

Session 1.1

Radiation-induced Thyroid Cancer

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The incidence of differentiated thyroid cancer is increasing worldwide since appr. 30 years with doubling times of about 20 years. Roughly 50% of the additional cases are small tumors with diameters below 1 cm which can not be detected by palpation. Just recently, it could be shown that a „screening effect“ due to the more frequent use of thyroid ultrasonography explains about half of the increase of thyroid cancer incidence. So still 50% of the „thyroid cancer epidemy“ still must have causes other than earlier diagnosis, as e.g. chemical pollutants or exposure to radiation.

It is well known since more than 50 years from the life-span study in atomic bomb survivors or follow-up studies in children exposed to medical irradiation that ionizing radiation can induce thyroid cancer. According to the life-span study, especially children and adolescents below age of 20 are at risk whereas the risk is negligible in adults above this age.

Appr. 5 years after the Chernobyl accident, a remarkable increase of thyroid cancer incidence in children and adolescents has been reported from Belarus, Ukraine and Russia. Again, the risk seems to be confined to persons exposed below age of 20. When discussing the experiences from Chernobyl in the light of the Fukushima accident, it is important to have in mind, that radiation exposure to the thyroid after Chernobyl was much higher (activity released 10 times higher, continuous release of radioactivity over 10 days, no withdrawal of milk and food contaminated with I-131).

Since many years, biochemists, geneticists and experts for molecular biology are looking for the genetic fingerprint of radiation induced thyroid cancer. Only few years ago, chromosomal rearrangements in the RET/PTC pathway were discussed as the most probable explanation. However, just recently studies of single nucleotide polymorphisms indicate that genetic variants of FOXE1 may be the major determinant of radiation induced thyroid cancer.

Clinically, radiation induced thyroid cancer is of papillary histiotype in more than 90% of the cases. Children and adolescents after radiation exposure usually present with the disease at younger age and with slightly higher percentages of locally advanced tumors, lymph node involvement and distant metastases. Nevertheless, even advanced stages of thyroid cancer after radiation exposure can be treated effectively with surgery, radioiodine therapy and thyroid hormone supplementation. In our series of 229 children from Belarus with advanced disease treated together with colleagues from Minsk, tumor specific mortality and recurrence rate were below 1%.