RTh 03

IN VITRO ASSAY OF RADIORESPONSE OF HUMAN TUMORS
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Fiebig (granted by DFG, Hi 368/1-1)

The "radiosensitivity" of human tumors established in serial passage in nude mice was tested by a modified HAMBURGER and SALMON colony assay. All tumors (3 plates each) were irradiated with 1, 1.5, 2.5, 4.5, 8, 10, 15 Gy x-ray (250 KV, 3.5 mm Al-filter) followed by incubation at 37°C, 7% CO₂ and humidity of 100%. The colonies were vital stained 1 day before counting by a modified image processor OMNICON FAS III (colony size 60-80 µ). T/C-values were calculated as a percental quotient of mean values from treatment and control groups. Only tests with a log-linear survival-dose dependency were considered. "Radiosensitivity" was defined as T/C value <30 at 1.5-4 Gy or <10 at 5 Gy and graduated as shown in table 1:

T/C-value	sign	response
<30 at 1.5 Gy	+++	high "sensitive"
<10 at 2.5 Gy		
<30 at 2.5 Gy	++	"sensitive"
<10 at 4.0 Gy		
<30 at 4.0 Gy	+	low "sensitive"
<10 at 5.0 Gy		
all others	-	"resistant"

We examined 18 human tumors obtaining the following results:
high "sensitive": 1 seminoma, 1 small-cell lung cancer / "sensitive": 1 renal cancer, 2 soft tissue sarcomas, 3 squamous-cell lung cancers / low "sensitive": 2 mal. melanomas, 1 squamous-cell lung cancer, 1 large-cell lung cancer / "resistant": 2 mal. melanomas, 2 adenocarcinomas of the lung, 1 gastric cancer.
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RTh 04

Combination of interstitial Hyperthermie with high dose rate afterloading radiation therapy.
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The use of hyperthermia, especially in combination with radiation gets increasingly important in clinical cancer therapy. The main problem of local hyperthermia is still the safe and reliable heating of the tissue, the mapping of the actual temperature distribution, and the fitting of a given isotherme to the target volume.

We developed a system for the combination of interstitial hyperthermia with interstitial high dose rate afterloading therapy. The needles which are used for guiding the radioactive source can also be used as electrodes for RF-heating. The outermost part of the needles that are not placed within the target volume are isolated. Consequently the r.f. current and therefore the powerdeposition is limited to the target volume. Our microcomputer controlled system allows to connect simultaneously or sequentially different needles to the r.f. power amplifier and is thus able to realize a great number of different heating patterns. The actual temperatures are recorded by thermistors located inside the needle electrodes. Each needle contains up to 3 thermometers so that also the temperature distribution in the direction of the needles is recorded. The microcomputer adjusts the r.f. power level to maintain a given temperature. Temperature distributions have been measured in phantoms.

The needle geometry has carefully to be planned so that both the temperature- and the dose distribution matches the target volume. Examples are given.
The reported results of this combination treatment are impressive. Contrarily to these groups we are using high dose rate afterloading therapy instead of low dose rate sources. Because of the short irradiation time we are able by a carefully chosen time intervall between radiation and hyperthermia to achieve a high therapeutic gain factor. Simultaneously the discomfort of the patient is reduced.

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RTh 05

EXPERIENCES WITH AFTERLOADING - AS INTRACAVITAL
RADIOTHERAPY - OF NON-GYNECOLOGIC TUMORS.
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Afterloading technique - developed in its fundamentals in the early sixties by Henschke - was initially intended to replace radium therapy of gynecologic tumors. The main goal of this modern brachytherapy is to avoid any radiation exposure of the medical personnel. Intracavitary and interstitial radiotherapy has the following advantages: 1.) high radiation dose applied to the target volume. 2.) steep dose-slope beyond the target volume. 3.) low exposure of the surrounding healthy tissue.

4.) reduction of percutaneous irradiation together with shorter hospitalization period. During the last three years we have used this method in the Department of Radiotherapy in Freiburg as additional therapy for oesophagus and rectum carcinomas together with percutaneous irradiation. The following further indications are possible and are applied in our department: **intracavitary**: - intrabronchial (in combination with laser therapy) - nasopharyngeal **interstitial**: - subcutaneous tumors - mamma carcinoma - tongue tumors - anal carcinoma. For this therapy we use the Gamma-Med-i-apparatus (Isotopen-Technik, Dr. Sauerwein, GmbH). Dosage and fractioning are still subject to experiences. We presently use the following concept: - Individual dose of 5 Gy in a source distance of 2.5 mm using a flexible tube (e.g. oesophagus) - Individual dose of 5 Gy in a source distance of 5.0 mm with a rigid distance-holder (e.g. rectum). Fractionation 3x5 Gy in weekly intervals.

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RTh 06

PALLIATION OF PAIN FROM BONE METASTASES USING
MULTIPLE DAILY FRACTIONS OF RADIATION.
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Metastatic bone disease is the most common cause of severe pain in patients with cancer. The efficiency of radiation therapy in providing relief from pain caused by bone metastases has been well established. Common practice has been to deliver a fractionated radiation therapy course spread over several weeks. It seems obvious that faster pain relief would be advantageous in many ways. In this study 23 patients, with a variety of primary tumors, have been treated for palliation of pain with radiotherapy using an accelerated regimen of multiple daily fractions. Patients received in general three treatments daily with 3 - 4 hour intervals on three consecutive days. The single dose applied was between 1.5 and 2.5 Gy depending on field size and site. The radiation portals included all sites of bone metastases except those in cervical, thoracic and upper lumbar spine. Good or complete pain relief, generally within one or two days after completion of treatment, was observed in all 18 patients with breast cancer, which could be documented by the reduction of pain medication. Less impressive response was obtained in carcinomas of bronchus or prostate (5/23), but the actual numbers for these tumors are too small to draw any conclusions. Enhanced side effects like acute skin reactions were not observed. The degree of remineralisation was similar as with conventional fractionation. This study shows that multiple daily fractions of radiation are at least for rapid palliation of pain from bone metastases in breast cancer an effective method.

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