Parathyroid Tumors in Atomic Bomb Survivors in Hiroshima: A Review

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Parathyroid tumors in A-bomb survivors in Hiroshima have been studied. Thirteen cases of parathyroid tumor were confirmed from 4,136 autopsy cases between 1961 to 1977, and an elevated incidence of tumor with increase of dose (T65D) was demonstrated (P<0.01). A high proportion of 42.9%, 6 out of 14 parathyroid tumors extirpated at Hiroshima University Hospital between 1956 and 1988, were atomic bomb survivors exposed within 4.1 km from the hypocenter. From an epidemiological study using 23 parathyroid tumor cases detected in Hiroshima Prefecture between 1974 and 1987, an elevated incidence of parathyroid tumors with increase of dose (proximally exposed, other exposed and control nonexposed) was demonstrated (P<0.001).

INTRODUCTION
Since 1975 parathyroid tumors with or without hyperparathyroidism which probably resulted from therapeutic irradiation of the head and neck have been reported in Western Countries1–9). While studying the cervical tumors in 1980 at RERF, a case was found of large parathyroid tumor with primary hyperparathyroidism. Although this Hiroshima patient suffered general malaise caused by bone fractures, renal stones etc., the disease had been dealt with merely as arthritis or fracture until her death in 1972. The estimated T65D dose was 28 rad.

Since then the studies of parathyroid tumors in A-bomb survivors have been continued10–15). The studies consist of three independent categories of cases; i.e., autopsy cases, Hiroshima University surgical cases, and registered cases at Hiroshima Prefecture Tumor Tissue Registry Committee. The results of these studies have been reported at meetings.
We have previously made a preliminary report of 16 autopsy cases of parathyroid tumors. However, the exact number of parathyroid tumor cases were found to be 13 upon strict pathological reanalysis. From the ABCC-RERF Extended Life Span Study cohort, autopsy was performed on 4,136 deaths occurring in a period of 17 years from 1961 to 1977. Table 1 shows the histopathological diagnoses of parathyroid diseases, in which parathyroid abnormality had been recorded during routine autopsy work. Thirteen cases of parathyroid tumor were confirmed, and an elevated incidence of tumor with increase of dose (T65D) was clearly suggested (P < 0.01). Compared with that of the 0 rad group, the relative risk of 5.1 in the 50+ rad group was high.

With the establishment of the dosimetry system (DS86), analysis of these cases using the new dose information is also necessary.

**HIROSHIMA UNIVERSITY SURGICAL CASES**

Seventeen patients with parathyroid gland tumor had undergone surgical resection at the Hiroshima University Hospital between 1956 and 1988. Three of them were born after the atomic bomb explosion, and 42.9%, or 6 of the remaining 14 patients, a high proportion, were atomic bomb survivors exposed within 4.1 km from the hypocenter.

**EPIDEMIOLOGICAL STUDY IN HIROSHIMA PREFECTURE**

An analysis on registered cases of parathyroid tumor in Hiroshima Prefecture between 1974
and 1987 was made, and 23 cases were found. An epidemiological study has been performed using these 23 cases. A-bomb exposed survivors were defined as proximally exposed (within 2 km from the hypocenter) and distally exposed (beyond 2 km) and the early entrants who entered the hypocenter area within 2 weeks after the A-bomb.

The populations (person-years) of A-bomb survivors and control nonexposed survivors were estimated based on data from the data base of the Research Institute for Nuclear Medicine and Biology in Hiroshima University and the National Census populations in 1975, 1980 and 1985.

Standardized annual incidence was 0.05 per 100,000 in the control nonexposed (nonexposed population born before the bombing), 0.28 per 100,000 among the total exposed, and a high rate of 0.81 per 100,000 in the proximally exposed, with an apparently higher incidence among the proximally exposed and the total exposed than among the nonexposed. The latter results were both statistically significant (P < 0.001) (Fig. 1).

A similar trend was seen in the cases of parathyroid tumor associated with primary hyperparathyroidism.

**DISCUSSIONS**

These data of both parathyroid tumors and those associated with hyperparathyroidism showed that they could be induced by A-bomb exposure. However clinical cases of parathyroid tumor were apparently rare in Hiroshima before 1980. This seems to have been due to poorer diagnostic ability of parathyroid gland diseases, delay in determination of the serum calcium level, and other
factors.

Arthritis, bone diseases, and kidney diseases may well increase with aging among A-bomb survivors. So it is also necessary to make a differential diagnosis of functioning parathyroid tumors for patients with such diseases, because parathyroid tumors appear to have a long latent period following exposure (see also Fujiwara's studies in this issue).

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