Radiation and risk of thyroid cancer: Fukushima and Chernobyl

30 years have passed since the accident at the Chernobyl nuclear power plant in Ukraine, and 5 years have passed since the crisis at the Fukushima Daiichi nuclear power plant. After the Chernobyl disaster, a significant increase in thyroid cancer was reported among children and adolescents exposed to radioactive iodine released at the time of the accident in Belarus, Russia, and the Ukraine.[1] On the basis of the experience of Chernobyl, thyroid ultrasound examination is being done within the framework of the Fukushima Health Management Survey.[2] This survey targets all residents who were younger than 18 years at the time of the Fukushima accident (roughly 360 000 individuals). The first screening cycle, done from October, 2011, to March, 2014, identified 113 confirmed or suspected thyroid malignancies among 300 476 screened individuals.[2]

The finding of thyroid cases after Fukushima might be an effect of screening caused by the use of modern, highly sensitive ultrasound technology. To examine this issue, the causal relation between radiation exposure and thyroid cancer in Fukushima should be carefully assessed against the existing evidence, especially from Chernobyl.

In Chernobyl, mean thyroid doses of affected children were estimated to be 560 mSv [SD 1180] in Belarus and 770 mSv [260] in Ukraine.[3,4] By contrast, doses of less than 15 mSv in 99% of children aged 0–14 years were reported in more than 1000 children from Fukushima after the accident.[5] At these low levels, the Fukushima doses are unlikely to have caused a detectable excess in thyroid cancer within 4 years after possible exposure.

Another important point to consider is the age of patients in the aftermath of the two accidents.[6,7] In Belarus, according to the cancer registry established before the accident, 25 operated cases of thyroid cancer were reported during the first 4 years after the accident (1986–89) in patients who were aged 0–15 years at exposure. This number rose to 431 in 1990–94, 766 in 1995–99, and 808 in 2000–03 (figure). In particular, starting from 1990, the incidence of thyroid cancer increased greatly in children who were aged 0–5 years at the time of the accident, which suggests that this age group is particularly vulnerable to the effects of radiation. The number of operated thyroid cancers after Chernobyl was the highest in the younger age groups, but only 4–10 years after the incident. On the basis of these observations from Chernobyl, the finding of large numbers of cases in older, and not younger, age groups after Fukushima is likely to be an effect of screening (figure).

Sequential screenings in Fukushima should continue, and periodic comparisons should be done of patients' age distribution against the prototypic radiation-induced patterns in Chernobyl.

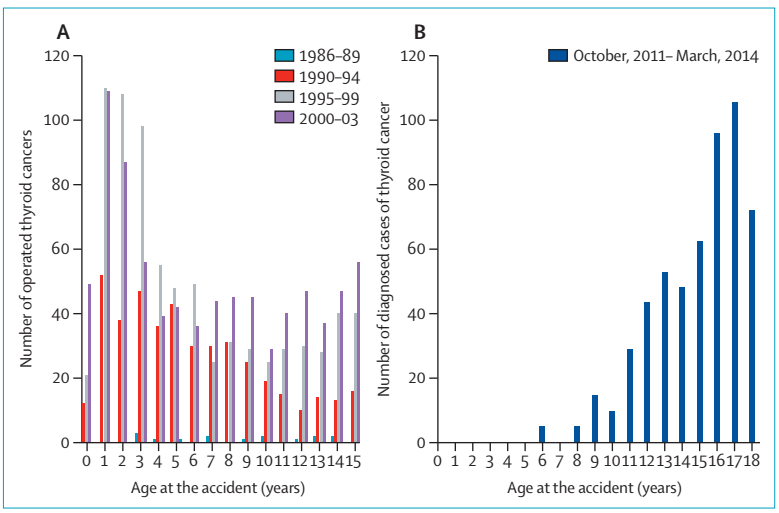

Figure: **Numbers of operated thyroid cancers in patients aged 0–15 years at the accident in Belarus (A) and diagnosed cases of thyroid cancer in patients aged 0–18 years at the accident in Fukushima (B)**

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