Occlusal Morphology of the Mandibular First and Second Premolars in Iranian Adolescents

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ABSTRACT: In dental textbooks, the mandibular premolar occlusal morphology has been described as having a predominantly "U-shaped" central groove on the first premolar and a "Y-shaped" central groove on the second premolar. In this study, we examined students (n = 400) of Isfahan high schools (Iran) and first and second premolars were examined bilaterally. Morphological features of the crown, number, height and position of cusps, central grooves shape and sex of the teethwere recorded. For the mandibular first premolars, 21.5% of students exhibited H-shape grooves bilaterally; 70.0% had bilateral U-shape grooves; and 8.5% were mixed. For the mandibular second premolars, 73.0% exhibited 2-cusp forms bilaterally; 15.8% had 3-cusp forms bilaterally; and 11.3% were mixed. In the 2-cusp forms, the predominant occlusal pattern was U-shaped (44.0%). In this Iranian sample, the predominant occlusal pattern was U-shaped in both the first premolar and second premolar, which contrasts with conventional textbook descriptions. *Dental Anthropology* 2004;17(3):94-96.

The mandibular first premolar (LP1) is the smallest premolar in the human dentition and typically has two cusps. Its buccal cusp is much larger than the lingual cusp, causing the central groove to be U-shaped, with the bottom of the "U" directed lingually. But, in some instances, the lingual cusp is wider buccolingually and the central groove becomes H-shaped. In these latter cases, the coronal morphology of this tooth is more similar to maxillary premolars (Van Beek, 1983; Ash, 1993).

The occlusal morphology of the mandibular second premolar (LP2) is variable with two or more cusps. The variation occurs in the lingual portion of the crown that may present as a single cusp or may be divided into two or three cusps giving a more angular and square outline (Loh, 1993). Van Beek (1983) stated that, like first premolars, various occlusal patterns are seen in the 2-cusp forms with the predominant pattern an H-shaped central groove. In the multiple cusp forms, the LP2 crown appears to have a more-square outline (Loh, 1993), with the buccal cusp much broader than either of the lingual cusps. A "Y-shaped" form occurs when there is a central pit with three grooves (mesial, distal and lingual developmental grooves) radiating from it (Van Beek, 1983).

In dental textbooks, the occlusal morphology of LP1 and LP2 are described as usually having a "U-shaped" central groove on the first premolars and a "Y-shaped" groove on second premolars. But in our experience, the anatomy of these teeth is more variable. A literature search revealed a paucity of descriptive information on prevalence and features of the coronal morphology of these teeth. The purpose of the present study was to assess the actual variability of the occlusal groove patterns in a sample of contemporary Iranian adolescents.

MATERIALS AND METHODS

This investigation was undertaken in the high schools of Isfahan City, Iran. The students were screened and only those with erupted mandibular first and second premolars present bilaterally were selected. Direct intraoral examination was undertaken. Morphological details of the crown: namely the number, position and height of cusps and the sex of the subjects were recorded on prepared forms. Data were excluded from the investigation in cases where the teeth were restored, worn or heavily broken.

A cusp was defined as a pronounced elevation on the occlusal surface of a tooth terminating in a conical, rounded, or flat surface (Jordan and Abrams, 1992). Four hundred individuals (1,600 teeth: 800 first premolars and 800 second premolars) were analyzed for the present descriptive study.

RESULTS

Mandibular first premolar

Eighty-six individuals (21.5%) had a bilateral H-shaped pattern, 280 (70.0%) had a bilateral U-shaped pattern, and 34 (8.5%) were mixed (Table 1). Chi-square test revealed that there was no sex predilection for pattern of the central groove. But in the mixed

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TABLE 1. Groove patterns of the mandibular first premolar

Groove form	Males	Females	Total n	Total %
H-shaped	41	45	86	21.5
U-shaped	134	146	380	70.0
Mixed	25	9	34	8.5
Total	200	200	400	100.0

TABLE 2. Cusp number of the mandibular second premolar

Number of cusps	Males	Females	Total n	Total %
2-cusp forms	143	149	292	73.0
3-cusp forms	25	38	63	15.7
Mixed	32	13	45	11.2
Total	200	200	400	100.0

group, there was significant difference between males and females (P = 0.0163), with mixed patterns occurring in males more often that females (males = 25, females = 9).

Mandibular second premolar

Most cases (292/400; 73.0%) were bilateral 2-cusp forms; 63 (15.8%) were bilateral 3-cusp forms; and 45 (11.3%) were mixed (Table 2). Chi-square test revealed no sex predilection in the first and second categories but in the mixed groups there was significant difference between males and females (P = 0.004), also with mixed cusp forms occurring more often in males (males = 32, females = 13).

Various occlusal patterns occurred in the 2-cusp premolar (Table 3). The predominant pattern (44.0%) was a U-shaped groove form (P < 0.001).

DISCUSSION

In the Iranian sample, 70.0% of cases had a U-shaped central groove pattern on the mandibular P1. But in a study from the Ivory Coast (Adiko *et al*., 1999) the occlusal morphology of this tooth tended toward the 2-cusp mandibular second premolar. Among bilaterally symmetric cases the 2-cusp forms were far more common in the Iranian that the 3-cusp forms (15.8%). This finding is consistent with other population studies. Pederson (1949) gave a frequency of 63.8% in his series of 188 casts of East Greenland Eskimos. He quoted frequencies of 16.8% and 25.6 % in European (de Terra, 1905) and Finnish (Kajava, 1912) dentitions, respectively. However, in the present study 11.3% of cases were asymmetric (2 cusps on one tooth and 3 cusps on the homologue); data on asymmetry in the other studies were not reported. The LP2 3-cusp form occurred in nearly 16.0% of the Iranian sample. This occurrence is not very high. In Loh's study of Chinese from Singapore (1993), the 3-cusp form constitutes a quarter of the cases studied, and Loh considered this trait to be a North Asians characteristic.

The H-shaped pattern in the 2-cusp form of LP2 might also be an ethnic feature Loh (1993), stated that the 3-cusp forms (Y-shaped) were an important variation in that (1) no sex predilection is found for its occurrence; (2) development of structures with bilateral presence usually shows minor variations in size and shape; (3) different forms on each side is unusual, and (4) when asymmetry occurs in pattern, it is seen significantly more often in males.

CONCLUSION

In this study of Iranian adolescents the predominant occlusal pattern was U-shaped in both the first and second premolar samples. Thus in this population, occlusal morphology of first premolars was like that explained in dental textbooks, but the occlusal anatomy of second premolars is more variable that expected.

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TABLE 3. Groove patterns of the mandibular second premolar

Groove pattern	Males	Females	Total n	Total %
H-shaped	32	52	84	21.0
U-shaped	85	91	176	44.0
Y-shaped	25	38	63	15.7
Mixed	58	19	77	19.2
Total	200	200	400	100.0

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