

<https://doi.org/10.333279/jkcd.v13i2.582>

ASSOCIATION OF MAXILLARY IMPACTED CANINES WITH THIRD MOLAR AGENESIS AND OTHER DENTAL ANOMALIES

Kosar Bahadur¹, Nazir Ahmad¹, Imran Tajik¹, Sundus Faiz²

¹Orthodontics and Dentofacial Orthopaedics, Sardar Begum Dental College and Hospital, Gandhara University, Peshawar

²Pediatric Department, Peshawar Dental College, Peshawar

ABSTRACT

Objectives: To find out if there is an association of MICs (Maxillary impacted canines) with third molar agenesis and other dental anomalies.

Materials and Methods: Data were collected using records of patients who visited the study setting during the study period. There were total 130 patients in the control group and 130 patients in the cases group. Pre-treatment records (OPG and CBCT) of all patients were used to assess impacted canines and missing third molars. Difference between the groups was assessed using chi-square test for categorical data.

Results: The mean age was 20.2 ± 7.1 years for the control group and 20.2 ± 7.1 years for the cases group. In the control group, agenesis of third molar was found in 9.2% of the patients and in the impacted group the prevalence was found to be 42.3%. The results were statistically significant. Other dental anomalies were also assessed, and the results showed that the MIC group had a higher prevalence of dental anomalies (36.2%) than the control group (5.4%).

Conclusion: Maxillary impacted canine patients showed a higher prevalence of third molar agenesis and other dental anomalies. There was a significant association between impacted canines and tooth agenesis other than third molars.

Key words: Impacted canines, Third molars, Agensis

INTRODUCTION

A tooth is considered to be impacted when it fails to erupt into the dental arch during the expected developmental time period.¹ The maxillary canine impaction prevalence ranges from 1%–3%; however, it varies among different populations.² Several factors are responsible for impacted canines, and the main etiopathogenesis is still controversial, but there is enough evidence that buccally and palatally impacted canines have different etiopathogenesis. An impaction on the buccal side is primarily due to arch length discrepancy, however canine impaction on the palatal side might not be due to the same reasons. Some studies have suggested that in the absence of

lateral incisor guidance owing to malformed lateral incisors, may result in the canine's palatal impaction even if there is sufficient space for the canine.³ Other factors that can cause impaction are local obstructions, syndromes, and systemic illnesses.³

Third molar agenesis is the most prevalent developmental anomaly of the permanent dentition, and its prevalence varies from 9% to 41% in different populations.^{4,5} It has also been associated with the alterations in the size and number of other teeth. According to previous studies, in the absence of a third molar the chances of missing other teeth increases by 13 times.⁶ The delayed development of certain teeth and microdontia are also associated with third molar agenesis.

The maxillary canine is the tooth most commonly affected by impaction after the third molar⁵ and is usually associated with various dental anomalies

Correspondence:

Kosar Bahadur

Orthodontics Unit, Sardar Begum Dental College and Hospital, Gandhara University, Peshawar, Pakistan
Email: kosarkhan1010@gmail.com

such as microdontia, peg laterals, dental transpositions, agenesis, and impactions of teeth other than the third molar.^{7,8} Numerous studies have highlighted the correlation between PDCs (Palatally displaced canines) and aberrant size and shape of the lateral incisors (peg laterals).⁹ There is also a strong association between impacted canines and agenesis of lateral incisors, supporting the guidance theory.³

Two broad theories have been given in the etiology of PDCs i.e. genetic and guidance theory. Sacerdoti and Baccetti¹⁰ found that unilateral canine impaction was usually associated with aplasia of upper lateral incisors and that bilateral canine impaction was associated with missing third molars, indicating that palatal canine displacement had a hereditary component. These studies suggest a genetic influence on the impaction of canines and its relation to other dental anomalies. No such study has been done on Pakistani population for establishing the association between maxillary impacted canines and missing third molars. The rationale of this study was to find out if there is an association of MICs (Maxillary impacted canines) with missing third molars and other dental anomalies. By studying these associations orthodontists can better understand the factors that contribute to the development of impacted canines and develop more effective treatment plans to address these issues. Additionally, it can also help with early and timely diagnosis and intervention, which can prevent more serious dental problems from developing.

MATERIALS AND METHODS

This Cross-sectional comparative, multicenter study was conducted at the orthodontics department of three different primary teaching dental hospitals in Peshawar (Sardar begum dental hospital, Rehman college of dentistry and Peshawar dental college) from September 2020 to April 2021. Data was obtained using convenient sampling technique from the history and records of patients reported to the orthodontic departments of these hospitals. An approval from the ethical board of Sardar Begum Dental College and Hospital was obtained. Sample size was calculated using Open Epi software with two independent groups, significance level was set $P \leq 0.05$ and power of 80%. Ratio of exposed to unexposed is 1:1. Confidence level was set to be 95%. Our calculation used the statistics given in a previous study which concluded 5% prevalence of

third molar agenesis in control group and 48% in impacted canine group.⁽¹¹⁾ Both the control group and the cases group each had 130 patients in total. Patients were divided in to two groups i.e. control group and cases group. Control group had patients with normally erupted canines and cases group had maxillary impacted canines (unilateral or bilateral).

Informed consent was taken from the participants. The study's participants ranged in age from 13-54 years, with a mean age of (20.2 ± 7.1) years. Patients with congenital anomalies, syndromes, missing canines, extractions and previous orthodontic treatment were not included in the study.

Pre-treatment OPG (orthopantomograms) of 130 patients in the control group with normally erupted canines and 130 patients with MICs having OPGs and CBCTs (Cone beam computed tomography) were evaluated for congenitally missing third molars and other dental anomalies. CBCTs were evaluated for the location of maxillary canine i.e. palatal or buccal. Following variables were checked for all patients in both groups and data obtained was recorded on a data collection form.

All OPGs were evaluated for the following:

- Missing third molars.
- Missing teeth other than third molars.
- Dental anomalies such as missing teeth and peg laterals.
- Impaction of any teeth other than canines.
- Supernumerary teeth.
- Transposition

For statistical analysis SPSS software (version.25, IBM) was used. Descriptive statistics were used for all measured variables like age, gender, third molar agenesis and other dental anomalies for each group. Difference between the groups was assessed using chi-square test for categorical data. A P value <0.05 was considered statistically significant.

RESULT

The control group consisted of 130 patients, 80 females and 50 males, with an age range of 13-54 years (mean age, 20.2 ± 7.1 years). The impacted canine group had 83 females and 47 males with an age range of 13-54 years (mean age, 20.2 ± 7.1). The

pattern of canine impaction in the impacted canine group is given in Table 1. Unilateral impactions were more common than bilateral with a percentage of 62.3% and 37.7% respectively. Furthermore, palatal impactions were more common than buccal impactions with a prevalence of 80% and 20% respectively.

At least one upper third molar was missing in 31.5% (13% in the unilateral impacted canine and 18.5% in the bilateral impacted canine) of impacted canine group compared to 7% in the normally erupted canine group. The difference between the two groups was statistically significant (P=0.00). In the impacted canine group, 28.46% of the patients were missing one or more lower third molars. (8.5% in the unilateral and 20% in the bilateral, respectively). Only 2.4% of the individuals in the control group were missing their lower third molars. The difference between these two groups was significant as shown in Table 2. In the control group, absence of any third molar was observed in 9.2% of the patients and in the impacted group the prevalence was found to be 42.3% shown in Table 3. Difference was highly significant statistically (P < .001).

The impacted canine group was found to be correlated with peg-laterals in our research. The impacted canine group showed 13.1% patients with peg-laterals as compared to 1.5% in the control group. In the MIC patients, missing lateral incisor was identified in only 3 patients (2.3%) however, in the control group it was observed in 5 patients (3.8%). The difference between the MIC group and control group was not significant. The distribution

Table 1: Distribution and Prevalence of side and position of impaction in the impacted canine group.

Maxillary Impacted Canine		
Side	Unilateral 62.3%	Bilateral 37.7%
Position	Palatal 80%	Buccal 20%

Table 2: A comparison of third molar agenesis between the impacted canine group and control group.

Third molar agenesis	MIC group			Control group	P value
	Unilateral	Bilateral	Total		
Upper 8	13%	18.5%	31.5%	7.7%	0.000***
Lower 8	8.5%	20%	28.4%	2.4%	0.000***

^aMIC: Maxillary Impacted canine
* P < .05; ** P < 0.01; *** P < .001.

of other dental anomalies associated with the MIC group in comparison with control group is shown in Table 3 and the results showed that the MIC group had a higher occurrence of dental anomalies (36.2%) than the control group (5.4%). The results were highly significant statistically (P<0.00).

DISCUSSION

In this study, we focused to find out the association between maxillary impacted canines and missing third molars and other dental anomalies. These two parameters have not been previously studied in Pakistani orthodontic patients.

The ratio between unilateral impaction and bilateral impaction in our study was reported to be 2:1 which is in accordance with previous studies.¹¹ A previous research also reported an increased prevalence of unilateral impactions by a factor of 5:1 between unilateral and bilateral impactions. No gender difference was seen in the impacted canine group however previous studies have reported a strong female predilection in patients having pal-

Table 3: Distribution of dental anomalies associated with MIC group when compared with the control group

Dental anomaly	Control group	MIC group	χ^2 , P value
M3 agenesis	9.2%	42.3%	37.17***
Peg laterals	1.5%	13.8%	13.86***
Missing lateral incisor	3.8%	2.3%	0.516
Transposition	0%	3.8%	5.09*
Impaction of other teeth	4.6%	11.5%	4.19*
Missing teeth other than M3	2.3%	13.8%	11.65**
Other dental anomalies other than missing third molars	5.4%	36.2%	37.39***

^aMIC: Maxillary Impacted canine
* P < .05; ** P < 0.01; *** P < .001.

atally displaced canines.¹¹ In our study the palatal impactions (80%) were more prevalent than the buccal impactions (20%) which is aligned with previous studies.^{3,7}

Our study evaluated the association between MIC and missing third molars. Our findings found a statistically significant correlation between MIC and missing third molars, which is accordance with Peck et al findings, which also demonstrated a correlation between missing third molars and palatally displaced canines.⁸ In some studies, PDCs and mandibular incisor–canine transposition has been closely correlated with third molar (M.3) agenesis. Another study also reported the same association and found greater chances agenesis of M.3 in the maxillary arch than in the mandible.¹¹

In our study, missing third molars were more common in patients having bilateral canine impactions in both the upper and lower arches than in unilateral MIC patients. Compared to unilateral impactions, cases with bilateral MICs can be assumed to have more perplexing dental anomalies. This was in accordance with the study done by Camilleri, who found that missing third molars in 39% of bilateral PDC patients and 25% of unilateral PDC patients.¹² We also evaluated other dental anomalies such as missing teeth, peg laterals impactions, and transpositions and found that the MIC group exhibited a higher prevalence of dental anomalies (36.2%) in comparison to the control group (5.4%). The difference between the two groups were found to be statistically significant ($P < 0.00$). These results are consistent with previous studies done.^{13,14}

In the present study the prevalence of lateral incisor agenesis was also studied in relation to palatally displaced canines. Only 3 patients had a missing lateral incisor in the impacted canine group and 5 patients had at least one missing lateral incisor in the normally erupted canine group. The association was not statistically significant which is in agreement with a study done by Peck et al, who also observed that third molar agenesis was found to be twice as prevalent in PDC, with a prevalence of 40% and missing lateral incisors with a prevalence of 3%.¹⁵ In subjects with palatally displaced canines, Peck et al found that tooth agenesis was site-specific.^{8,15} They reported that malposed maxillary canines were associated with missing third molars even in the

absence of lateral incisor aplasia.

From these findings we can make an assumption that this association supports the genetic theory which states that the palatal displacement of canine is an anomaly of genetic origin and malposed maxillary canines were associated with missing third molars even in the absence of lateral incisor aplasia. It seems to implicate that there is a strong genetic component involved in the occurrence of PDC and other dental anomalies and is not always associated with missing lateral incisors. Furthermore, the association between PDC and other dental anomalies does not necessarily negates the guidance theory of eruption, as this theory may still play a role in the occurrence of PDCs. Overall, further research is needed to fully understand the etiology and the complex interactions between genetic and environmental factors that contribute to its occurrence. This will help in the early diagnosis and interceptive treatment of impacted canines and thus avoid the serious dental problems from developing.

CONCLUSION

There was a higher incidence of missing third molars and other dental anomalies in subjects with maxillary impacted canines. There was a significant association between impacted canines and missing teeth other than third molars.

REFERENCES

1. Dinoi MT, Marchetti E, Garagiola U, Caruso S, Mummolo S, Marzo G. Orthodontic treatment of an unerupted mandibular canine tooth in a patient with mixed dentition: A case report. *J Med Case Rep*. 2016;10(1):6–9.
2. Sune Ericson and Jiiri Kuroi. Radiographic assessment of maxillary canine eruption in children with clinical signs of eruption disturbance. *Eur J Orthod*. 1986;8(8):133–44.
3. Jacoby H. The etiology of maxillary canine impactions. *Am J Orthod*. 1983;84(2):125–32.
4. Lee SH, Lee JY, Park HK, Kim YK. Development of third molars in Korean juveniles and adolescents. *Forensic Sci Int*. 2009;188(1–3):107–11.
5. Hattab FN, Rawashdeh MA, Fahmy MS. Impaction status of third molars in Jordanian students. *Oral Surgery, Oral Med Oral Pathol Oral Radiol*. 1995;79(1):24–9.
6. Garn SM, Lewis AB, Vicinus JH. Third Molar Agenesis and Reduction in the Number of Other Teeth. *J Dent Res*. 1962;41(3):717.
7. Mercuri E, Cassetta M, Cavallini C, Vicari D, Leonardi

- R, Barbato E. Dental anomalies and clinical features in patients with maxillary canine impaction: A retrospective study. *Angle Orthod.* 2013;83(1):22–8.
8. Peck S, Peck L, Kataja M. Concomitant occurrence of canine malposition and tooth agenesis: Evidence of orofacial genetic fields. *Am J Orthod Dentofac Orthop.* 2002;122(6):657–60.
 9. Peck S, Peck L, Kataja M. Prevalence of tooth agenesis and peg-shaped maxillary lateral incisor associated with palatally displaced canine (PDC) anomaly. *Am J Orthod Dentofacial Orthop.* 1996;110(4):441–3.
 10. Sacerdoti R, Baccetti T. Dentoskeletal features associated with unilateral or bilateral palatal displacement of maxillary canines. *Angle Orthod.* 2004;74(6):725–32.
 11. Abu Alhaija ES, Wazwaz FT. Third molar tooth agenesis and pattern of impaction in patients with palatally displaced canines. *Angle Orthod.* 2019;89(1):64–70.
 12. Camilleri S. Maxillary canine anomalies and tooth agenesis. *Eur J Orthod.* 2005;27(5):450–6.
 13. Lempesi E, Karamolegkou M, Pandis N, Mavragani M. Maxillary canine impaction in orthodontic patients with and without agenesis: A cross-sectional radiographic study. *Angle Orthod.* 2014;84(1):11–7.
 14. Gulati S, Singla D, Mittal S, Bhullar M, Aggarwal I, Sharma A. Relationship between Third Molar Agenesis and Other Dental Anomalies. *Dent J Adv Stud.* 2019;07(01):023–7.
 15. Peck S, Peck L, Kataja M. Site-specificity of tooth agenesis in subjects with maxillary canine malpositions. Vol. 66, *Angle Orthodontist.* 1996. p. 473–6.