



The Relationship between Palatal Displacement of Upper Canines and Incisors Widths in a Syrian Sample of Patients with Uncrowded Arches

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ABSTRACT

The aim of this study investigates mesiodistal crown size of the maxillary and mandibular incisors of patients with palatally impacted canines (PDC). Pretreatment dental casts of orthodontic patients with PDC of one or both maxillary canines (N: 33) were collected. This PDC sample was matched according to age and sex with pretreatment dental casts from unaffected orthodontic patients. For the PDC and matched control samples, maximum mesiodistal crown diameters were recorded for the four incisors on the right side only. The results showed that, on average, the mesiodistal crown diameters for the maxillary and mandibular incisors measured smaller in the PDC sample than in the control sample. These findings of statistically significant tooth-size reductions associated with PDC occurrence indicate a generalized pattern of reduced tooth size as a characteristic associated with the PDC anomaly. Further, the presence of generalized tooth-size reduction in cases with palatally displaced canines help explain why most orthodontic treatment plans for PDC patients are of the nonextraction type.

Keywords: Canine, Ectopic, Impacted, Tooth eruption, Tooth size.

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INTRODUCTION

The prevalence of impacted maxillary canines is 1 to 3% in the general population.^{1,2} The etiology of impaction is due to multifactorial causes. Some of the common causes were

found to be genetic predisposition, anomalies in maxillary lateral incisors, in addition to inadequate arch space.^{3,4}

An overview on the populations from European origin, 70 to 85% of cases of maxillary canine impaction are characterized by the canine being ectopically displaced palatally to the dental arch.^{5,6}

Other studies referred that Syrian population have almost the same rates.⁷

Other studies pointed out that palatally impacted canine (PDC) ranges from 0.8 to 2.8%.^{1,3}

Palatally displaced canines occur twice in females rather than in males.³ Bilateral occurrence of PDC has been reported for both sexes in a range of 19 to 45%.⁸

Specifically, tooth-size reductions associated with PDC have been studied only for the maxillary lateral incisor, which is often noticed in its peg-shaped phenotype in cases of PDC.⁹ Therefore, the aims of the current study were to:

- Evaluate the mesiodistal crown width of the maxillary and mandibular incisors in patients with PDC.
- To detect the possible associations between tooth size and the PDC abnormality.

MATERIALS AND METHODS

Pretreatment dental casts of 33 normal orthodontic patients (M:10:F:21) with palatal displacement of one canine or both were evaluated, were selected from the University of Damascus in 2013. This PDC sample was selected according to a clear diagnosis of palatal ectopic displacement of the abnormal canines, this was based upon panoramic, periapical and occlusal radiographs and clinical history.

All PDC subjects are self-identified as Syrians. The range of ages for the PDC patient sample was from 13 to

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23 years with a mean of 18 years. Patients with impacted canines had uncrowded arches. The control reference group consisted of pretreatment dental casts of 33 non-PDC orthodontic patients, matched with the PDC subjects according to age (rounded to the whole year) sex and race for the PDC subjects.

The maximum mesiodistal (MD) crown widths were recorded in millimeters for the four incisors (FDI/ISO tooth numbers employed) on one side only (right), on the basis of strong right-left metrical concordance between homologous human teeth.^{10,11} The following measurements to the nearest 0.01 mm were taken from the pretreatment dental casts using a specially tipped odontometric dial caliper (Table 1).

Tooth-size data from the patients with PDC were compared with data from the control group. Student's t-test was employed to test differences between the mean values of the measurements MD11, MD12, MD41 and MD42 found for the PDC subjects and those intraexaminer reliability was assessed using a double-determination method. The dental casts were measured twice by the same investigator, with a 1 week separation between each set of measurements.

RESULTS

All four incisor mesiodistal crown diameters on average measured smaller in the PDC sample than in the control sample (Table 2). Three of the four incisor-size comparisons showed differences between the means that were statistically significant. Thus, three of the four variables indicated significantly smaller teeth in the PDC cases *vs* the controls ($p < 0.01$). The fourth variable, the mandibular

central incisor (MD41), which is the smallest of human teeth, confirmed this trend in the same direction, but did not show statistical significance.

DISCUSSION

This study showed that there was a decreased mesiodistal crown size for the maxillary and mandibular incisors in PDC subjects indicating that there was a generalized pattern of smaller tooth size in this Syrian sample of patients with the anomaly of palatal impaction of maxillary canines.

It is known that inter-relationships exist between anterior tooth size and the dimensions of the rest of the teeth; therefore, reduced incisor tooth widths are indicative in generalized reductions in tooth size throughout the dentition.¹¹⁻¹³

This tendency for smaller incisors with PDC is a strong indicator that the entire dentition is smaller in PDC patients.

The presence of smaller-than-average teeth in the PDC group supports previous reports that palatal canine impactions may occur in patients with dentoalveolar arch-space adequacy.

Dewel¹⁴ showed that canine malpositions occur most often in cases with a normal arch form and enough space.

Zilberman et al¹⁵ showed that some crowding were seen in only 16% of patients with PDC.

The current results related the PDC abnormalities with the occurrence of generalized tooth-size reductions, are consistent with increasing evidence identifying a complex of genetically controlled dental disturbances that often occur altogether.⁷

In addition to that, tooth-size reduction, PDC and other dental anomalies in this genetic feature complex are hypodontia, delayed tooth eruption and certain canine tooth transpositions. These behaviors share some common genetic controls; therefore, they are associated in occurrence, but not causally related to one another.

This is why the appearance of small permanent incisors in the early mixed dentition especially in combination with some of these other associated dental

Table 1: Measurement items and explanation

| | |
|------|---|
| MD11 | Maximum MD crown diameter, maxillary right central incisor |
| MD12 | Maximum MD crown diameter, maxillary right lateral incisor |
| MD41 | Maximum MD crown diameter, mandibular right central incisor |
| MD42 | Maximum MD crown diameter, mandibular right lateral incisor |

Table 2: Maximum mesiodistal crown diameters for four incisors (right side) in the palatally displaced canines (PDC) sample vs controls

| Variable | Sample | N | Mean (mm) | SD (mm) | t-test | p-value |
|----------|---------|----|-----------|---------|--------|----------|
| MD11 | PDC | 33 | 8.57 | 0.53 | 1.816 | 0.079 |
| | control | 33 | 8.67 | 0.46 | | |
| MD12 | PDC | 33 | 6.2 | 0.63 | 5.721 | 0.000 |
| | control | 33 | 6.78 | 0.5 | | |
| MD41 | PDC | 33 | 5.39 | 0.39 | 1.119 | 0.271 NS |
| | control | 33 | 5.47 | 0.43 | | |
| MD42 | PDC | 33 | 5.8 | 0.33 | 2.39 | 0.023 |
| | control | 33 | 5.94 | 0.32 | | |

NS: Nonsignificant



anomalies could serve as a helpful indicator of PDC occurrence to come. In these instances, clinicians should understand that the reduced size of the mandibular and maxillary incisors are a noncausal trait connected to the PDC anomaly.

Reduced teeth size may help in identifying candidates for interceptive treatments for PDC, such as the extraction of maxillary deciduous canines.

Clinically speaking, the outcomes of this study may help clarify the predominance of nonextraction type treatment plans for orthodontic patients with PDC problems.

A collateral study has indicated that maxillary arch width is normal, not constricted, in the PDC patient.¹⁶ Integrating this dental-arch width adequacy with the pattern of reduced tooth size we now have related to PDC, it becomes clear that permanent tooth extractions become usually unnecessary to create space in dental arch for orthodontic treatment of the palatally ectopic canine.

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