

unexplored but could not be solved on this series. Prospective verification by large aperture CT image acquisition in treatment position using a simulator CT extension may be required.

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## PUBLICATION

### The preventive effect of verapamil on radiation induced cataract: An experimental study

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**Purpose:** Cataract formation is an unavoidable complication when radiation therapy, even in small doses, includes the lens. In this experimental study on rats, the preventive effect of verapamil, a calcium channel blocker, was studied on radiation induced cataract.

**Methods:** Experiment was performed on 40 female, 180–250 g weighted Wistar albino rats. Animals were divided into 3 groups. A control group (n = 10) was observed for 7.5 weeks. Radiation (n = 10) and verapamil groups (n = 20) which received 5 Gy radiation to whole cranium, in single fraction, including both eyes within irradiation volume, in addition verapamil group received daily subcutaneous injection of 8 mg/kg verapamil from the first day of radiation. At the end of 7.5 weeks all animals were sacrificed by bleeding. Ca, Na, K, levels were studied both in blood and in lens homogenates. Mg level could not be studied in sera for technical reasons.

**Results:** Serum levels of Ca, Na measured within normal ranges in all groups, but serum K level was higher than normal levels in control and radiation groups. Lens K and Na concentrations were not significantly different in control and radiation groups, but both levels were significantly lower in verapamil group (p = 0.0001, p = 0.0009). Ca levels were higher in the radiation group and lower in verapamil group compared to control ones (p < 0.0001). Mg levels were not significantly different (p = 0.590).

**Conclusion:** Verapamil effectively decreased the concentration of Ca in lens which is accepted as the key element in radiation cataractogenesis. Thus, it is concluded that verapamil may prevent radiation induced cataract formation.

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## PUBLICATION

### Is dosimetry by planning CT the optimal method for external beam irradiation of the breast?

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**Purpose:** In modern radiotherapy, the use of a planning CT for 3D dosimetry is widely spread. The reproducibility of the position of a patient being irradiated (IR) on the breast is difficult because of shape and composition of the breast and because of the position of shoulder and arm. Differences in position between simulation, planning CT and IR may occur. We therefore examined the possibility of these differences, their influence on treatment planning and dose calculation.

**Methods:** Forty pts with IR on the breast by two opposite fields were evaluated. Contours of the breast were taken after simulation and field markers were noted. The diameter between the center of both fields was measured. The size of the breast was measured by ultrasonography, which was used to complete the contours for 3D dosimetry. Each pt had a planning CT scan too, which was used for 3D dosimetry. Information of both was compared.

**Results:** Differences in diameter when measured by ultrasonography & contour and compared with reality were 0–3.5 mm. They occurred in ±80% and were not related to the size of the breast. There was no significant influence of these differences on dose calculations of the IR. The measurements by CTscan varied >80% and were almost always exaggerated. The differences in diameter ranged from 0–16 mm and were higher for pts with a greater size of breast. There was an influence of 0–6.4% on dosimetry and dose calculation.

**Conclusion:** The position of especially pts with a large size of breast is difficult to reproduce for simulation, planning CT and irradiation. This may cause a difference in dose calculation and total dose of the IR. For these pts, the dose calculations obtained by use of several contours and measurements of the breast size by ultrasonography might be more appropriate for dosimetry of external beam irradiation of the breast.

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## PUBLICATION

### The relations of radiation induced ultrastructural cardiac damage with serum troponin T and creatin kinase MB levels

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**Purpose:** Troponin-T (TnT) and creatin kinase MB (CK-MB) are specific markers of myocardial cell injury. Radiation-induced changes in the ultrastructure of the rat heart was shown but, relations of serum TnT and CK-MB levels were not investigated yet. This study was performed to search relationship between these markers and cardiac radiation damage.

**Method & Material:** In this time sequence study, wistar rats were exposed 20 Gy (200 kV, 0.5 Cu filter) irradiation to a field including the heart. The hearts were excised at varying time intervals (8 h–180 days) and the ultrastructure of myocardium was studied. Besides, serum TnT&CK-MB levels of irradiated and control groups were detected synchronously for every time interval.

**Results:** Changes were observed in myocytes at all time intervals. Although membranes of cells were intact, mitochondrial damage, characterized by swelling and fenestration, myofibrillar disarray and lysis, separation and damage of intercalated discs were seen focally. These changes increased progressively and we did not find any recovery in myocytes during the study period. TnT&CK-MB serum levels did not increase. In contrast TnT levels decreased in irradiated groups relative to control group at 24 h–180 days. CK-MB level decreased on the 60th day.

**Conclusion:** Radiation-induced cardiac myocyte damage did not cause an increase in serum TnT&CK-MB levels. But, these serum marker levels might be decreased by radiation induced cellular effects. These changes may be the result of intracellular radiation-mediated gene expression or extralysosomal protease activation.

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## PUBLICATION

### The efficiency of total liver irradiation (TLI) in patients with Hodgkin's disease (HD)

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**Purpose:** Involvement of the liver into pathologic process in HD frequently determines prognosis.

**Methods:** 37 patients with HD (liver lesions were proved by histology) were studied to estimate the efficiency of TLI in complex therapy. In 15 patients liver lesions were revealed during primary diagnosis of HD, in 22 patients liver lesions appeared in relapse of further progression. In all patients TLI was one of the stages of complete therapy and was held on gamma-apparatus. (Single dose was 1.8–2.2 Gy, standard fractioning 5 in a week, cumulative local dose 36–44 Gy).

**Results:** All 15 patients (1 group) were subjected to standard polychemotherapy (PCT) (MOPP or COPP), liver lesions eradication (LLE) was reached only in 4 patients, after TLI – in 14 from 15 patients. 11 patients live more than 5 years in remission. In 22 patients (2 group) LLE as a result of complex therapy, including TLI, was reached in 17 cases, but remission only in 13 cases. Life duration and prognosis in these patients depended only on the efficiency of PCT, but not TLI.

**Conclusion:** TLI is most useful when liver lesions appeared in HD manifestation. In HD relapse TLI is expedient if liver is the only single extranodal site, or if PCT is effective in other zones.

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## PUBLICATION

### Individualized vaginal moulds using 192-Iridium and CT evaluation in gynecological (Gyn) tumors

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**Purpose:** Individualized vaginal moulds along with CT-scan information to perform dosimetric study for low dose 192-Iridium (Ir) is a treatment modality used in Gyn cancer patients (ptes). We present a preliminary results of 15 ptes treated with this modality.

**Methods:** Since March 1995, 8 cervical cancer (6 stage IIA, 1 stage IV, 1 vaginal relapse) and 7 endometrial carcinoma (71% vaginal involvement) have been treated by vaginal moulds. All but one pte had surgery