

The Human Remains of the Yayoi Period from the Sena Site in Shizuoka

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Abstract The permanent tooth crowns of four adult or subadult individuals and the deciduous tooth crowns of an infant were recovered from the square-shaped moated burial precincts of the Middle phase of the Yayoi period at the Sena site in Shizuoka. PENROSE's distance analyses of the mesiodistal and buccolingual crown diameters showed that all the five specimens were akin to the immigrant Yayoi people in the westernmost part of Japan, rather than to the aboriginal Jomon people, in the absolute tooth size or in the proportion of tooth sizes. Though meager, this is the first bioanthropological evidence of the people of the immigrant descent that has been found in moated burial precincts in the eastern half of Honshū.

Introduction

The Yayoi period was an age of innovation when rice cultivation and metal technology were imported for the first time to the Japanese islands from the Asiatic mainland. A large number of human skeletal remains of this period, buried in ceramic or lithic coffins, have been found in recent years from various cemeteries in northern Kyūshū and western Chūgoku, and it is now widely accepted that a substantial number of immigrants with physical characters that are distinct from those of the native Jomon people came from the continent to the western part of Japan (NAKASHI and NAGAI, 1989; DODO and ISHIDA, 1990; HANIHARA, 1991; NAKASHI, 1993; etc.).

Although human skeletal materials of this period are still quite rare in the greater part of this country, it has been demonstrated that the influence of the immigrants from the continent extended at least to the region around Ise Bay in central Honshū (IKEDA, 1988; KIBI, 1989; BABA, *et al.*, 1990; IKEDA, 1993; etc.). As for the region east of the Ise Bay area, skeletal materials are even rarer and virtually all of the Yayoi remains recovered so far from eastern Honshū are known to have the morphological features of the Jomon population in greater or lesser degree (SUZUKI, 1969; SAKURA and YAMAGUCHI, 1981; KAIFU, 1992).

The condition of the skeletal remains from the Sena site is extremely poor, but some tooth crowns have been preserved in workable conditions. Though far from sufficient, the materials are important because they were found, not in a cave site, but in square-shaped moated burial precincts (*hōkeishūkōbo*), that are typical graveyards of the Yayoi period in the central and eastern parts of Honshū.

Materials and Methods

Badly eroded and crushed human remains were found in seven wooden coffins, each buried in a square-shaped moated precinct, at the Sena site in the eastern suburb of the city of Shizuoka. All the burials are of the Middle phase of the Yayoi period. The excavation was carried out by the Archaeological Institute of Shizuoka Prefecture in 1988–1992.

The bony remains are decayed and distorted, but the crown enamels of four partial permanent dentitions and one partial deciduous dentition are preserved intact. Brief description of the burials will be followed by measurements of crown diameters and comparative analyses of the odontometric data.

Crown measurements were taken according to the criteria of FUJITA (1949), and the results were compared with the averages of the Jomon materials from various sites throughout Japan and those of the Yayoi materials from northern Kyūshū and western Chūgoku given by MATSUMURA (1989, 1991, and in press). The Yayoi samples measured by MATSUMURA are those of the predominantly immigrant stocks from the Doigahama, Kanenokuma, and Nakanohama sites.

Description of Burials

Burial 1 in Area 1: Buried in a supine position in a wooden coffin measuring 150 cm long by 55 broad on the inside, with the head to the north, facing west, the elbows fully flexed, and the knees flexed and tilted to the right. The maximum sagittal diameter of the deformed braincase is 195 mm. The upper facial height is estimated to be around 70 mm. The maximum length of the left femur was estimated to be around 443 mm, which gave a stature estimate of 164.5 cm by PEARSON's equation (1899) and 164.3 cm by FUJII's equation (1960). The following teeth are preserved, but not all of them could be measured because of chemical hardening treatment of the entire cranial remain.

M M M P P C ? ?	I I ? ? P M M —
M M M P P C I I	I I C P P M M M

The degree of tooth wear is slight, corresponding to the category 2 or 3 of MOLNAR (1971). The total pattern of the wear of the maxillary dentition is close to the phase E (24–30 yrs.) of LOVEJOY (1985). This skeleton is considered to be that of a young adult male.

Burial 5 in Area 7: Buried in a supine flexed position in a wooden coffin measuring 135 by 56 cm on the inside, with the head to the north, and the bent knees tilted to the right. Condition of preservation is generally poor, but the height of the mandibular symphysis is estimated to be around 30 mm. The crowns of the following teeth were recovered.

— M M P P — I I	— I — P P — M —
— — M — P C I —	— — — P — — — —

The upper incisors are shovel-shaped. Tooth wear is generally horizontal, and small dentine patches are present on the incisors, canine, first premolars, and first molars. The total pattern of tooth wear roughly corresponds to LOVEJOY's phase D (20–24 yrs.). This skeleton is probably that of a young adult male.

Burial 7 in Area 7: Only tooth crowns in loose condition were recovered from a wooden coffin measuring 111 by 50 cm on the inside. Most of the crowns were those of the deciduous teeth as shown below.

— m c i i	i i — — —
m — c i —	— i c — — —

The upper incisors are slightly shovel-shaped. A small patch of dentine is present on the first upper molar. Besides these deciduous tooth crowns, incomplete crown enamels of two permanent canines were also recovered. The developmental stage of these canine crowns is approximately that at the age of 4.

Burial 12 in Area 7: Only the cranial and tibial remains were recognizable. Probably buried in an extended supine position, with the head to the south. The body length is roughly estimated to have been around 130 cm. The badly eroded and distorted braincase is about 170 mm long in sagittal diameter. No teeth had been preserved. The skeleton was probably that of a juvenile.

Burial 14 in Area 7: Only the occipital portion of the braincase, the mandible, and the upper and lower dentitions were recovered from southern part of a wooden coffin measuring about 150 by 60 cm on the inside. Because of advanced surface erosion, no morphological features could be observed on the bony remains. However, the crowns of the following teeth have been preserved in good shape.

— M M P P C I I	I I — — — — —
— M M P P — — — —	— — C P — — — —

The upper incisors are shovel-shaped. The dental wear is barely advanced, with slight dentine exposure recognized only in the incisors and canines. Corresponding phase in LOVEJOY's criteria is B2 (16–20 yrs.) for the maxillary dentition and C (18–22 yrs.) for the mandibular dentition. The individual is probably a subadult female.

Burial 1 in Area 8: Only small fragments of the skull and major limb bones could be recognized in pasty conditions. Buried in a flexed position, with the head to the north. The bent knees were tilted to the left. The following tooth crowns were recovered.

— M M P — — — —	— — — — P M M —
— — — — — — — —	— — — — — — — —

The degree of tooth wear is close to LOVEJOY's phase B1 (16–20 yrs.). In view of this

and the tooth size, the skeleton was likely that of a subadult male.

Burial 2 in Area 9: Buried in a flexed position, with the head to the north in a 180 cm long and 72 cm broad wooden coffin. Only the crown of the left upper canine and a fragment of the shaft of the right femur about 25 cm long were recovered. The canine is large, with buccolingual diameter measuring 9.2 mm, and shows a dentine patch of moderate size. The femoral shaft appears, though distorted by soil pressure, to have had a pilastric structure with the well developed *linea aspera*. The maximum diameter at the middle is 36 cm in the present distorted condition. The skeleton was probably that of an adult male.

It is worthy to note here that none of the tooth crowns from this site show any sign of dental caries.

Tooth Crown Measurements

The mesiodistal and buccolingual crown diameters of the four permanent dentitions and one deciduous dentition from the Sena site are given in Tables 1 and 2, along with the means of the Jomon and Yayoi samples and the standard deviations of the Jomon sample given by MATSUMURA (1989, 1991, and in press).

According to MATSUMURA (in press), the permanent dentition of the Yayoi populations of immigrant descent in northern Kyūshū and western Honshū is different from that of the native Jomon populations with the absolutely larger general size and also the relatively larger sizes of the canines, premolars, and the second molars against that of the first molars. In case of the deciduous dentition, the difference in absolute size is consistent with the permanent dentition, but the difference in proportion is not so distinct as in the permanent dentition (MATSUMURA, 1991).

The crown diameters of the Sena remains are generally larger than the Jomon averages and much closer to the Yayoi averages with the only exception of the individual from Burial 14 in Area 7. However, if the individual from 7-14 is a female, as it seems quite likely, the tooth crowns from 7-14 is definitely larger than those of the average Jomon female (MATSUMURA, 1989). Therefore it can be concluded that all the individuals from the Sena site are closer to the immigrant Yayoi populations in western Japan with larger tooth crowns than the native Jomon populations.

Table 3 shows Penrose's size and shape distances (CONSTANDSE-WESTERMANN, 1972) of each Sena dentition from the average Jomon and Yayoi dentitions based on the available crown diameters. All the Sena dentitions, with the only exception of that from the burial 7-14, are closer to the Yayoi in size distances, and all the permanent dentitions are also closer to the Yayoi in shape distances. Only the deciduous dentition from the burial 7-7 is nearly equidistant from the Jomon and the Yayoi averages in the shape distance. Considering the ambiguity of the difference in dental proportion between the Jomon and Yayoi deciduous series, more importance should be placed in this case to the size distance, which definitely points to the closer affinity to the Yayoi dentition.

Table 1. Crown diameters of the permanent teeth (mm).

	Sena site				Yayoi ♂ ¹⁾	Jomon ♂ ²⁾	
	1-1 ♂	7-5 ♂	7-14 ♀	8-1 ♂	Mean	Mean	S.D.
Mesiodistal							
UI1	9.3	—	8.6	—	8.81	8.51	0.40
UI2	6.9	7.0	7.1	—	7.44	7.10	0.47
UC	—	—	8.1	—	8.17	7.55	0.42
UP1	7.7	7.6	7.4	—	7.59	6.90	0.38
UP2	7.1	7.2	7.4	7.2	7.10	6.46	0.40
UM1	10.5	10.4	10.5	10.6	10.68	10.28	0.47
UM2	10.1	9.7	9.3	10.4	9.86	9.12	0.60
LI1	—	—	—	—	5.44	5.27	0.36
LI2	—	—	—	—	6.19	5.72	0.37
LC	—	7.0	6.9	—	7.24	6.73	0.45
LP1	—	7.7	7.3	—	7.38	6.91	0.37
LP2	—	—	7.2	—	7.49	6.94	0.45
LM1	—	11.6	11.4	—	11.82	11.61	0.45
LM2	—	—	10.7	—	11.35	10.80	0.63
Buccolingual							
UI1	—	—	6.9	—	7.56	7.29	0.34
UI2	—	6.9	6.2	—	6.87	6.69	0.42
UC	—	—	8.0	—	8.68	7.96	0.49
UP1	9.4	9.6	9.3	—	9.74	9.27	0.49
UP2	9.5	9.1	9.1	9.8	9.52	9.00	0.58
UM1	11.4	11.8	10.9	12.1	12.06	11.78	0.51
UM2	11.7	11.3	11.0	12.1	11.84	11.45	0.62
LI1	—	—	—	—	6.02	5.93	0.36
LI2	—	—	—	—	6.47	6.20	0.37
LC	—	—	—	—	8.13	7.44	0.51
LP1	—	8.0	8.1	—	8.35	7.79	0.48
LP2	—	—	8.1	—	8.76	8.33	0.48
LM1	—	11.3	10.8	—	11.33	11.23	0.43
LM2	—	—	10.2	—	10.73	10.47	0.51

1) MATSUMURA, in press. 2) MATSUMURA, 1989.

Discussion and Conclusion

Human remains of the Yayoi period showing characteristic features of the immigrant populations in the northern Kyūshū and western Chūgoku have so far been discovered only in the western half of Japanese archipelago, with the eastern limit being around the Ise Bay area (IKEDA, 1993). All the remains of the Yayoi period from eastern part of Honshū were diagnosed as kindred to the people of the preceding Jomon period. Although the human remains of the Middle phase of the Yayoi period from the Sena site are poor in condition of preservation and only a limited number of tooth crowns could be examined and measured, all of the four permanent dentitions

Table 2. Crown diameters of the deciduous teeth (mm).

	Mesiodistal diameters				Buccolingual diameters			
	Sena 7-7 Infant	Yayoi* Mean	Jomon* Mean	Jomon* S.D.	Sena 7-7 Infant	Yayoi* Mean	Jomon* Mean	Jomon* S.D.
Ui1	6.3	6.89	6.72	0.29	3.9	5.12	4.94	0.20
Ui2	5.7	5.64	5.50	0.20	4.1	5.07	4.80	0.18
Uc	7.4	6.71	6.52	0.65	5.9	5.76	5.54	0.42
Um1	8.2	7.51	7.24	0.32	9.6	8.95	8.84	0.34
Um2	—	9.54	9.34	0.56	—	10.40	10.18	0.45
Li1	—	4.36	4.19	0.26	—	3.83	3.75	0.17
Li2	5.5	4.94	4.87	0.31	4.6	4.27	4.12	0.18
Lc	6.2	6.00	5.87	0.33	5.8	5.42	5.27	0.33
Lm1	—	8.76	8.63	0.47	—	7.53	7.10	0.41
Lm2	11.6	10.87	10.97	0.47	9.5	9.44	9.32	0.37

* MATSUMURA (1991). Males and females are combined.

Table 3. PENROSE's distances of the Sena dentitions from the immigrant Yayoi and the Jomon averages, based on the mesiodistal and buccolingual crown diameters.

	Size distances from		Shape distances from	
	Yayoi	Jomon	Yayoi	Jomon
Permanent dentition				
Sena 1- 1	0.035	0.663	0.563	0.985
7- 5	0.102	0.373	0.233	0.586
7-14	0.787	0.004	0.403	0.873
8- 1	0.107	1.655	0.135	0.380
Deciduous dentition				
Sena 7- 7	0.002	0.253	6.981	5.780

showed closer affinity to the immigrant Yayoi population in the shape distance analysis and the only deciduous dentition showed also closer resemblance to the immigrant Yayoi population in the size distance analysis.

We can thereby conclude that the Middle Yayoi people buried in the square-shaped moated burial precincts in the Sena site in Shizuoka resembled the Yayoi population of the immigrant descent in the westernmost part of Japan in their dental morphology. Although it is now well known that overwhelming genetic influence of the population of immigrant stock had extended to eastern Japan in the subsequent Kofun period (YAMAGUCHI, 1985, 1986, 1987), how far can this influence be traced back has remained to be settled. The Sena remains are the first and the earliest bioanthropological evidence, at present, of the people of non-Jomon ancestry in the eastern half of Honshū.

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