

BTh 12

TREATMENT OF UNRESECTABLE CARCINOMA OF PANCREAS BY IODINE-125 BRACHYTHERAPY AND EXTERNAL RADIATION THERAPY
M. H. Shiu, B.S. Hilaris and M. F. Brennan

Carcinomas of the pancreas are often unresectable due to invasion of adjacent major blood vessels. From 1969 to 1982, 68 such tumors were treated by intra-operative implantation of iodine-125 seeds. The surgical technique consisted of mobilization of the duodenum and head of the pancreas, and display of the major blood vessels to facilitate insertion of the seeds. Biliary bypass procedures were performed. A Henschke Permanent Implant Applicator was used to insert the sources. The required number of seeds was calculated using a nomogram based on the activity of the sources, the treatment volume and the mean of its three dimensions, with 1 cm margin beyond the tumor, so as to deliver a minimal peripheral dose of $12,000 \pm 2,000$ cGy. Supplementary external radiation therapy (2,500-4,000 cGy) was given in 9 pts. Survival after treatment was:

Stage	No. pts.	At 1 year	At 2 years
T2-4 NO MO	35	38%	26%
T2-4 N1 MO	16	37%	---
T2-4 NO-1 M1	16	14%	---

Median tumor regression as measured by serial abdominal x-rays or CT was 35% at 2 months and 39% at 6 months. 8 of 11 pts. who received over 12,000 cGy survived 2 years, as compared with none of 14 who received less than 12,000 cGy. Only one patient died in the postoperative period, from stroke. Complications include: pancreatic fistula, 1 pt., intra-abdominal or wound sepsis, 3 pts., and anastomotic bleeding, 1 pt.. These results are superior to those of bypass alone without implant at our institution, but direct comparison of these treatments is not valid because of obvious bias in the selection of patients.

Memorial Sloan-Kettering Cancer Center
1275 York Avenue, New York, N.Y. 10021, U.S.A.

TRa 01

INDUCTION OF LEUKEMIAS - INDICATOR OF TOTAL BODY IRRADIATION
H.J. Seidel

The "best" human data on the induction of leukemias as a consequence of radiation exposure are still those from the Hiroshima and Nagasaki experience. Present re-calculations concern some differences between both events and the relative contribution of neutron irradiation. The biological data are available in an excellent quality. Leukemogenesis can still be considered the most common effect of total body irradiation (t.b.i.), although mammary gland carcinogenesis seems of equal quantitative importance now. - Animal studies with t.b.i. have shown in mice and also in dogs that leukemogenesis is indeed the most prominent effect in a certain dose range. These models are T cell leukemogenesis in C57Bl/6 mice irradiated according to Kaplan, the induction of myeloid leukemias in CBA mice as studied by Mole and the induction of aplastic anemias and/or myeloid leukemias in beagle dogs, as studied at the Argonne National Laboratory by Fritz and coworkers. Data obtained from these animal studies will be analyzed with respect to the conditions of radiation exposure, latency time, tumor type and the present knowledge of molecular events. It will be shown to what extent these results can be used to understand leukemogenesis in man.

Abteilung für Klinische Physiologie und Arbeitsmedizin der Universität Ulm, Oberer Eselsberg, D-7900 Ulm

TRa 02

LUNG CANCER AFTER IRRADIATION: THE RADON-PROBLEM
W. Jacobi

The results of epidemiological studies on the lung cancer frequency among several groups of miners which were exposed to relative high levels of ^{222}Rn (Radon) and its short-lived decay products during their underground work, are summarized. Whereas the radiotoxicity of the noble gas ^{222}Rn is small, the inhalation of the associated radioactive decay products leads to a relatively high α -dose to the bronchial epithelium.

The observed excess rate of lung cancer among these miners is rather linearly correlated with their cumulative exposure and bronchial dose from inhaled ^{222}Rn -decay products and indicates a synergistic influence of smoking. These findings which are in accordance with the results of animal experiments, cannot be explained by the influence of other initiating or promoting agents in the air of these mines.

A similar Radon-problem can occur in houses. Recent surveys in various countries have shown the level of ^{222}Rn and its decay products in indoor air of dwellings varies over three orders of magnitude. In some houses the measured levels are comparable with those in uranium mines. Transferring the epidemiological data from Rn-exposed miners to the population, taking into account corrections for the different exposure conditions in mines and houses, would lead to the conclusion that about 3-10 percent of the total observed lung cancer frequency in our population might be associated with the indoor exposure to ^{222}Rn -daughters. Considering a synergistic influence of smoking, the absolute lung cancer risk from ^{222}Rn -decay products should be higher for inhaling smokers than for nonsmokers.

Inst.f.Strahlenschutz, Ges.f.Strahlen-u.Umweltforschung,
Ingolstädter Landstr. 1, D-8042 München-Neuherberg

TRa 03

INDUCTION OF OSTEOSARCOMA AFTER RADIATION
W. Gössner

Ionizing radiation in the form of external radiation or bone-seeking radionuclides may cause serious damage to the skeletal system, such as growth disturbances, necrosis of the osseous tissue and so-called radiation osteitis. The most important late effect after irradiation of bone and cartilage, however, is the development of both benign and malignant bone tumors. The first part of this presentation will be devoted to the role of radiation as an oncogenic agent in human bone tumors. Bone tumor induction by external and internal irradiation will be described with regard to incidence, latency period, site of localization and histologic features. Induction of osteosarcoma in humans has not only been observed following intake of the long-lived Radium-226, it has also been observed after incorporation of Radium-224 which is a short-lived alpha-emitting isotope of radium with a half-life of 3.66 days. The latest data in the follow-up studies of patients who received repeated injections of Radium-224, mostly for the treatment of tuberculosis and ankylosing spondylitis, will be presented. In the second part some aspects of the experimental pathology of radiation-induced bone tumors will be discussed with special emphasis on the histogenesis of preneoplastic lesions and the early stages of malignancies during the latent period in radiation-induced bone tumors.

Institut für Pathologie, GSF, Ingolstädter Landstraße 1, D-8042 Neuherberg