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# Morphological changes in the crown of mandibular molars with an additional distolingual root

Ki Rim Kim [a,d], Je Seon Song [a,c,d], Seong-Oh Kim [a,c], Seung Hye Kim [a], Wonse Park [b], Heung-Kyu Son [a,c,*]

[a] Department of Pediatric Dentistry, College of Dentistry, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 120-752, Republic of Korea
[b] Department of General Dentistry, College of Dentistry, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 120-752, Republic of Korea
[c] Oral Science Research Institute, College of Dentistry, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 120-752, Republic of Korea

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ABSTRACT

*Objective:* The mandibular molars typically have two roots placed mesiodistally, but they occasionally have an additional distolingual (DL) root. This study was to determine the morphological characteristics of the crown of such mandibular molars.

*Design:* Radiographic records and study models were collected from a Korean population ($n = 86$ patients). Each molar was assigned to either the experimental group (i.e. with a DL root) or the control group (i.e. without a DL root; $n = 41$ patients) based on the radiographic findings. The intercuspal distances of the first permanent molars (total, $n = 100$; control/experimental, $n = 50/50$) and primary second molars (46, 23/23), and the largest buccolingual/mesiodistal widths of those molars and primary first molars (42, 21/21) were measured for molars with and without a DL root. In addition, the correlation between the existence of a sixth cusp and a DL root was examined.

*Results:* The crowns of first permanent and primary second molars with DL roots had significantly larger intercuspal distances between the distobuccal–distolingual cusp tips and a larger distal-area buccolingual width than those without the DL root (t-test; $p < 0.05$). There was no significant correlation between the existence of a sixth cusp and the presence of a DL root.

*Conclusions:* The existence of a DL root was associated with larger buccolingual dimensions, especially in the distal area.

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## 1. Introduction

The primary mandibular and permanent mandibular first molars generally have two roots, one each on the distal and mesial sides, but occasionally there is an isolated additional root located distolingually, known as the 'distolingual root'[1–3] or 'radix entomolaris'.[4] The distolingual (DL) root is considered to be more common in races of Mongoloid origin, in which the incidence is about 20%, including Chinese (8–21.1%),[2,5–7] Japanese (20%),[8] Eskimo (12.5–19%)[9,10] and native American (11–16%).[1,11] Its incidence among Caucasians is rare, reportedly being only 0.9–4.3%.[8,12,13] The DL root usually occurs in the permanent first molar and tends to have a high concurrency rate with the primary molars, but very rarely

* *Corresponding author at*: Department of Pediatric Dentistry, College of Dentistry, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 120-752, Republic of Korea. Tel.: +82 2 2228 3172; fax: +82 2 392 7420.
E-mail address: hgson@yuhs.ac (H.-K. Son).

[d] These authors equally contributed to this work.

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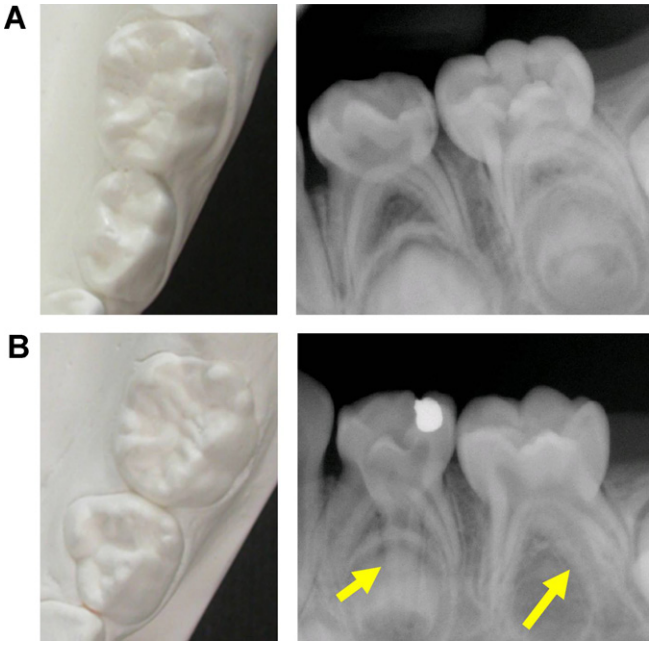


**Fig. 1 – Crown morphology of the primary mandibular molars in ones of the study models (left), and periapical radiographic views distinguishing the existence of a distolingual (DL) root (right). (A) Molars without a DL root in a 4-year-old boy. (B) Molars with a DL root in a 3-year-old boy. Arrowheads indicate DL roots.**

occurs in the second molar.[2,3,14,15] Many studies have found that the DL root has a predilection towards the right side,[2,5,7,15] with a left-side predilection being reported much less frequently.[14]

Many studies have investigated the incidence, racial distribution,[3,16–20] and morphology of the DL root,[6,21–24] but there have been few investigations of the morphological changes in the crown of mandibular molars with a DL root. Although changes in the morphology of the primary first molar with a DL root has been reported previously,[16,17] there have been no such studies of primary second and permanent first molars. Changes in crown morphology are clinically relevant, since they impact upon molar restoration with stainless-steel crowns; increases in buccolingual distance in the distal-half area of primary molars with DL roots can be observed clinically, creating difficulties for clinicians regarding their restoration (Fig. 1). The aim of this study was thus to determine whether there are any statistically significant morphological changes in the crown of mandibular molars (especially the primary second and permanent first molars) with a DL root compared to those without such a root in a general Korean population of Mongoloid origin.

## 2. Materials and methods

### 2.1. *Subjects*

All procedures were approved by the Institutional Review Board of the Dental Hospital, Yonsei University, and informed consent to participate was obtained from all of the subjects (and their parents, in the case of minors) (#2-2009-0006, 2-2009-0007). The inclusion criteria for each mandibular molar (permanent first molar, primary first molar and primary second molar) were as follows:

(1) The absence of restoration or dental caries extending to the proximal surface or cusp.
(2) No cusp wear that could cause measurement difficulty (i.e. less than 0.3 mm).
(3) A full tooth eruption that is sufficient to reveal the contour height on the buccolingual surface.
(4) Use of radiographic images (periapical, panoramic, and/or CT images) to clarify the existence or absence of a DL root.

When a tooth met the inclusion criteria, an impression was taken with alginate (Cavex, CA37, Haarlem, The Netherlands) to allow the fabrication of a study model with hard plaster of Paris (Samoo, Busan, Korea). Radiographic evaluation was performed to determine the existence of a DL root by two independent experimenters; any disagreement between them was discussed until a consensus was reached. Each molar was then assigned to either the experimental group (i.e. with a DL root) or the control group (i.e. without a DL root), depending upon the radiographic findings.

In total, 86 subjects (65 males and 21 females, aged 5–43 years) were assigned to the experimental groups. The distribution of teeth was as follows:

(1) Permanent first molars, $n = 50$ units (from 31 males and 19 females, aged 18–43 years).
(2) Primary second molars, $n = 23$ units (from 18 males and 5 females, aged 6–13 years).
(3) Primary first molars, $n = 21$ units (from 16 males and 5 females, aged 5–13 years).

For the control groups, 41 subjects (31 males and 10 females, aged 6–43 years) were assigned as follows:

(1) Permanent first molars, $n = 50$ units (from 37 males and 13 females, aged 18–43 years).
(2) Primary second molars, $n = 23$ units (from 10 males and 13 females, aged 6–13 years).
(3) Primary first molars, $n = 21$ units (from 11 males and 10 females, aged 6–13 years).

### 2.2. *Measurements*

Each tooth model was measured by two independent experimenters under single blind conditions regarding the existence or absence of a DL root. The mean of two measures was used as the final data value. The measurements were made with the aid of a digital precision calliper (530-101, Mitutoyo, Hiroshima, Japan) and rounded to two decimal places. If the severity of voids or cusp wear prevented measurement, that tooth was excluded from the experiment (based on the agreement of two experimenters).

The following linear measurements were used for the primary second molars and permanent first molar:

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