ORIGINAL

Double-rooted lower canines

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Abstract: According to our investigation of lower canines which were extracted from a hundred Indian skulls, we conclude as follows: 1) The frequency of double-rooted canines on the right side is 2 per cent, on the left side is 1 per cent and the total is 1.5 per cent. 2) The root is bifurcated into a labial and lingual component. Two teeth, one case from the left-side and one from the right, had a bigger labial root. Another tooth, from the right-side, had a bigger lingual root. 3) The tooth on the opposite side to the double-rooted one is generally single-rooted. 4) The overall length of the double-rooted tooth is shorter and the labiolingual diameter of the crown is longer in comparison with the canine on the opposite side. 5) In comparison with other populations, the frequency of Indians getting double-rooted lower canines is close to those of coloured populations, but less than Whites.

Introduction

In the order of primates, canine teeth are as a rule single-rooted. However, double-rooted lower canines may occur on occasions. They have been considered a rare phenomenon conceived either as *lusus naturae* or as an atavism reproducing conditions seen in some Mesozoic mammals. The frequency of getting double-rooted lower canines are found more in White, but less in coloured populations.

Alexandersen¹⁾ is the first person who researched differences of each population by comparison with past reports. Although there are many case reports^{3-5,7-9,11-14)} on Japanese and other populations, for a comparison with other populations we examined White-Indians.

Materials and Methods

The materials are lower canine teeth which were extracted from a hundred Indian skulls, in the possession of the Department of Oral Anatomy in Matsumoto Dental College: 98 examples from the right side and 100 ex-

amples from the left side. Measurement of the length, mesiodistal diameter and labiolingual diameter of crown, the length of the root, overall length of tooth and the length of the labial and lingual root from bifurcated point were made using dental calipers. As for double-rooted lower canines and contralateral canines, the pulp cavities were observed by radiography.

Result and Discussion

From the present-sample the frequency of getting double-rooted lower canines is 2 per cent on the right side, 1 per cent on the left side and total 1.5 per cent. (Table 1) The size of these teeth is shown in Table 3.

Table 1 Frequency of double rooted mandibular canines

	Right n (%)	Left n (%)	Total n (%)
1 root	96(97.96)	99(99.00)	195(98.48)
2 roots	2(2.04)	1(1.00)	3(1.52)
Total	98	100	198

Fig. 1 Measurements of case 1 (Specimen number 1411, the right side).

Case 1 (Specimen number 1411, the right side)

The root bifurcates into a labial and lingual root. The length from the bifurcation to the apex of the labial root is 7.6 mm and 6.0 mm in the lingual root (Fig. 1).

Two grooves can be observed on the mesial surface of the root and one on the distal surface of the root. These grooves have almost the same depth. There are two types of grooves on the mesial surface: One groove runs from the furcation point to the cervical line. The other groove appears in the labial part and is broader and parallel to the groove in the lingual region. At the apex of the root, the labial and lingual root are curved in the mesial and labial direction (Fig. 2). The root canal of this tooth bifurcates from the half way point of the root of the tooth (Fig. 3).

The contralateral tooth is single-rooted and has a single root canal. Compared with double-rooted teeth, the mesiodistal diameter of the crown is smaller and the length is greater. Grooves on both mesial and distal surfaces are single. The apex of the root is

curved in a mesial and lingual direction. Case 2 (Specimen number 1430, the left side)

The length from the bifurcation of the labial root to the apex of the root is 5.0 mm, and 1.5 mm in the lingual root (Fig. 4).

Two grooves can be observed on the mesial surface and two on the distal surface.

The depth of those on the distal surface is deeper than on the mesial surface. One of the two grooves on the mesial surface is narrow and runs from the cervical line to the bifurcated point. The other one on the mesial surface is found on the labial part and runs toward the cervical line, and tends to be broader depending on the cervical division. As for the grooves on the distal surface, grooves which run from the cervical line to the bifurcated point and grooves in the labial region meet at the middle third of the root, and this creates grooves deeper and broader near the cervical line. Both root apices curve toward mesial surface (Fig. 5).

The root canal forms an incomplete bifurcation from half the length of the root, and opens in an apical foramen in the labial

Fig. 2 Labial, lingual, mesial and distal surface of case 1.

root. The canal in the lingual root opens in an apical foramen in the lingual root (Fig. 6).

The contralateral tooth is single-rooted and forms an incomplete bifurcated root-canal. In comparison with double-rooted teeth, the mesiodistal and the labiolingual diameters of the crown are of equal size. Other surveys of the ratio show almost the same size. Grooves

are single on the mesial and distal surfaces: the grooves on the distal surface tend to be deeper than those on the mesial surface. The apex of the root curves in a distal direction. This tooth is similar to the double-rooted tooth on the opposite side in comparison with the other two cases. This may occur because the bifurcated root of the double-rooted tooth is smaller.

Case 3 (Specimen number 1444, the right side)

The length of the root from the bifurcation is 4.5 mm in the labial root and 5.1 mm in lingual root.

Compared with the labial root, the lingual root is longer and wider (Fig. 7, 8).

The root canal bifurcates one third of the root length from the apex of the root, and opens into separate apical foraminae (Fig. 9).

The contralateral tooth is single-rooted and has a single root-canal. In comparison with the double-rooted tooth, the length of the root and crown are longer, and the mesiodistal diameter and labio-lingual diameter of crown are smaller. Also, this tooth has a peculiar shape. In comparison with the average value for Japanese males, the root of the tooth is extremely long. Suppose the above mentioned Japanese value is 1, the Indian's

Fig. 3 Roentgenogram of case 1 and canine on the opposite side.

Fig. 4 Measurements of case 2 (Specimen number 1430, the right side).

Fig. 5 Labial, lingual, mesial and distal surface of case 2.

length of root is 1.31. The other ratio is conversely smaller: the length of crown is 0.87, the mesiodistal diameter of crown is 0.78 and labiolingual diameter of crown is 0.91.

Bringing these three cases to a conclusion, the contralateral tooth to the double-rooted

lower canine is single-rooted. There is one case in which the root can be observed to have a double root-canal. In comparison with single-rooted teeth, a common variation of the double-rooted tooth, has shorter root and tends to have a thicker crown (Table 3).

The frequency of double-rooted canines in Indians is 1.5 per cent. The frequency of finding double-rooted lower canines in Bantu Negroes is 1.61 per cent, in East Greenlandic Eskimos 1.39 per cent and in Japanese (Okamoto¹⁵) 1.07 per cent. The frequency of double-rooted lower canines in Indians is close to those mentioned above. However, these frequencies are a much higher ratio than the 0.30 per cent for Japanese (Imoto⁹) and the 0 per cent for Pecos Indians. These ratios are lower than the 5-10 per cent of European populations.

Despite, being regarded as White the frequency of finding double-rooted lower canines in the Indian is highly correlated with those of coloured populations (Table 2).

Alexandersen¹⁾ researched double-rooted lower canine teeth from Danish populations

Fig. 6 Roentgenogram of case 2 and canine on the opposite side.

Fig. 7 Measurements of case 3 (Specimen number 1444, the right side).

Fig. 8 Labial, lingual mesial and distal surface of case 3.

Fig. 9 Roentgenogram of case 3 and canine on the opposite side.

mainly from the Middle and Late Neolithic periods and from the middle Ages. The ratio between mandibles with one double-rooted lower canine and mandibles with two double-rooted canines was approximately 3 : 1. As compared with modern European populations, the results of these investigation shows that the frequency of double-rooted lower canines in human populations is related to atavism. However, the author wish to point out that the difference in dentition between the right and left side may be related to an environmental makeup.

Table 2 Distribution of double-rooted lower canines by population

Ethnic group	Author	Total	1 Root n (%)	2 Roots n (%)
Indian	Onda et al.	198	195 (98.48)	3 (1.52)
Bantu	Shaw	62	61 (98.39)	1 (1.61)
Hungarians	Hillebrand	1707	1604 (93.97)	103 (6.03)
Alemanns	Schwerz	507	476 (93.89)	31 (6.11)
Germans	Fabin	315	295 (93.65)	20 (6.35)
Finns	Hjelman	98	93 (94.90)	5 (5.10)
Dutchmen	Visser	2488	2365 (95.06)	123 (4.94)
Frenchmen	Huche	282	254 (90.07)	28 (9.93)
Danish (Neolithic)	Alexandersen	107	100 (93.96)	7 (6.54)
Danish (Middle Ages)	Alexandersen	622	580 (93.25)	42 (6.75)
Pecos Indians	Nelson	94	94 (100.0)	
East Greenlandic Eskimo	Pedersen	72	71 (98.61)	1 (1.39)
Japanese	Okamoto & Osada	3248	3238 (99.69)	10 (0.31)
Japanese	Imoto et al.	4364	4351 (99.70)	13 (0.30)
Japanese	Okamoto et al.	2616	2588 (98.93)	28 (1.07)

Table 3 Size of double-rooted lower canines and opposite side canines

Speciment No.	1411		1430		1444	
Number of root	Right 2 roots	Left 1 root	Right 1 root	Left 2 roots	Right 2 roots	Left 1 root
Length of crown	10.3	11.0	9.2	9.5	8.7	9.0
Mesiodistal diameter of crown	6.3	6.3	6.5	6.5	5.8	5.4
Labiolingual diameter of crown	7.9	7.3	7.4	7.4	7.3	7.1
Length of root	13.7	16.6	13.4	13.5	18.2	18.7
Overall length of tooth	24.0	26.0	22.6	23.0	26.9	27.7

抄録: インド人頭蓋骨 100 体より抜歯した下顎犬歯, 右側 98 例, 左側 100 例について観察した。また, 2 根歯とその反対側の同名歯については大きさ, 根面溝, 根管などを詳細に調査した。

出現率は右側 2%, 左側 1%, 合計 1.5% である。この値は黒色人種や黄色人種に近い値であり, 白色人種より少ない。分岐根は総て唇側根と舌側根に分かれており, 2 歯は唇側根が, 1 歯は舌側根が大きい。

2 根歯を有する歯の反対側の同名歯は総て 1 根歯である。2 根歯を有する歯は 反対側の同名歯に比べて 全長は短かく, 歯冠の唇舌径が大きい。また, 反対側の同名歯の根管は 1 例のみ 不完全分岐根管で, 他の 2 例は 1 根管である。この様に下顎犬歯の 2 根分岐は非対称的に生ずることから, 遺伝性より環境による影響が強いと考える。

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