

# Lack of Association of Palataly Impacted Canines with Maxillary Arch Width and Lateral Incisor Anomalies



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**OBJECTIVE:** To investigate if there is any relationship between palataly impacted canines and missing or anomalous lateral incisors as well as maxillary arch widths.

**METHODOLOGY:** The materials for this study comprised of orthodontic records including orthopantomographs and dental casts of patients visiting the Dental OPD of Bahria University Medical and Dental College. The sample size was 60 and was divided into 30 experimental subjects and 30 control subjects. The experimental group comprised of subjects having palatal canine impaction while the control group included subjects without palatal impactions. The presence of impacted canines was confirmed on OPG, their palatal presence was checked with horizontal parallax using an additional periapical radiograph. Dental casts were used not only to assess anomalies/ or absence of lateral incisors but also for measuring maxillary width from interpremolar and inter moalr distance. Data was analyzed using SPSS software. Co-relation between incisor anomaly or absence with impaction was checked using fisher exact test. To see the significance of intermolar and interpremolar widths (mm) between case and controls, independent sample t test was applied.

**RESULT:** Subjects with palatal canines had a weak association with anomalous and absent lateral incisors as 83% of experimental subjects and 93% of control subjects had normal lateral incisors. Maxillary width taken from inter-molar and inter-premolar distance, also had similar values between the experimental subjects and controls.

**CONCLUSION:** There was no association between palataly impacted canines with absent and anomalous incisors nor with maxillary skeletal width.

**KEYWORDS:** Palatal impactions, Maxillary arch width, Lateral incisor anomalies.

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## INTRODUCTION

The most frequently impacted tooth in the dental arch after the third molars is the maxillary canine. The incidence of its impaction is between 1 and 2.5 %. Impactions of canine can be either buccal or lingual.<sup>1</sup> Around 85% of impactions are palatal while the remaining 15% are buccal. Canine impaction occurs twice as more in the maxilla than in the mandible. In subjects with impacted maxillary canines, 8% of impactions occur bilaterally.<sup>2</sup>

The etiology of palatal canines is accepted to be multifactorial and of a complex nature. The two accepted theories for this anomaly are guidance theory and genetic theory. The guidance theory stresses on the impact of lateral incisors on the eruption of palatal canines and also states that absent, peg or anomalous lateral incisors lead to the impaction of maxillary canines. The genetic theory explains the occurrence of different dental anomalies that occur along with palataly impacted canines e.g. infraoccluded deciduous molars and ectopic eruption of maxillary 1<sup>st</sup> molars.<sup>3,4</sup>

Maxillary width is usually decreased in patients with buccaly impacted canines<sup>5</sup> but the relationship between width of maxilla and palatal canines is questionable. McConell in a study implicated maxillary width deficiency as a factor for palatal canine displacement.<sup>6</sup> On the other hand, Langberg and Peck found no statistical significant difference in the

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anterior and posterior maxillary arch widths in patients with palatally displaced canines.<sup>1,2,7</sup>

There is compelling evidence that palatally displaced canines are associated with agenesis of lateral incisors as well as peg shaped lateral incisors.<sup>8</sup> Becker and Smith in their study indicated that the absence of lateral incisor could lead to palatal canine impaction.<sup>9</sup> Al Nimri in his study found smaller mesiodistal width and short roots of lateral incisors in association with palatal canines.<sup>10</sup>

Contrary to the aforementioned evidence, there are studies that reflect a weak association between palatally impacted canines and lateral incisors. Mossey et al in their study showed a weak support between impacted canines and absence of adjacent lateral incisors.<sup>11</sup> Jena and Duggal in their study also found no positive association between lateral incisor anomalies and canine impaction.<sup>12</sup>

As such an association has not been checked on Pakistani population, our aim with this study was to explore a relationship between palatally impacted canines and maxillary interarch widths at the level of first premolar and first molars, and also their possible relation with anomalies of lateral incisors (agenesis/ peg laterals).

## METHODOLOGY

This cross sectional study was conducted on the orthopantomograms and dental casts of the patients coming for orthodontic treatment at the Dental OPD of Bahria University Medical and Dental College between the periods of 2016 to 2019. An institutional ethical committee approved the protocol of study (letter no ERC 39/2019). The sample was selected via convenience sampling. The sample size was calculated with the OPENEPI online software. With a standard of 95% confidence interval and 5% error size, the proportion of subjects and controls was found to be 60 (30 subjects and 30 controls). The experimental group comprised subjects diagnosed with palatal canine impaction while the control group included subjects without palatal impactions.

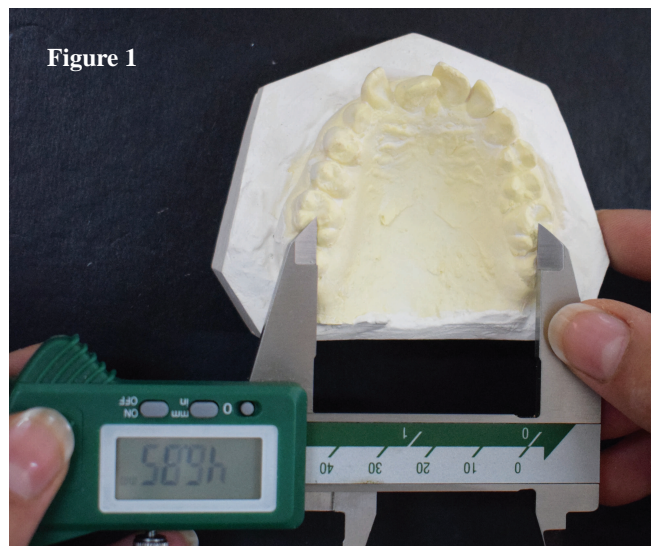
The inclusion criteria for experimental subjects included:

- Nonsyndromic subjects
- Unilateral palatal canine impaction
- Age group: 12 to 30 years

The exclusion criteria for experimental subjects are:

- Missing 1st premolars
- Missing 1st molars
- Severely mesially rotated 1st molars
- Previous orthodontic treatment

The patients were documented with OPG's and Periapical



x rays (horizontal parallax technique) for the presence of palatal canine. Pretreatment dental casts of the patients were used to assess maxillary first inter-premolar and first intermolar widths. These readings would be used to determine the maxillary transverse width. The data was collected by a single examiner who was calibrated to make these measurements by placing the caliper tips into the deepest portion of the central fossae of the upper first premolars at their junctions with the most lingual aspect of the buccal cusp. The same examiner also recorded the intermolar width by placing the caliper tips into the deepest portion of the central fossae at its junction with the most lingual aspect of the mesio-buccal cusp. All dental cast measurements were made using a digital boley gauge.

The dental anomalies to be included in the experimental and control group included lateral incisor's agenesis /peg laterals.

## STATISTICAL ANALYSIS

Data analysis was done by using SPSS version 23. Fisher exact test was used to determine the co-relation between impacted canines and missing or anomalous lateral incisors. To observe the correlation of impaction with intermolar and interpremolar width (mm), independent sample t test was applied. P value <0.05 was considered as statistically significant.

## RESULTS

A total of 60 patients (30 experimental and 30 controls) were examined in this study. Mean age in experimental subjects was  $17.93 \pm 5.23$  years, whereas in controls it was found to be  $18.30 \pm 3.90$  years.

The presence/ absence of lateral incisors as well as anomalies are presented in Table 1. There were 25 (83.3%) experimental subjects who had normal shaped lateral incisors, whereas in controls normal lateral incisors were present in

**Table 1:** Intergroup comparison of the number of lateral incisor anomalies

Anatomy & Presence /absence of lateral incisor (Radiographs)	Group		Total	P-value
	Case	Controls		
Normal	25	28	53	0.339
	83.3%	93.3%	88.3%	
Absent	4	2	6	
	13.3%	6.7%	10.0%	
Peg	1	0	1	
	3.3%	0.0%	1.7%	
Total	30	30	60	
	100.0%	100.0%	100.0%	

*Fisher exact test used to determine the co-relation*

**Table 2:** Intergroup comparisons of maxillary intermolar and interpremolar widths (in mm)

Group		Mean	Std. Deviation	P-value
Inter molar width (mm) Cast Analysis	Case	44.033mm	3.2956mm	0.64
	Controls	44.467mm	3.8213mm	
Inter premolar width (mm) Cast Analysis	Case	33.267mm	3.1397mm	0.802
	Controls	33.067mm	2.9935mm	

*Correlation checked with independent sample t test*

28 (93.3%) cases. Peg lateral incisor, an anomaly of lateral incisors was found in only 1 (3.3%) experimental subject whereas none in controls with non-significant p-value of 0.339.

Mean Inter molar width (mm) in experimental subjects was found to be  $44.03 \pm 3.29$  whereas in controls it was found to be  $44.46 \pm 3.82$  with non-significance p-value of 0.64. Mean Inter premolar width (mm) in experimental cases was found to be  $33.26 \pm 3.13$  whereas in controls  $33.06 \pm 2.99$  was observed with non-significant p-value of 0.802. (Table 2)

## DISCUSSION

Impaction of the maxillary canine is a common occurrence and is encountered frequently by orthodontists as well as general dentists. It has a prevalence of 1-2.5% and is the second only to developmental disturbance in third molars.<sup>1,13</sup> Diagnosis of this condition at an early age along with preventive measures such as rapid maxillary expansion, extraction of deciduous canine and first molars, transpalatal arches as well as cervical headgear can aid in spontaneous eruption of these teeth. If the palatal canine is left untreated, it can result in various side effects of which the noteworthy ones include cyst formation, root resorption of adjacent teeth and development of malocclusion.<sup>9</sup>

In our study, lateral incisor hypodontia was found in

only 13% out of 30 experimental cases with palatal canine impactions while in controls; only 6.7% of laterals were absent. Only one case of peg lateral incisor (3.3%) was found in experimental subjects while none was reported in controls. Even though some studies have established a correlation between impacted teeth with dental anomalies, our study showed no correlation. Our study was in accordance with the study of Garib et al who had maxillary lateral incisor agenesis (18.9%) for subjects with unilateral palatal canine impactions.<sup>14</sup> Zilberman et al in their study showed similar results with only 5.5% lateral incisors missing in patients with palatal canines whereas the percentage of peg laterals was 13%.<sup>15</sup> Peck and Peck in their study also found lateral incisor hypodontia to be 3.4% in cases with palatal canines.<sup>16</sup> Leifert and Jonas found similar results to our study with 7.23% hypodontia of lateral incisors.<sup>11</sup>

From the results of our study, we found that the maxillary transverse dimension measured as first interpremolar and intermolar width was similar in experimental cases as well as in controls. We found the mean intermolar width to be 44 mm in both subjects and controls with a p value of 0.64 whilst the mean interpremolar width was 33 mm in both groups with a p value of 0.8. Our study was in accordance with the study of Gull and Mushtaq who also found the intermolar width to be 44mm and the interpremolar width to be 35 mm with no significant correlation to the impacted teeth.<sup>17</sup> Naoumova and Alfaro in their study also found no difference between arch width at the molars in both impaction cases and controls.<sup>18</sup> Ariza et al in their study found contrasting results and showed that the transverse dimensions of the first molar and first premolar were smaller in subjects with impacted maxillary canines when compared with subjects without impaction.<sup>19</sup>

From our study and the results of various other researches, we can confirm that dental anomalies like agenesis of lateral incisors, peg lateral incisors as well as maxillary skeletal width do not correlate positively with the presence of palatal canine impactions. Further investigation into the etiology of palatally impacted canines is needed before clinical recommendations can be made to find more factors that correlate positively with palatal canines.

## CONCLUSION

Our study did not show any relationship between palatally impacted canines with anomalous and missing incisors or maxillary width.

## CONFLICT OF INTEREST

None declared

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