Prevalence of congenital missing teeth in the offspring of Hiroshima atomic bomb survivors

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Abstract

A number of studies have been conducted on atomic bomb (A-bomb) survivors in Hiroshima and Nagasaki, evaluating the late influence of ionizing radiation on humans. The enormous atomic bomb explosion caused massive destruction and loss of lives in Hiroshima in 1945. The present study was conducted to examine the relationship between radiation exposure and prevalence of congenital missing teeth.

Six hundred seventy-eight orthodontic patients (212 males, 466 females), had registered in our clinic. Questionnaires were used to the enrollers for the examination.

Generally, the number of female patients with congenital missing teeth were greater than that of males. In our study, the number of patients with congenital missing teeth was found to be significantly higher in the radiation exposed affected families compared to that of non-affected ones. In these radiation exposed families, male subjects also exhibited higher prevalence of congenital missing teeth than the females of the non-affected families.

These findings suggest that the higher rate of missing teeth in the offspring of Hiroshima atomic bomb survivors is possibly the consequence of the exposure of ionic radiation.

Introduction

The enormous atomic bomb explosion caused massive destruction and loss of lives in Hiroshima in 1945. De-struction was instantaneous. In addition to tremendous social and economic losses, the health of survivors was subject to continuing damage due to aftereffects of burns and radiation. The complex effects compounded by other losses created by numerous obstacles that impaired patient(s) recovery of physical and economic well-being. Approximately 140,000 people were dead (±10,000) as of the end of December 1945 (Hiroshima's estimated population was 350,000). The A-bomb exploded close to the center of the city, and because 85% of the city buildings were within 3 km of the explosion site, physical destruction of the city was nearly complete, with 90% of buildings collapsed or burned. (August 1946 Survey by the Hiroshima City Government) [Fig. 1 Damage due to Heat Radiation]. Radiation had caused various problems over the decades that followed, such as higher rates of leukemia, peaking after contamination [1,2]. The incidence of malignant tumors such as thyroid, breast, lung and salivary-gland neoplasm, began to increase in the 1960 [3,4] Furthermore, the report of the malformation in the craniofacial by radiation was carried out [5]. The present study was conducted to examine the relationship between radiation exposure and prevalence of congenital missing teeth.

Table 1: The number of patients of congenital missing teeth

Gender			
		Male	**Female**
Congenital missing teeth	Existence	16	66
	Non existence	196	400

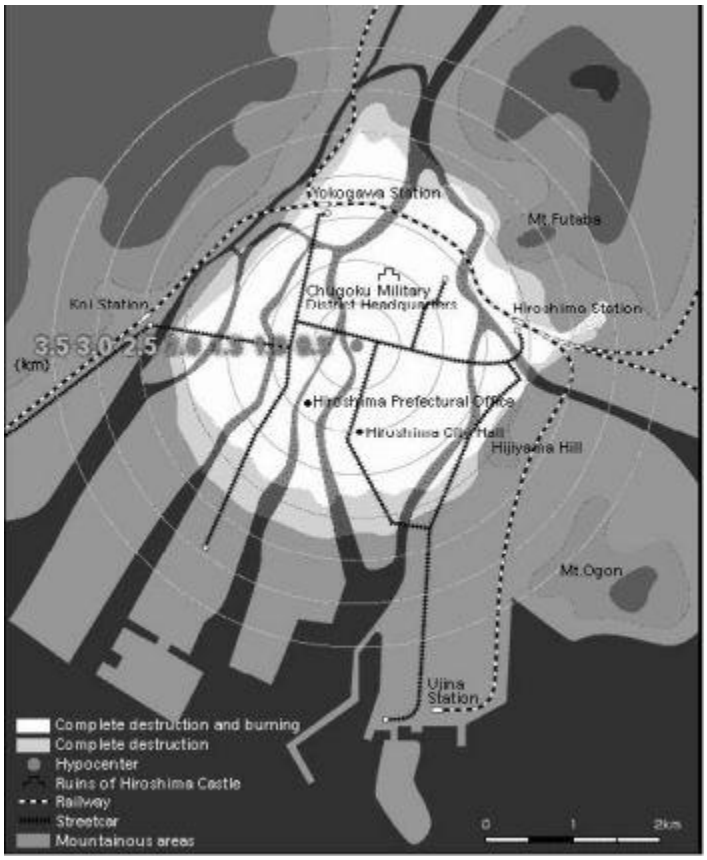
Patients and Methods

The subjects of this study were patients who visited the Hiroshima University Dentistry Hospital in the past three years. The present study was conducted to examine the relationship between radiation exposure and prevalence of congenital missing teeth. Six hundred seventy-eight orthodontic patients (212 males, 466 females) registered in our clinic were covered as the subjects. Questionnaires were enrolled. All subjects gave informed consent. The results were compared statistically by χ^2-test.

Results

It seems that the atomic bomb dropped in Hiroshima in-fluenced broadly the area as shown in Fig 1.The survey showed that 82 subjects have congenital missing teeth among the total of 678 (2.1%).The male and female rates were 14.2% and 7.5%, respectively. Tendency of higher rates of congenital missing teeth in females had previ-ously been recorded. However, our finding is consistent with the previous reports. Congenital

missing teeth are more common in descendants of A-bomb victims than others ($P<0.05$) (Table. 2).



(For larger image, click here)

Fig. 1: The damage in Hiroshima city. This figure was provided by Hi-roshima Peace Memorial Museum, Hiroshima Peace Culture. (http://www.pcf.city.hiroshima.jp/peacesite/English/Stage1/S1-.html) [**Indmedica note:** link no longer functional – 24 April, 2008]

Table 2: The rate of the family experienced exposure and congenital missing teeth

Contamination			
		Male	**Female**
Congenital missing teeth	Existence	9	4
	Non existence	11	26

Discussion

The rates in previous studies with congenital missing teeth were 7.9% [6], 9.2% [7], 9.91% [8], 10.9% [9], and 14.9% [10], respectively. Research of Hanaoka and Ya-mano [10] was conducted at the Hiroshima University Dentistry Hospital. It seems that Hiroshima University has many patients without congenital missing teeth. Gene mutation by radiation was proven by Muller [11] and in recent years, genes related to dental genesis has been discovered in experimental animals. MSX1 and PAX9 were discovered as dental formation genes [12-14]. Further-more, MSX1 is related to the 2nd premolar and 3rd molar [12]. PAX9 is related to congenital missing molars [13,14]. Many A-bomb victims' sequelae cannot be attributed to radiation, however, it seems that missing teeth is likely a resultant condition related to radiation exposure [7]. In the future, patient's detailed gene analysis will be investigated.

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