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Parathyroid Tumors in Atomic Bomb Survivors in Hiroshima: First Report of Surgical Cases, 1956—1988

Nobuo TAKEICHI[1], Kiyohiko DOHI[1], Hisao ITO[2], Hitoshi HARA[3], Tsuguru USUI[4] and Kenjiro YOKORO[5]

1) Department of Surgery, Hiroshima University School of Medicine, Hiroshima 734, Japan
2) Department of Pathology, Hiroshima University School of Medicine
3) Department of Internal Medicine, Hiroshima University School of Medicine
4) Department of Urology, Hiroshima University School of Medicine
5) Department of Pathology, Research Institute for Nuclear Medicine and Biology, Hiroshima University

ABSTRACT

Seventeen patients with parathyroid gland tumors underwent surgical resection at the Hiroshima University Hospital between 1956 and 1988. Three of them where born after the atomic bomb explosion, and 6 of the remaining 14 patients (42.9% of the total- a high proportion) were atomic bomb survivors. Because parathyroid gland tumors and hyperparathyroidism are assumed to develop in patients who have been exposed to radiation after a long latent period, it is necessary to anticipate the possible occurrence of these diseases in atomic bomb survivors. The present paper is the first to report surgically extirpated parathyroid gland tumors in atomic bomb survivors.

Key words: *Parathyroid tumors, A-bomb survivors, Surgical cases*

We reported parathyroid tumor cases among A-bomb survivors from an autopsy in 1983[12]. However, clinical cases of parathyroid tumor at Hiroshima University Hospital had been rare (only 7 cases) until that year. The number of cases increased between 1956 and April 1988, and the total number reached 17. The present report deals with parathyroid tumors in A-bomb survivors who had been surgically extirpated at Hiroshima University Hospital.

MATERIALS AND METHODS

The subjects were 17 patients with parathyroid gland tumors that had been surgically resected at Hiroshima University Hospital during the period between 1949, when the Division of Surgery at Hiroshima University Hospital was established, and April 1988. Cases of secondary hyperparathyroidism, parathyroid hyperplasia and parathyroid cyst were excluded. The A-bomb survivors we examined had been directly exposed to radiation within 5.0 km of the hypocenter in Hiroshima City.

RESULTS

Tables 1 and 2 give the patients' case number, sex, date of first surgery on the parathyroid gland, situation of exposure, tumor size, symptoms that led to the detection of the disease, classification according to clinical morbid type, histopathological diagnosis and others, in that order, for the 17 patients. Three of these patients, numbers 3, 7 and 15, who were born after the atomic bomb explosion, were excluded from the analysis of A-bomb exposure.

Primary hyperparathyroidism produces various widespread symptoms. In the present study, a case showing osseous lesions was classified as the bone type regardless of the presence or absence of a renal stone, while a case showing renal stone and lacking any osseous lesion was regarded as being of the renal stone type.

A case without either osseous lesion or renal stone, in which hypercalcemia led to detection, was recognized as being of the chemical type. There were four patients in whose cases hypercalcemia detected on medical examination provided a clue to the diagnosis after 1983. A case without any of these findings was recognized as being of the non-functioning type. All these types were observed regardless of whether there had been a past history of exposure or not, indicating no significant difference in the incidence of these types between exposed and nonexposed patients. Of the 17 cases, 14 or 82.4% were operated on after 1980.

The diagnosis of adenoma was made basically according to the classification by WHO[15]. When at least two factors among the following were present: invasion into the peripheral tissue; mitosis; metastasis, and blood vessel invasion, it was recognized as cancer. All three cases of cancer clinically showed infiltration into peripheral organs. Excluding the 3 nonexposed cases born after the bombing, the fre-

Table 1. Parathyroid gland tumors, Surgical cases, Hiroshima University (1956~1988.4.)

Cases	Sex	First operation (Age, Yrs.)	A-bomb exposure (Age, Yrs.)	Tumor size (mm)
1	F	1956. 3. (52)	1.3 km, Inside of wooden house (42)	47 × 37
2	M	1974. 1. (43)	(–)	60
3	M	1978. 10. (26)	Birth after A-bomb	30 × 17
4	F	1980. 12. (52)	(–)	7
5	M	1981. 8. (50)	1.5 km, Inside of wooden house (14)	8 × 5
6	F	1981. 9. (67)	1.2 km, Inside of wooden house (31)	7
7	M	1983. 1. (33)	Birth after A-bomb	27 × 21
8	F	1984. 5. (48)	(–)	45 × 23
9	F	1984. 5. (71)	(–)	50 × 22
10	F	1984. 8. (60)	(–)	23 × 17
11	F	1984. 8. (58)	(–)	20 × 15
12	M	1986. 9. (47)	(–)	25 × 18
13	M	1987. 5. (59)	4.1 km, Outside of house (17)	55 × 30
14	M	1987. 9. (43)	1.0 km, Inside of wooden house (1)	57 × 32
15	M	1987. 10. (14)	Birth after A-bomb	30 × 25
16	F	1988. 1. (51)	(–)	23 × 14
17	F	1988. 4. (66)	2.0 km, Outside of house (24)	10 × 8

(–): Nonexposed cases

Table 2. Parathyroid gland tumors, Surgical cases, Hiroshima University (1956~1988.4.)

Cases	Clue of diagnosis	Clinical type	Histopathological diagnosis	Others
1	FNN	Chemical or NF	Cancer	
2	FNN	Bone	Cancer	1986. 6. Died of PHP
3	Arthralgia	Bone	Adenoma	1977. 4. Ope. for bone cyst
4	Surgery for thyroid	NF	Adenoma	Adenomatous goiter in thyroid
5	Back pain	Bone	Adenoma	1963. 12. Ope. for duodenal ulcer
6	Surgery for thyroid	NF	Adenoma	Adenomatous goiter and occult cancer in thyroid
7	Nausea, Vomiting	Bone	Adenoma	
8	FNN	NF	Adenoma	
9	Nausea, Vomiting	Renal stone	Adenoma	1957. R. nephrectomy (Renal stone)
10	Arthralgia	Bone	Adenoma	
11	Hypercalcemia	Bone	Adenoma	1972. L. nephrectomy (Renal stone)
12	Hypercalcemia	Chemical	Adenoma	
13	FNN	NF	Cancer	
14	Back pain	Renal stone	Adenoma	
15	Lumbago	Renal stone	Adenoma	
16	Hypercalcemia	Renal stone	Adenoma	1970, Ureter stone
17	Hypercalcemia	Chemical	Adenoma	

FNN: Foreneck nodule, NF: Nonfunctioning, PHP: Primary hyperparathyroidism, Ope: Operation

Table 3. Surgical cases of parathyroid tumor depend on situation of A-bomb exposure.

Group	Exposed	Control nonexposed[a)]	Total
Tumors	6 (42.9%)	8	14
Associated with PHP	2 (28.6%)	5	7

a) Born before the bombing.
PHP: Primary hyperparathyroidism.

quency of parathyroid gland tumors of the 6 exposed cases represented 42.9% in the remaining 14 cases (Table 3). The age at which first surgery was received was older than 43 and the mean age was 56.2 ± 9.5 for exposed cases. This is not so different from the nonexposed cases of 53.8 ± 8.9. The age at the time of bombing in the exposed cases was between 1 — 42 years and the mean age was 21.5 ± 14.2. The exposed distance of these 6 cases was within 4.1 km, and the mean distance was 1.9 ± 1.1 km.

The male-to-female ratio of the 8 nonexposed patients was 1:3, showing a high proportion of females, whereas the ratio of the 6 exposed patients was 1:1, showing an equal proportion. Although it was not statistically significant, there was a trend indicating that the proportion of males was higher among the exposed patients than among the nonexposed patients. There were three cases of cancer and the diagnostic clue was foreneck nodule. Although the cases were rare, two (Case 1 and

Case 13) out of 3, 66.6% were exposed cases within 4.1 km from the hypocenter. The percentage of functioning parathyroid tumors in exposed patients among the all functioning parathyroid tumors was 28.6% (Table 3).

DISCUSSION

Since 1975, reports on parathyroid tumor or hyperparathyroidism probably resulting from therapeutic irradiation of the head and neck have appeared[1-7,13,14].

The present report deals with 17 cases of parathyroid gland tumors including 6 cases of A-bomb survivors who had been surgically resected at Hiroshima University Hospital. These circumstances are very similar to those under which we first drew attention to the high incidence of salivary gland tumors among A-bomb survivors[8-11]. At the 93rd Surgical Meeting at Hiroshima in April 1971, we reported 17 cases of surgically resected salivary gland tumor at Hiroshima University Hospital, including 7 A-bomb survivors[8,11].

The fact that only one case of parathyroid tumor had been operated on before 1973, and 3 cases before 1979, seems to be due to the lower interest in parathyroid gland diseases, poorer diagnostic ability, delay in determination of the serum calcium level, and so on. In two previously described autopsies on A-bomb survivors with functioning parathyroid adenoma, the disease had been treated merely as arthritis or bone fracture, and the patients had died in 1965 and 1971, respectively.

The latent period between radiation exposure and the development of parathyroid gland tumor or hyperparathyroidism is recognized to be long, ca. 30-40 years, according to some reports[5,6,14], and it is assumed that the incidence of parathyroid gland tumor may still increase with aging among A-bomb survivors in the future. The early detection and treatment of parathyroid gland diseases in A-bomb survivors is thus recommended.

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