivered to 3 SCLC and 2 NSCLC human lung cancer cell lines. Ten Gy were given in 5 days: 1 Gy bid, 2 Gy once a day and 5 Gy day 1 and 5. Surviving fraction (SF) and doubling time were registered. A survival analysis was accomplished accoring to a model similar to the alfa/beta concept but with a proliferation factor added to it.

Results: The five Gy fractions schedule accomplished the lowest SF in the two radioresistant NSCLC cell lines, but the one Gy fraction shedule in the most radioresponsive cell line, a SCLC cell line. Proliferation during treatment was registered in the NSCLC cell lines, and indicated according to analysis in the SCLC cell lines. Analysis according to the model also indicated that the degree of proliferation during treatment might depend on the radioresistancy of the tumour cell population. If very resistant, so many cells might be left that the supply of nourishment and place is not sufficient to permit but a a minimal proliferation.

Conclusion: The study indicates that hyperfractionated, accelerated treatment might not be optimal in all tumours. It might be suggested that characterization of radiosensitivity and proliferation rate might help to optimize treatment, but that the conditions at least in very radioresistant cell lines are too complicated to make valid predictions with only these two parameters.

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Hemoglobin is more than a surrogate of tumour oxygenation: Part 1. Relation of erythrocyte indices and body iron markers to oral cancer growth

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Purpose: To see the relation of pre-treatment erythrocyte indices and iron markers to primary tumour size (Tsize) in oral cancer patients.

Methods: Hb, RBC count, PCV, MCV, MCH and MCHC, and Serum Fe, TIBC and %Fe were determined in 125 men and 92 women with epidermoid cancer of the bucco-gingivo-palatine complex and their relation to Tsize (UICC T1, T2, and T3) analysed by Kruskal-Wallis one-way analysis of variance.

Results: Among men, 76.8% (Hb < 13 g%) and in women 40.2% (Hb < 11 g%) were anemic. Hb, RBC count and PCV showed a decrease with increasing Tsize. Statistical significance was lacking in the case of Hb. The decrease in RBC count was nearly significant (p 0.06) for the whole group and significant in women (pValue = 0.01). The decrease in PCV was significant for whole group (pV-0.04) and in women (p 0.01). MCH (pico grams) and MCHC (g/dL) showed an increase with Tsize, being significant for MCH (T1-29.7, T2-31.4, and T3-31.7; pValue = 0.04) and highly significant in the case of MCHC (T1 29.9, T2-31.5 and T3-2.1; pValue = 0.006) for the whole group. Statistical significance was lacking for men and women separately. MCV, SeFe, TIBC and %Fe did not show any relation to Tsize.

Conclusions: The decrease in HB, RBC and PCV, and the increase in MCH and MCHC with increasing Tsize suggest increased RBC destruction, probably due to effect of tumour, and rapid regeneration attempt by the marrow. This will be compounded by i) alterations of iron storage and metabolism, and transferrin and erythropoietin activity, probably induced by tobacco and alcohol related habits, which could also have contributed to the genesis of the tumour, ii) altered expression of transferrin receptors by tumour cells, iii) nutritional deficiencies especially that of iron and, iv) consumption of iron – vitamin Œtonics' prescribed by medics before the definitive diagnosis of cancer. The study shows that anemia in oral cancer patients represents a host-tumour interaction and its importance should not be relegated simplistically to one of oxygen carrying capacity of Hb.

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The long-term effects of combined radiation therapy and chemotherapy on articular cartilage: Animal study

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Purpose: A multimodality approach is necessary to obtain good results of limb-salvage surgery for malignant bone and soft tissue tumors. The integrity of articular cartilage is crucial to long-term functional results. The objective of this study was to observe the reactions of articular cartilage in rabbits by intraoperative radiation combined with chemotherapy.

Methods: Thirty adult rabbits received a single high dose (50 Gy) of intraoperative irradiation at an unilateral knee joint after systemic chemotherapy (Doxorubicin 60 mg/m^2). Subsequent changes in the articular cartilage were examined 1 month later, then every 3 months, over a 12-month period by light microscope and scanning electron microscope. The contralateral knee joint of each rabbit was served as a control.

Result: The subchondral bone showed histologically typical findings of osteonecrosis six months after irradiation. The articular cartilage did not reveal obvious changes until twelve months after irradiation. The cartilage was thinner in the irradiated site than the control site, and the number of chondrocytes also decreased after irradiation. The reduction of cartilage cells was accompaned by a disturbance in their columnar organization. Scanning electron microscopy revealed disarrangement of collagen architecture in the irradiated cartilage 12 months after irradiation.

Conclusion: A single high dose of irradiation combined with systemic Doxorubicin chemotherapy may lower the tolerance of articular cartilage in rabbits.

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Radiation processed haematoporphyrin for combined photodynamic therapy

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Purpose: On the present paper, we report some experimental remits carried out in order to observe if haematoporphyrin (HP) exposed to electron or photon beam has any modifying effects on the sensitivity of some cells (Saccharomices Cerevisiae) trader laser irradiation (one modified photodynamic method for cancer therapy).

Methods: The combination of electron or photon irradiation type (provided from a particle accelerator) of HP with light (provided from an Ar laser) leads to a significant enhancement of the subsequent therapeutic effect of some cells (Saccharamices Cerevisiae) in vitro.

Results: The best effect is observed when photon -irradiation preceds the light irradiation. When the irradiation with ionising radiation was applied before the laser irradiation, the porphyrin might be activated and the PDT efficiency is four-times greater compared with light alone. This could be done both to the reoxygenation of the system (induced in the system by the singlet oxygen photochemically generated) and to the interaction with HP.

When the laser irradiation is applied before the electron/photon irradiation the PDT efficiency is less because the unefficient aggregated forms of HP is generated.

Conclusion: The order of PDT combined with ionizing radiation effect is: photon/electron-irradiation only < PDT alone < photon/electron irradiation after PDT < photo/electron irradiation before PDT