EPIDEMIOLOGIC STUDIES ON PATIENTS WITH IODINE-131 DIAGNOSTIC AND THERAPY[+)]

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Radiation can produce somatic and stochastic damages in the thyroid. We dispose of these experiences since many years after external, internal and mixed internal and external irradiation of the human thyroid. We got these experiences after external irradiation mainly in younger poeple. The results obtained in these studies are summarized in Figure 1.

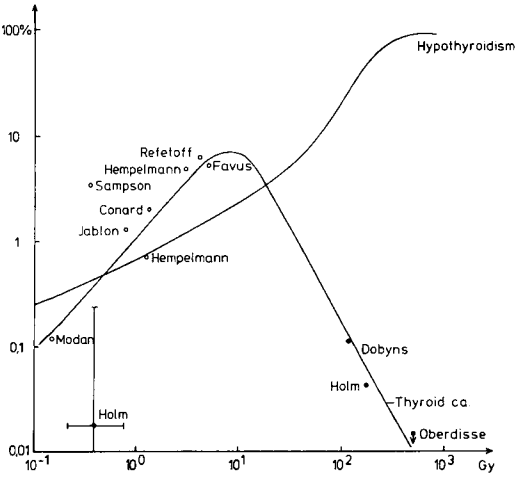

Fig. 1: Thyroid-cancer and hypothyroidism as a function of radiation dose.

The risk of hypothyroidism increases continuously from about $1o^{-1}$ Gy to $1o^{3}$ Gy. In the dose range of hyperthyroidism therapy it is about 8 % and in the range of cancer therapy it reaches almost 1oo %. According to the investigations of MODAN (1974), HEMPELMANN (1975), JABLON (1971), CONARD (197o), REFETOFF (1975), FAVUS (1976), SAMPSON (1974), who examined mainly the cancer-risk after external or mixed irradiation of the thyroid the cancer-risk increases almost linear between $1o^{-1}$ Gy and $8 \cdot 1o^{o}$ Gy and reaches a maximum near 1o Gy with an incidence of 8 %. These examinations include the atomic bomb survivors in Japan and at the Marshall islands. Above a dose of 1o Gy the cancer-risk decreases because there exists an increasing distruction of thyroid tissue (DOBYNS (1974), HOLM (198o) and OBERDISSE (198o)). HOLM performed studies in Sweden on a group of patients who incorporated ^{131}J for diagnostic and therapeutic purposes. The result of these investigations differs by a factor of 1o to 1oo from the risk, which was expected in comparison with the results of the

+) with Support of the Bundesminister des Innern of the Federal Republic of Germany

other authors. He found a smaller risk. If the lower dose rate after application of ^{131}J compared to the others groups of patients is the or the only reason of the lower risk is not still clear. Previous papers show that the frequency of thyroid cancer in a population can be influenced by many factors. The essential factors are: supply with iodine of the population, genetic assumtions, timing of observation, age distribution of patients in study, as well as the criterion of examination, for example morbidity or mortality from thyroid carcinoma or finally the histological classification (GLÖBEL (1983)). Since 25 years the radio-iodine uptake test was performed with ^{131}J in the Federal Republic of Germany. Therefore there exist a group of patients sufficent great in number to study how far the risk to produce thyroid cancer, after external and mixed irradiation, differs from that obtained by HOLM after incorporation of ^{131}J. Therefore we have contacted the patients examined at the nuclear medicine hospital of the University of the Saarland at Homburg, hitherto 15o79. Several dose groups could be formed: patients with one or more diagnostic application of ^{131}J and patients who incorporated ^{131}J for therapy. The study is not yet closed. We contacted 81 % of the patients, and we found 84 thyroid carcinomas. The distribution on the several groups is shown in the following table. In general there where used 2 MBq iodine-131 for one uptake test and o,2-2 GBq for therapy of hyperthyroidism.

	number of patients in study (N)	thyroid cancer incidence % mortality	% morbidity	(N)
unexposed poeple	-	o,21	o,6	-
one uptake test	611o	-	o,44	27
two uptake tests	3231	-	o,77	25
three uptake tests	2567	-	o,7o	18
four or more uptake tests	1988	-	o,5o	1o
therapy of hyperthyroidism	1183	-	o,34	4

Table 1: Incidence of thyroid cancer in patients who incorporated iodine-131 and in unexposed poeple.

The frequencies of thyroid cancers found in these groups of patients differ not essential from that frequency considered to exist in the unexposed population. With the results in Figure 1 we expected at least the tenfold number, if the risk factor after external and mixed irradiation of the thyroid was true for the case of internal irradiation. It seems that our results confirm those of HOLM. The examinations relative to the causation of thyroid hypofunction are not yet finshed and shall not be discussed here.

We believe, that the lower dose rate in the group of patients who incorporated ^{131}J compared with the groups exposed to external and mixed radiation is not the only reason for the smaller risk.

During the external irradiation of the thyroid in most cases the neck-head-area was for different reasons the target of a therapeutic use of x-rays.

The immunological system, the thymus gland in the younger age, was situated partially in the primary beam. According to the results of the last years it seems to be sure that disturbances of the immunological system can cause thyroid diseases, evaluated as auto-immune-diseases. For example the induction of goitre and nodular goitre. They lead in an increased percentage to thyroid cancer.

The immunological system and the whole body of the atomic bomb survivors had been exposed to radiation as well as the thyroid. The stress, to which these persons were also exposed, can cause impairments of the immunological system. Re-examinations of patients irradiated externally revealad in a considerable dimension thyroid hypofunctions and nodular goitres. We assume that the damage of the immunological system and the induction of auto-immune processes, are probably the reason of the increasing incidence of thyroid cancer after external and mixed in radiation. The application of ^{131}J exposes almost only the thyroid. The other tissue of the organism get only 1/2ooo of the thyroid dose. The frequent occurance of nodular mutation of the thyroid after external radiation exposure probably shows also, that the estimation of dose for the external and mixed irradiation is wrong. The given frequency of nodular mutation of about 1o % of the examined persons let us presume that the true radiation dose was higher than estimated in the publications.

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