

The Pectoral and Pelvic Girdles of the People of the Okhotsk Culture from the Ōmisaki Site in Hokkaido

By

Bin YAMAGUCHI

Department of Anthropology, National Science Museum
3-23-1 Hyakunincho, Shinjuku-ku, Tokyo, 169 Japan

Abstract The clavicles, scapulae, and the hip bones of the Okhotsk people excavated from the Ōmisaki site in Wakkanai, Hokkaido were examined and compared with those of the Ainu and modern and prehistoric Japanese skeletons. The clavicle is long and slender, but its shaft is not so flattened as that of the Ainu and Jomon clavicles. Muscular and ligamentous markings are well developed. The scapula is characterized by the laterally protruded acromion, broad acromioglennoid distance, and high incidence of a small pit in the center of the glenoid cavity. As for the hip bone, age assessment was attempted on the basis of the symphyseal surface, and a case of injury due to an arrowhead was described.

Introduction

The skeletal remains of the people of the Okhotsk culture who inhabited the northern and northeastern coastal areas of Hokkaido through the 8th to the 12th century have been investigated by ISHIDA (1988, 1991, 1994), ISHIDA, *et al.* (1993), ISHIDA and YONEMURA (1993), ITO (1948, 1951, 1965, 1971), KODAMA (1948), KOZINTSEV (1990), MITSUHASHI and YAMAGUCHI (1961, 1962 a, 1962 b, 1962 c), and YAMAGUCHI (1962, 1981, 1991).

This article is the seventh contribution on the human skeletal remains of the Okhotsk period from the Ōmisaki site following those on the mandible, the lower limb long bones, the tarsal bones and the lower limb joint surfaces, and the upper limb long bones by MITSUHASHI and YAMAGUCHI (1961, 1962 a, 1962 b, 1962 c), that on the sex estimation by YAMAGUCHI (1962), and that on the cranium by ISHIDA (1988).

Materials and Methods

The materials are the clavicles, scapulae, and hip bones of the human skeletal remains from the Ōmisaki site in Sōya-mura, Wakkanai, Hokkaido that are in the custody of the Department of Anatomy, Sapporo Medical College in Sapporo.

As the skeletal remains of more than thirty individuals were collected by construction workers without paying due attention to the association of bones that belong to each individual, the age and sex had to be estimated on separate bone rather than on each skeleton. Thus the subject of this study was confined to those bones with

fused epiphyses, and the sex of each bone was determined on the bases of the size and other morphological features, in accordance with the estimated sex ratio of approximately two males to one female (see YAMAGUCHI, 1962). Incomplete bones that could not be sexed were examined for morphological traits but were exempted from measurement.

All the measurements were made, unless otherwise provided, according to the definitions by MARTIN (BRÄUER, 1988). The *t*-distribution or ASPIN's table was used to test the significance of the differences between the means.

Clavicles

Measurements

Table 1 gives the results of measurements. The means of the left male clavicles that are the most numerous are compared with those of the modern Japanese, Ainu, prehistoric Jomon, and Yayoi series in Table 2.

The maximum length of the Ōmisaki clavicle is generally large, when compared with those of other series given in Table 2. Only the Yayoi mean is equivalent to the Ōmisaki mean, but the sample size of the former is only one. The claviculo-humeral indices (maximum clavicular length/total humeral length) in the male series calculated from mean values are 48.1 (right) and 51.2 (left). These index values are smaller than in the Jomon series from the Yoshiko and Tsukumo sites and close to those in the modern Japanese and Ainu series.

The circumference at middle is slightly larger than in the modern Japanese, but

Table 1. Measurements of the Ōmisaki clavicles.

	Side	Male			Female			
		n	m	s	n	m	s	
1	Maximum length	r	4	145.0	7.62	2	124.0	
		l	5	150.0	6.78	2	135.5	
2a	Height of curvature	r	4	31.0	3.16	2	24.5	
		l	6	34.2	3.54	3	27.7	
4	Vertical diameter at middle	r	5	11.2	0.84	4	8.8	0.96
		l	6	11.0	0.89	4	9.3	1.50
5	Sagittal diameter at middle	r	5	13.4	1.14	4	10.8	0.50
		l	6	13.5	1.38	4	10.3	0.87
6	Circumference at middle	r	5	40.4	1.82	4	33.8	3.87
		l	6	39.2	4.31	4	31.3	2.87
6:1	Index of robustness	r	4	27.6	1.36	2	26.2	
		l	5	25.3	1.70	2	24.5	
4:5	Shaft index	r	5	83.8	5.67	4	81.4	7.48
		l	6	81.8	5.31	4	89.9	9.14
2a:1	Index of curvature	r	4	21.4	1.52	2	19.8	
		l	5	22.2	1.19	2	20.3	

Table 2. Comparison of the measurements of the clavicle.

	Side	Ōmi- saki	Japa- nese ¹⁾	Sakh. Ainu ²⁾	Hokk. Ainu ³⁾	Jomon ⁴⁾ (Yoshiko)	Yayoi ⁵⁾ (Mitsu)
1 Maximum length	1	150.0	142.3	144.3*	145.7	148.4	(150.0)
4 Vertical diameter at middle	1	11.0	9.1*	10.4	(9.6)	10.0	10.4
5 Sagittal diameter at middle	1	13.5	12.2	12.8	(13.6)	14.1	13.3
6 Circumference at middle	1	39.2	37.6	39.4	(38.8)	40.3	39.7
6:1 Index of robustness	1	25.3	26.4	26.9	(26.4)	27.5	(28.7)
4:5 Shaft index	1	81.8	82.4	72.8	(71.4)	71.3*	79.2
2a:1 Index of curvature	1	22.2	21.5	21.0		20.6	(18.7)

1) TAKANO, 1958. 2) SEKI, 1930. 3) KOGANEI, 1893. 4) OBA, 1935. 5) USHIJIMA, 1954.

* Asterisked means are significantly different from the Ōmisaki means at 0.05 level. Bracketed means were not tested because variance was not given or sample size was too small.

is not significantly different from other series. Therefore the index of robustness is the smallest, though the differences are not significant. In the shaft index the Ōmisaki is close to the modern Japanese and Yayoi, and sharply differentiated from the Ainu and the Jomon that are characterized by very flat clavicular mid-shaft.

Nonmetrical traits

The sternal articular facet in the Ōmisaki clavicles tends to be more elongated than that in the modern Japanese clavicles. When the acromial end is positioned horizontally, the axis of the sternal articular facet in medial view is more nearly vertical, slightly inclined anteriorly, in about 80% of the Ōmisaki clavicles, while it is more nearly horizontal in about 60% of the Japanese clavicles.

The impression for the costoclavicular ligament is variable in shape from an almost flat surface to a robust rugosity, and no case of excavated type has been observed in the present series. The impression due to the first rib that was called the costal facet by RAY (1959) is seen in only 2 clavicles out of 26.

The rough surface for the attachment of sternocleidomastoid muscle is recognized in 22 cases out of 25 and that for pectoralis major is in 27 cases out of 28. The groove for subclavius muscle on the inferior surface is clearly formed in all of the 28 cases, whereas it is recognizable only in about 70% of modern Japanese clavicles (TAKANO, 1958). The attachment area for deltoid muscle on the anterior border is roughed in most cases, and the deltoid tubercle is seen in 8 cases (30.8%) out of 26.

The conoid tubercle is present in all of the 26 observable cases, and the trapezoid line is also generally well developed. The articular facet with the coronoid process of the scapula was found in none of the 23 clavicles examined.

A case of the canal for supraclavicular nerve was observed in a left clavicle out of 27.

Scapulae

Measurements

Because of the poor condition of preservation of the scapulae, measurements could be taken only on the spine and the glenoid surface region (Table 3). The means of the left or right male series are compared with those of other series in Table 4. The acromion is similar to in width and tends to be larger in length than that in other series. Similarly, the glenoid cavity is relatively invariable in width but longer in the Ōmisaki series than in the modern Japanese and Yayoi series. The length-breadth index of the glenoid cavity of the Ōmisaki series is small and close to that of the Sakhalin Ainu.

The acromioglennoid distance, as measured in accordance with HASEBE's method (HASEBE, 1921) (Fig. 1), is significantly larger than those in the modern Japanese and the Sakhalin Ainu and close to those in the Hokkaido Ainu and the Yayoi series, but

Table 3. Measurements of the Ōmisaki scapulae.

	Side	Male			Female		
		n	m	s	n	m	
9	Breadth of acromion	r	3	25.3		2	24.0
		l	5	28.6	3.71	3	24.3
10	Length of acromion	r	3	53.3		2	42.0
		l	5	49.4	6.02	3	41.7
12	Length of glenoid cavity	r	9	38.8	2.73	2	34.0
		l	8	39.0	2.27	2	33.5
13	Breadth of glenoid cavity	r	9	27.8	1.64	2	23.5
		l	6	27.2	1.47	2	24.5
13:12	Acromioglennoid distance*	r	8	18.9	0.35	3	18.7
		l	7	19.0	1.41	3	18.7
13:12	Index of glenoid cavity	r	9	71.8	3.95	1	72.7
		l	6	69.7	3.64	2	73.2

* Defined by HASEBE (1921).

Table 4. Comparison of the measurements of the scapula.

	Side	Ōmi- saki	Japa- nese	S. Ainu	H. Ainu	Jomon (Yoshiko)	Yayoi (Mitsu)
9	Breadth of acromion	l	28.6	27.9		30.9	
10	Length of acromion	l	49.4	45.3		46.6	
12	Length of glenoid cavity	r	38.8	35.2*		37.7	36.0*
13	Breadth of glenoid cavity	r	27.8	26.8		28.1	27.6
13:12	Index of glenoid cavity	r	71.8	76.2*	69.2	74.4	76.1
	Acromioglennoid distance	r	18.9	16.5*	17.9*	18.6	19.7* (18.3)

See the footnotes of Table 2.

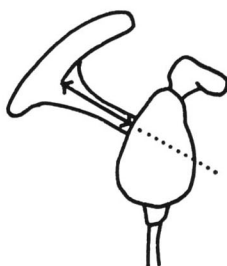


Fig. 1. Acromioglennoid distance defined by HASEBE (1921).

it is significantly smaller than in the Jomon series. The size of this distance is regarded to be roughly proportional to the development of supraspinatus and infraspinatus muscles.

Nonmetrical traits

The incidence of the sulcus axillaris subscapularis and the sulcus axillaris teretis at the level of upper one third of the lateral (axillary) border in the Ōmisaki scapulae is given in Table 5 along with that in modern Japanese. There is no substantial dif-

Table 5. Incidence of the sulcus axillaris subscapularis (S) and the sulc. axill. teretis (T) on the lateral border of the scapula (total of right and left sides).

	Sex	n	Posteriorly faced S	Laterally faced S	S and T coexisting
			%	%	%
Ōmisaki	M	14	4 (28.6)	5 (35.7)	5 (35.7)
	F	6	5 (83.3)	1 (16.7)	0 (0)
Japanese ¹⁾	M	61	18 (29.5)	30 (49.2)	13 (21.3)
	F	28	24 (85.7)	2 (7.1)	2 (7.1)

¹⁾ KUZUYA, 1927.



Fig. 2. Glenoid cavities showing an excavated rough spot in the center.

ference between the two series, with the former sulcus occurring in 100% and the latter sulcus concurring with the former in some males. The attachment area for teres major muscle at the lower part of the lateral border projects laterally, forming a flat triangular process (spina m. teretis majoris) in 8 scapulae out of 9.

The glenoid cavity is pear-shaped with a shallow notch in the upper part of the anterior border. A slightly excavated small roughened area is present in the middle of the cavity in 17 cases (68.0%) out of 25 (Fig. 2). This may be an expression of osteo-arthritic degeneration, but it is not always accompanied by pathological bony growth along the border of the articular surface.

The acromion protrudes antero-laterally in most of the Ōmisaki series without curving antero-inferiorly as often observed in modern Japanese scapulae.

Hip Bones

Measurements

The measurements of the separate hip bones and of some reconstructed pelves,

Table 6. Measurements of the Ōmisaki pelves and hip bones.

		Male			Female		
		n	m	s	n	m	s
Pelvis							
1'	Height of pelvis	11	201.1	12.32	5	190.0	9.43
2	Breadth of pelvis	4	277.0	5.72	2	277.5	
23	Conjugata vera	4	105.0	6.16	1	111	
24	Transv. diam. of pelvic inlet	9	125.4	6.45	4	135.3	5.91
25	Oblique diam. of pelvic inlet	6	124.8	6.34	3	136.0	
27(a)	Transv. diam. of pelvic outlet	5	114.4	8.56	2	126.0	
34(1)	Angle of divergence	4	82.5	5.72	2	79.0	
1':2	Breadth-height index	3	72.1		2	70.8	
24:2	Breadth index	4	47.2	2.75	2	47.6	
23:24	Index of pelvic inlet	4	85.0	3.07	1	84.7	
Hip bone							
10'	Height of ala of ilium	7	102.9	7.67	4	103.3	5.74
11	Depth of iliac fossa	6	8.5	2.67	3	5.7	
12	Breadth of ilium	5	159.8	3.83	4	157.5	8.35
13	Breadth of ala of ilium	11	92.8	3.97	5	93.6	5.81
15	Height of ischium	7	83.9	7.32	4	81.8	4.57
22	Maximum diameter of acetabulum	11	54.5	3.21	6	52.3	3.67
28	Lateral height of lesser pelvis	7	99.0	8.56	1	98	
30	Real height of lesser pelvis	11	134.5	9.03	4	129.5	12.53
12:10'	Index of ilium	4	150.0	5.02	3	154.0	
13:10'	Index of ala of ilium	7	91.6	6.00	4	91.2	2.38
15:1'	Ischium-hip-bone index	7	39.3	0.93	4	39.9	0.53

Measurements nos. 1' and 10' were taken after the method of KOGANEI & OSAWA (1900) rather than the standard method of MARTIN.

taken according to the method of KOGANEI & OSAWA (1900), are recorded in Table 6. Hip bone measurements were taken on the left bones, but when the left bone was missing or damaged it was substituted by the right bone. Reconstruction of the pelvis was made by applying a wax plate about 1.5 mm thick on the auricular surface of the ilium and the sacrum.

Compared with the Japanese and Ainu (KOGANEI & OSAWA, 1900) and the Jomon pelvis (TABATA, 1929), the Ōmisaki pelvis are closer to the Ainu and the Jomon than to the Japanese, with relatively lower shape, broader lesser pelvis, and narrower ilium than the latter.

Nonmetrical traits

The shape of the auricular surface was sorted into four types according to the schemata given by KURIYAMA (1931) and the incidences are compared with those in modern Japanese reported by him (Table 7). In both the Ōmisaki and Japanese series, the type A (auricular shape) is predominant among males and the type A and type C (comma shape) are equally frequent among the females.

The deepest point of the iliac fossa was reported, by KOGANEI & OSAWA (1900), to be in the central part in the Japanese whereas it was just in front of the auricular surface in the Ainu. In the Ōmisaki hip bones, it is in the central part of the iliac fossa in 6 cases and in front of the auricular surface in 11 cases.

Age estimation was attempted on the symphyseal surface of 17 adult individuals according to the criteria for modern Japanese males given by HANIHARA (1952). Some questionable cases were judged by Dr. K. HANIHARA himself. Results fall into three broad age classes as follows:

20 — 29 yrs.	5 (29.4%)
30 — 39 yrs.	4 (23.5%)
40 — x yrs.	8 (47.1%)

If the classes are represented by 25, 35, and 50 yrs. respectively, the average year at death of the adult sample over the age of 20 yrs. is 39.1 yrs.

Table 7. Variations of the auricular surface of the ilium.

	Male		Female	
	Ōmisaki	Japanese ¹⁾	Ōmisaki	Japanese ¹⁾
A (Auricular)	12 (75.0)	37 (74.0)	3 (42.9)	12 (35.3)
B (Thin)	3 (18.8)	3 (6.0)	1 (14.3)	7 (20.6)
C (Comma)	1 (6.3)	5 (10.0)	3 (42.9)	11 (32.4)
D (Triangular)	0 (0)	5 (10.0)	0 (0)	4 (11.8)
Total	16	50	7	34

¹⁾ KURIYAMA, 1931.

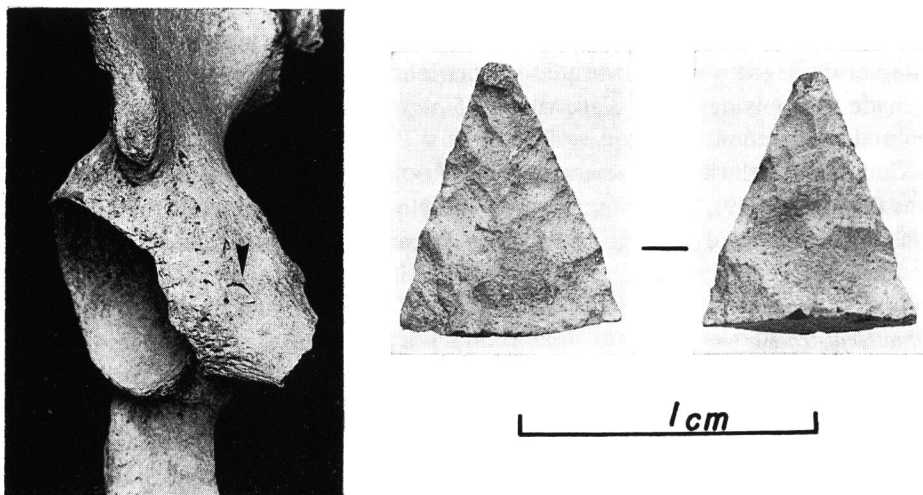


Fig. 3. The injured male right hip bone (left), and the extracted arrowhead tip (right).

An arrowhead sunk into the hip bone

The 9 mm long tip of a chipped stone arrowhead was found thrust into the anterior surface of the superior ramus of the pubis of an adult male right hip bone from the Ōmisaki site (Fig. 3). The wound is in front of the acetabulum and in short distance antero-inferiorly from the iliopubic eminence. The broken surface of the arrowhead is lozenge-shaped and 7.6×3.7 mm in diameters. It was just below the bone surface. The lozenge-shaped defect of the cortical bone is 7.6×4.8 mm in diameters and about 10 mm in depth. No sign of reactive change can be seen in the bone tissue around the wound. Dr. S. YASOJIMA of forensic medicine has suggested that the injury could have been fatal, since the wound is very close to the passage of the femoral artery. Supposing that the victim was upright, the arrow was shot horizontally from the front. The stone was identified by Dr. M. FUNABASHI as pelitic hornfels that is available in the northern part of Hokkaido.

Discussion

The Okhotsk culture is considered by the majority of archaeologists (see KIKUCHI, 1978, and KIKUCHI, 1984) to have diffused from the lower Amur basin to Sakhalin and the northern and eastern coasts of Hokkaido. Comparative studies on the cranial remains from the Moyoro and the Ōmisaki sites in Hokkaido indicated a close affinity of the Okhotsk people with the northern Mongoloid populations such as the Aleut, Eskimo, Nanai, and Ulchi (ISHIDA, 1988, KODAMA, 1948, SUZUKI, 1958, YAMAGUCHI, 1974).

The results of the present study on the pectoral and pelvic girdles of the Ōmisaki

remains do not directly contribute to the issue of population affinity because few comparative data are available from those northern populations. However, it has been found that they are not only different from those of the modern Japanese in some respects but also from the Ainu and the prehistoric Jomon population in Japan in other respects.

The case of injury by an arrowhead found on a male hip bone suggests that the northern part of Hokkaido was not always peaceful during the Okhotsk culture period.

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