An Anthropological Positioning of Human Skeletal Remains from Tomari Cave in Himi City, Toyama Prefecture from a Viewpoint of Tooth Size

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Abstract Skeletal remains discovered in 1967 and 1972 at Tomari cave in Himi city, Toyama prefecture, Japan (Tomari cave man) has been provisionally attributed to the earlier Holocene or to the later Late Pleistocene according to physicochemical and osteological studies. The present study was designed to give Tomari cave man a more precise anthropological position from the viewpoint of tooth size, using principal coordinate analysis of Penrose's size and shape distances among age populations. The analyses by both distances support the previous studies that Tomari cave man belongs to the age since the neolithic Jomon period or earlier Holocene.

Bull. Sch. Allied Med. Sci., Nagasaki Univ. 3 : 13 – 19, 1989

Key words : Tomari cave, Human skeletal remains, Tooth size, Neolithic Jomon, Late Pleistocene

Introduction

A human skull lacking mandible and costal fragments were discovered in 1967 and 1972 respectively at Tomari cave in Himi city, Toyama prefecture, Japan (hereafter referred to as Tomari cave man) without any cultural associate. Relative dating using the fluorine method has provisionally attributed the human bones to the earlier Holocene or to the later Late Pleistocene[2]. According to the morphological study reported by Ogata et al. (1989)[3], the skull was regarded as that of a male about twenty years old and in general resembles more closely the neolithic initial to early Jomon skull (ca. 10000 to ca. 6000 B. P.) than the other comparative age populations. However, the Toma-

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ri cave man is also similar to the Late Pleistocene man (ca. 30000 to 10000 B.P.) in the morphology of some parts of the face.

The present study was designed to give Tomari cave man a more precise anthropological position from the viewpoint of tooth size, using principal coordinate analysis of Penrose's distances.

Materials and Methods

The remaining teeth were 7 6 4|4 5 6 7, and were in well preserved (Fig. 1). The mesio-distal and labio-lingual crown diameters of the teeth were measured according to Fujita's method (1949) in triplicate by the second author.

Penrose's size and shape distances[5] of Tomari cave man and comparative age populations[1)4)6)8)] were calculated. Principal coordinate analysis was applied to the matrices of two kinds of distances, and each relationship among the populations was plotted along the first two coordinate axes. Principal coordinate analysis was carried out using statistical software[7] for PC−9800 series (NEC personal computer).

Results and Discussion

Fig. 1 shows the occlusal aspect of the remaining teeth with the dental arch of Tomari cave man. A detailed description of the morphology of the teeth was reported by Ogata et al (1989)[3]. The teeth were slightly worn away and showed

Fig. 1 Occlusal aspect of maxillary dentition of Tomari cave man.

1 or 2 degrees of attrition according Martin's classification. The crown measurements of Tomari cave man are presented in Table 1. They tended to be small.

Table 1. Mesio-distal (MD) and Bucco-lingual(BL) measurements of the teeth of Tomari cave man.

	MD	BL
4(P1)	6.84	9.02
5(P2)	6.07	8.03
6(M1)	10.28	11.70
7(M2)	8.46	11.24

P 1, P 2 : 1 st and 2 nd premolars,
M 1, M 2 : 1 st and 2 nd molars

The matrices of Penrose's size distances and shape distances are shown in Table 2. The results of principal coordinate analysis of the matrices of size

Table 2. Penrose's size distances (upper) and shape distances (lower) among age populations.

Population	Tomari	Jomon[1]	Yayoi[1]	Yayoi[2] (Hirota)	Yayoi[3] (Doigahama)	Yayoi[4] (Mitsu)	Edo[1]	Modern[1] (Kyoto)	Modern[1] (Fukuoka)	Ainu[1]	Korean[1]
Tomari		0.242	1.975	0.219	1.227	0.448	1.253	1.970	1.131	0.060	1.201
Jomon	0.365		0.834	0.001	0.379	0.032	0.394	0.831	0.327	0.061	0.365
Yayoi	0.537	0.069		0.878	0.089	0.542	0.082	0.000	0.117	1.346	0.096
Yayoi (Hirota)	0.492	0.029	0.056		0.409	0.040	0.424	0.874	0.354	0.050	0.394
Yayoi (Doigahama)	0.641	0.222	0.096	0.257		0.192	0.000	0.088	0.002	0.744	0.001
Yayoi (Mitsu)	0.562	0.100	0.041	0.137	0.071		0.202	0.539	0.155	0.180	0.182
Edo	0.743	0.125	0.053	0.116	0.131	0.037		0.081	0.003	0.765	0.001
Modern (Kyoto)	0.638	0.114	0.052	0.072	0.183	0.083	0.047		0.116	1.342	0.095
Modern (Fukuoka)	0.939	0.259	0.096	0.188	0.198	0.124	0.083	0.052		0.670	0.001
Ainu	0.503	0.084	0.041	0.116	0.118	0.010	0.050	0.071	0.120		0.724
Korean	0.819	0.158	0.071	0.088	0.198	0.125	0.045	0.026	0.063	0.133	

1) : Brace and Nagai, 1982 2) : Yamada et al., 1970 3) : Sanui, 1960 4) : Oono, 1957

and shape distances are shown in Fig. 2 and Fig. 3 respectively. In Fig. 2, each population was located linearly on the Axis 1 of the principal coordinate axis, because it accounted for 99.98 of the total variability. Tomari cave man and modern populations were on opposite ends of the axis. Ainu having the smallest teeth recorded in Asia[1], were near Tomari cave man. Although 4 populations of the Yayoi varied widely, the population from the Hirota site in southern Kyushu was close to the Jomon.

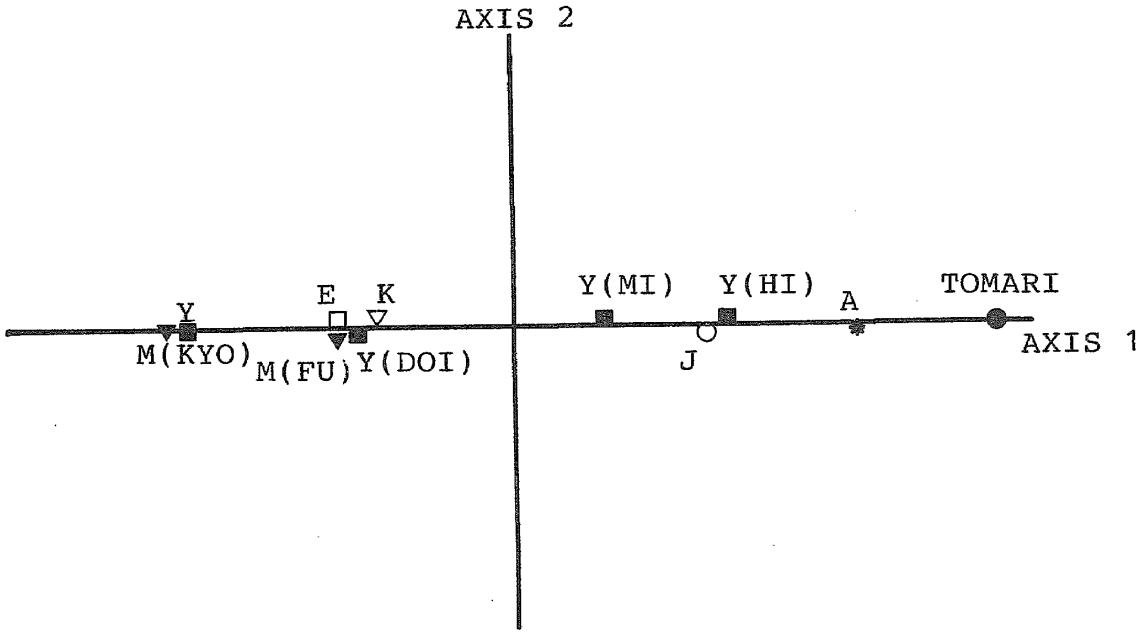

Fig. 2 Positioning of Tomari cave man compared with several populations at different periods using principal coordinate analysis based on Penrose's size distances in the tooth size;
● Tomari : Tomari cave man, ○ J : Jomon, ■ Y : Yayoi (HI : Hirota, DOI : Doigahama, MI : Mitsu), □ E : Edo, ▼ M : Modern (KY : Kyoto, FU : Fukuoka), ✱ A: Ainu, ▽ : Korean.

Based on the shape distances, the first two coordinate axes account for 65.8% and 18.3% respectively of the total variability of the system (Fig. 3). Tomari cave man alone was located far from the other populations, of which three clusters were noted. One cluster contained, the Jomon and the Yayoi from Hirota site in southern Kyushu, another Ainu and the Yayoi from the sites in northern Kyushu, and the other modern populations. Tomari cave man and modern populations were on opposite ends of the first coordinate axis, which may be related to age. Judging from the above finding, the tooth size of Tomari cave man showed primitive features.

Principal coordinate analysis based on shape distances allows classification of the age-populations more distinctly than that on size distances. In any case, both analyses support the physicochemical findings[2] obtained from the fluorine method and the osteological findings[3] from the skull suggesting that

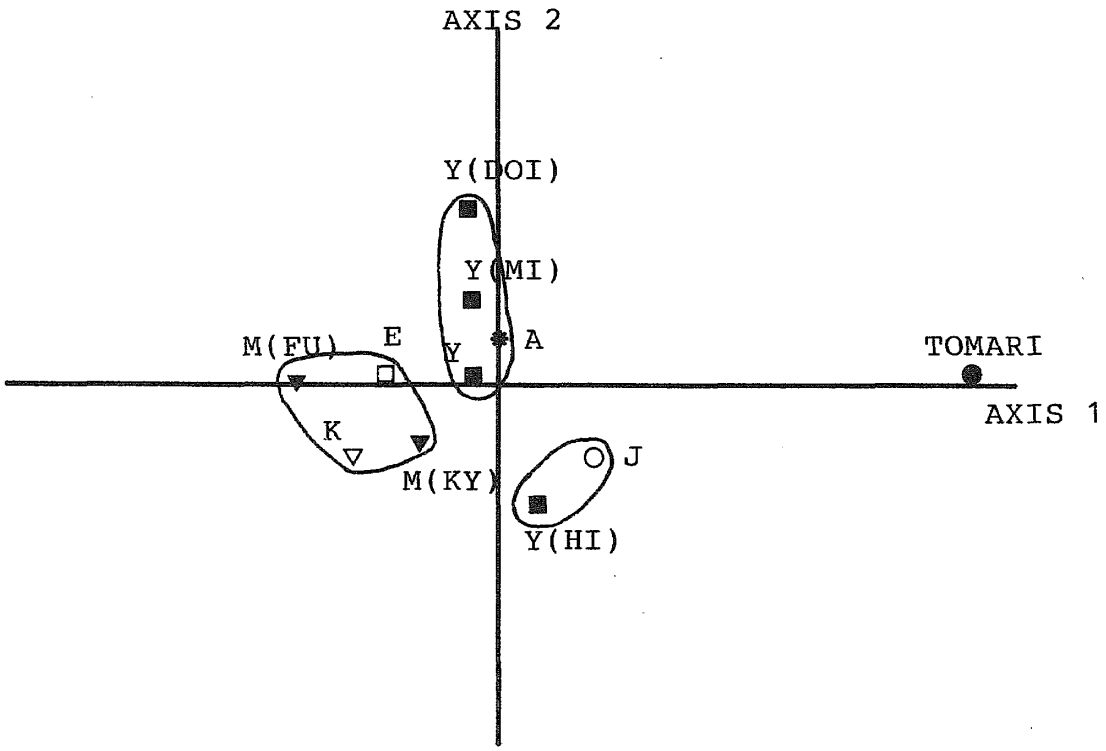

Fig. 3 Positioning of Tomari cave man compared with several populations at different periods using principal coordinate analysis based on Penrose's shape distances in the tooth size;
● Tomari : Tomari cave man, ○ J : Jomon, ■ Y : Yayoi (HI : Hirota, DOI : Doigahama, MI : Mitsu), □ E : Edo, ▼ M : Modern (KY : Kyoto, FU : Fukuoka), ✽ A : Ainu, ▽ : Korean.

Tomari cave man belongs to the age since the earlier Holocene or the Jomon period.

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(1989年12月25日受理)

富山県氷見市泊洞穴出土人骨（泊洞穴人）の歯の大きさから見た人類学的位置

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要　旨　富山県氷見市泊洞穴から出土した人骨（泊洞穴人）は、そのフッ素含有量が完新世前期から更新世末期に比定され、形態学的研究もこれをほぼ裏づけている。本研究は歯の大きさの観点から、泊洞穴人の人類学的な位置をさらに明確にするために行われた。歯の計測値に基づくペンロースの距離の主座標分析から得られた結果は、泊洞穴人が少なくとも完新世前期以前ないしは縄文時代以前に属する、とする従来の報告を支持している。

長大医短紀要 3：13－19，1989