

Agensis of third molars and its association with other dental anomalies in a Peruvian population.

Agnesia de terceros molares y su asociación con otras anomalías dentales en una población peruana.

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Abstract: Objective: The purpose of the present study was to determine the association between agensis of the third molar and other dental anomalies. **Materials and Methods:** This was an observational, retrospective, cross-sectional and analytical study. The sample included 367 patients, aged 14 to 20 years old with adequate digital panoramic radiography. Patients with syndromes, who had extractions of any third molar and with orthodontic treatment prior to panoramic radiographic examination, were excluded. For data collection, each radiograph was recorded with patient code, sex and age. **Results:** The prevalence of third molar agensis was 20.71%. Subsequently, patients were divided into two groups, with agensis of at least one third molar and a control group; the prevalence of other dental anomalies was 48.69% of third molar agensis group and 21.31% in the control group. A highly significant association was found between the presence of third molar agensis and the presence of other tooth abnormalities ($p= 0.0000$; contingency coefficient = 0.2425). The most frequent dental anomaly was dental inclusion with 20.44% of the population studied; followed by the agensis of other teeth (7.90%) and finally the presence of supernumerary teeth (1.63%). **Conclusions:** This study demonstrates that there is an association between third molar agensis and other dental abnormalities, with a higher prevalence of dental abnormalities in patients with third molar agensis.

Keywords: *Third molar; tooth abnormalities; anodontia; radiography, panoramic; adolescent; young adult.*

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Abstract: Objetivo: La presente investigación tuvo como finalidad determinar la asociación que existe entre la agnesia del tercer molar y otras anomalías dentarias. **Material y Métodos:** El estudio fue observacional, retrospectivo, transversal y analítico. La muestra que incluyó 367 pacientes de 14 a 20 años de edad con radiografía panorámica digital con parámetros adecuados. Se excluyeron pacientes con algún tipo de condición sindrómica, con exodoncias de algún tercer molar y con tratamiento ortodóntico previo al examen radiográfico panorámico. Para la recolección de datos, cada radiografía fue registrada con código de paciente, sexo, edad. **Resultado:** Se reportó una prevalencia de 20,71% de casos con agnesia de terceros molares. Los pacientes fueron divididos en 2 grupos, con agnesia de al menos un tercer molar y un grupo control, en ambos se calculó la prevalencia las otras anomalías dentarias, la cual fue de 48.69% de los pacientes que presentan agnesia de tercer molar tienen otra anomalía dentaria y 21.31% del grupo control tienen otra anomalía dentaria. Se encontró

una asociación altamente significativa entre la presencia de agenesia de tercer molar y presencia de otras anomalías dentales ($p=0.0000$; coeficiente de contingencia= 0.2425). La anomalía dental encontrada con más frecuencia es la inclusión dentaria con 20,44% del total de la población estudiada; seguido de la agenesia de otros dientes con 7,90% y finalmente la presencia de dientes supernumerarios

con 1,63%. **Conclusion:** Este estudio demuestra que existe asociación entre la agenesia de tercer molar y otras anomalías dentarias, existiendo una mayor prevalencia de anomalías dentales en pacientes con agenesia del tercer molar.

Palabra Clave: Tercer molar; anomalías dentarias; anodoncia; radiografía panorámica; adolescente; adulto joven.

INTRODUCTION.

The study of third molars, commonly known as wisdom teeth, has been a concern for dental professionals for several years since they are the last permanent teeth to erupt in the dental arch.¹ They can cause problems during the eruption process, as well as suffer from different abnormalities in their morphology, position in the arch, congenital absence or another associated pathology, causing alterations in different parts of the oral system.^{2,3}

Agenesis is the most frequent abnormality observed in this tooth. Its prevalence varies according to the population under study.¹ It has been reported that the absence of any third molar occurs in approximately 22.63% of the world population, with a higher prevalence in females.^{4,5} In general, in order to diagnose third molar agenesia, a radiographic examination must be carried out from the age of 14, since this is considered the critical age for the formation of the germ of this molar.⁶

Although the etiology of this abnormality has been just partially described, there are various hypotheses to explain its cause, one of which proposes that the absence of this tooth is due to changes in diet throughout human history. This theory considers these teeth as “vestigial”.⁷ Another suggests that this condition is due to the increase in human brain size and facial shortening.⁸ However, the most accepted explanation is that agenesia of these teeth is due to genetic factors.⁹⁻¹¹

An important aspect to consider when studying the absence of the third molar is that dental agenesia is often associated with the presence of other alterations in the formation, position or absence of other teeth, which could be explained by genetic factors.^{2,12,13} Among these abnormalities, the most frequently found in radiographic studies, except for third molar agenesia, include dental impaction, agenesia of another tooth, supernumerary teeth and dental transposition.^{14,16} There are studies that show that third molar agenesia

makes the absence of another tooth 13 times more likely.¹⁷

Others indicate that agenesia of at least one third molar significantly increases the likelihood of impaction of the other third molars present in the dental arches.¹⁸

Taking into account previous research on third molar agenesia and its relationship with different dental abnormalities, it is of great interest to establish the association that may exist in other populations considering that the manifestation of this condition varies with ethnicity.¹⁹

Therefore, the aim of the present study was to determine the prevalence of third molar agenesia, as well as to study the frequency in which there is an association with agenesia of other teeth, taking into account dental inclusion and supernumerary teeth in patients from 14 to 20 years of age, and comparing the results with patients without third molar agenesia in a Peruvian population.

MATERIALS AND METHODS.

In this study, digital radiographic records of patients of both sexes were reviewed. They were sent to the Imaging Center at Universidad Católica de Santa María de Arequipa, Peru, in 2016 and 2017.

All the x-rays previously taken for diagnostic purposes of patients with ages ranging between 14 and 20 years were selected for the study. A total of 367 digital records (226 females and 141 males) with adequate parameters of sharpness, contrast and brightness, where anatomical structures under study could be properly observed, were obtained. The study design was observational, retrospective, cross-sectional, and analytical.

All the patients were between 14 and 20 years old, had not undergone previous orthodontic treatment, had no dental extractions of any third molar, and did not report any congenital abnormality. For data collection, each radiograph was registered with patient code, sex,

and age. The total sample was divided into two groups: a group of patients with agenesis of any third molar, and the second group contained patients without agenesis of the third molar (control group).

The presence of agenesis of third molars was established when these teeth were absent without radiographic evidence of having been extracted, or when there was no evidence of initiation of mineralization or formation of the crypt of the third molar.² In both groups, the prevalence of the following associated dental abnormalities was measured:

- Dental agenesis of other teeth excluding the third molar: absence of mineralization of the crown of a tooth without evidence of extraction)²⁰

- Supernumerary tooth: an additional tooth in the dental arch that appears additional to the normal number of teeth.²¹

- Dental impaction: a tooth, whose crown was still inside the bone, without erupting, was considered to be impacted, taking into account the age of the patient and the degree of normal root formation²²

Absolute and percentage frequency distribution were used to determine the prevalence of third molar agenesis and other associated abnormalities; and a chi-square test as well as a Pearson's contingency coefficient were used to determine the differences in the distribution of associated dental abnormalities between the two groups.

Table 1. Prevalence of dental abnormalities in the group with third molar agenesis and in the control group.

Dental Abnormalities	No.	Third molar agenesis GROUP		Control GROUP		TOTAL	
		No.	%	No.	%	No.	%
Another dental agenesis	YES	17	4.63	12	3.27	29	7.90
	NO	59	16.08	279	76.02	338	92.10
Dental impaction	YES	23	6.27	52	14.17	75	20.44
	NO	53	14.17	239	65.12	292	79.56
Supernumerary Tooth	YES	2	0.54	4	1.09	6	1.63
	NO	74	20.16	287	78.20	361	98.37

Table 2. Association of total dental abnormalities between the group with third molar agenesis and the control group.

GROUP		Total Abnormalities				TOTAL	
		With Abnormalities		Without Abnormalities		No.	%
		No.	%	No.	%		
Group with third molar agenesis	= 76	37	48.69	39	51.31	76	20.71
Control group	= 291	62	21.31	229	78.69	291	79.29
						367	100
Chi Square Test, $X^2 = 22.93$				DF=1	$p:0.0000$	$(p<0.01)$	
Contingency coefficient				0.2425			

RESULTS.

In the present study, it was found that from all patients studied (n=367), 62% (n=226) were females and 38% (n=141) males. The mean age was 16.8 years. It was found that 76 presented dental agenesis of at least one third molar, accounting for 20.21%.

In relation to the other dental abnormalities studied, it was found that dental impaction was the most frequent dental abnormality accounting for 20.44% of the total study population, 6.27% in the group with third molar agenesis and 14.17% in the control group.

Agenesis of other teeth (excluding the third molar) had

the second highest prevalence (7.90%); it was 4.63% in the group with agenesis of the third molar and 3.27% in the control group. The least frequent abnormality was the presence of supernumerary teeth accounting for 1.63%: 0.54% in the group with agenesis of the third molar and 1.09% in the control group. (Table 1)

When comparing the two groups, it was found that of the group of patients with agenesis of some third molar, 48.69% also had another abnormality; while in the control group (patients without third molar agenesis) only 21.31% had another abnormality. In turn, it was determined that there is a highly significant relationship between third molar agenesis and total dental anomalies, as shown by the chi square test result ($p < 0.01$) and the contingency coefficient (0.2425). (Table 2)

DISCUSSION.

The main contribution of the present study is the relationship found between third molar agenesis and other dental anomalies. In the same way, it was observed that patients with presence of included teeth present a higher percentage of third molar agenesis in relation to the other abnormalities.

Comparing the results obtained in this research with those of other studies, Celikoglu *et al.*,² reported that patients with agenesis of the third molar, when compared to patients who do not have this condition, present a greater number of other dental abnormalities, such as agenesis of other teeth, dental impaction or supernumerary teeth. Herrera *et al.*,¹⁹ found similar results, reporting that abnormalities with the highest association were agenesis of other teeth and impacted teeth. The agreement of those studies with the current study is of great importance as the impact of this abnormality on dentition becomes increasingly relevant due to its association with other problems in the oral cavity. This may have a negative impact on the proper development of dental occlusion, as well as other consequences, such as an imbalance in the stomatognathic system.^{1,23}

This study found a high prevalence of agenesis of the third molar (20.71%) in the studied population. This figure is high in comparison to other studies conducted in the population of Venezuela, where agenesis of this tooth was observed in 8.7% of the total number of radiographies studied.²⁴ Similar data were reported in studies carried out in Black-American and Indian populations, where the prevalence of this abnormality

is much lower, ranging between 9%-11%.^{25,26}

These marked differences could be due to ethnic differences, in addition to the methodology used for each study. When the studies of the prevalence of other dental abnormalities are analyzed, it is observed that they can cause functional and aesthetic alterations that must be considered in the planning of dental treatments. The results of this research show that 26.97% of the total population studied presents some dental abnormality; the most frequent being dental inclusion with 20.44%, followed by agenesis of other teeth, and supernumerary teeth, with 7.90% and 1.63%, respectively.

These data are similar to the findings reported by Bedoya *et al.*,²⁷ in a study carried out in Colombia, a country with ethnic similarities to the population of this study. They reported, for example, that agenesis was the most common abnormality accounting for 14.4%, followed by dental inclusion with 10.8%, and supernumerary teeth with 3.6%.

Concerning the other dental abnormalities, the present study is also in agreement with the research carried out by Chappuzeau *et al.*,²⁸ in Chile, in which 5.75% of the studied population presented dental agenesis without considering the third molar, and 2.0% presented supernumerary teeth.

CONCLUSION.

It is concluded that the prevalence of third molar agenesis has a statistically significant association with other dental abnormalities in the Peruvian study population.

When comparing patients with agenesis of at least one third molar and patients without this condition, it is observed that patients with third molar agenesis present a greater number of associated dental abnormalities, particularly due to an increase in agenesis of other teeth and impacted teeth.

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REFERENCES.

1. Trakinienė G, Šidlauskas A, Andriuškevičiūtė I, Šalomskienė L, Švalkauskienė V, Smailienė D, Trakinis TI. Impact of genetics on third molar agensis. *Sci Rep.* 2018;8(1):8307.
2. Celikoglu M, Bayram M, Nur M. Patterns of third-molar agensis and associated dental anomalies in an orthodontic population. *Am J Orthod Dentofacial Orthop.* 2011;140(6):856-60.
3. Dang HQ, Constantine S, Anderson PJ. The prevalence of dental anomalies in an Australian population. *Aust Dent J.* 2017;62(2):161-4.
4. Carter K, Worthington S. Morphologic and Demographic Predictors of Third Molar Agensis: A Systematic Review and Meta-analysis. *J Dent Res.* 2015;94(7):886-94.
5. Moghadam MG, Etemadi F, Akbari N. The Relationship between Agensis of Third Molar and Craniofacial Morphology in Orthodontic Patients. *J Int Soc Prev Community Dent.* 2018;8(4):304-8.
6. Tavajohi-Kermani H, Kapur R, Sciote JJ. Tooth agensis and craniofacial morphology in an orthodontic population. *Am J Orthod Dentofacial Orthop.* 2002;122(1):39-47.
7. Singh N, Chaudhari S, Chaudhari R, Nagare S, Kulkarni A, Parkarwar P. A radiographic survey of agensis of the third molar: A panoramic study. *J Forensic Dent Sci.* 2017;9(3):130-4.
8. Vukelic A, Cohen JA, Sullivan AP, Perry GH. Extending Genome-Wide Association Study Results to Test Classic Anthropological Hypotheses: Human Third Molar Agensis and the "Probable Mutation Effect". *Hum Biol.* 2017;89(2):157-69.
9. Lopez SI, Mundstock KS, Paixao-Cortes VR, Schuler-Faccini L, Mundstock CA, Bortolini MC, et al. MSX1 and PAX9 investigation in monozygotic twins with variable expression of tooth agensis. *Twin Res Hum Genet.* 2013;16(6):1112-6.
10. Mitsui SN, Yasue A, Masuda K, Watanabe K, Horiuchi S, Imoto I, Tanaka E. Novel PAX9 mutations cause non-syndromic tooth agensis. *J Dent Res.* 2014;93(3):245-9.
11. AlFawaz S, Plagnol V, Wong FS, Kelsell DP. A novel frameshift MSX1 mutation in a Saudi family with autosomal dominant premolar and third molar agensis. *Arch Oral Biol.* 2015;60(7):982-8.
12. Al-Nimri KS, Bsoul E. Maxillary palatal canine impaction displacement in subjects with congenitally missing maxillary lateral incisors. *Am J Orthod Dentofacial Orthop.* 2011;140(1):81-6.
13. Choi SJ, Lee JW, Song JH. Dental anomaly patterns associated with tooth agensis. *Acta Odontol Scand.* 2017;75(3):161-5.
14. Lagana G, Venza N, Borzabadi-Farahani A, Fabi F, Danesi C, Cozza P. Dental anomalies: prevalence and associations between them in a large sample of non-orthodontic subjects, a cross-sectional study. *BMC Oral Health.* 2017;17(1):62.
15. Campoy MD, Gonzalez-Allo A, Moreira J, Ustrell J, Pinho T. Dental anomalies in a Portuguese population. *Int Orthod.* 2013;11(2):210-20.
16. Al-Jabaa AH, Aldrees AM. Prevalence of dental anomalies in Saudi orthodontic patients. *J Contemp Dent Pract.* 2013;14(4):724-30.
17. Alam MK, Hamza MA, Khafiz MA, Rahman SA, Shaari R, Hassan A. Multivariate analysis of factors affecting presence and/or agensis of third molar tooth. *PLoS One.* 2014;9(6):e101157.
18. Celikoglu M, Miloglu O, Kazanci F. Frequency of agensis, impaction, angulation, and related pathologic changes of third molar teeth in orthodontic patients. *J Oral Maxillofac Surg.* 2010;68(5):990-5.
19. Herrera-Atoche JR, Colomé-Ruiz GE, Escoffié-Ramírez M. Third Molar Agensis, Prevalence, Distribution and Association with Other Dental Anomalies. *International Journal of Morphology.* 2013;31:1371-5.
20. Lagana G, Venza N, Lione R, Chiamonte C, Danesi C, Cozza P. Associations between tooth agensis and displaced maxillary canines: a cross-sectional radiographic study. *Prog Orthod.* 2018;19(1):23.
21. Khandelwal P, Rai AB, Bulgannawar B, Hajira N, Masih A, Jyani A. Prevalence, Characteristics, and Morphology of Supernumerary Teeth among Patients Visiting a Dental Institution in Rajasthan. *Contemp Clin Dent.* 2018;9(3):349-56.
22. Bareiro F, Duarte L. Most common position of including mandibular third molar and its anatomical relationship with the inferior dentary canal in patients of National Hospital of Itauguá until 2012. *DEL NACIONAL.* 2014;6:40-8.
23. Trakinienė G, Smailienė D, Kuciauskienė A. Evaluation of skeletal maturity using maxillary canine, mandibular second and third molar calcification stages. *Eur J Orthod.* 2016;38(4):398-403.
24. Loaiza Y, Cárdenas G. Prevalencia e interpretación radiográfica de la agensis dentaria en el área de influencia del servicio de ortopedia dentofacial de la facultad de odontología de la universidad de Carabobo. 2014;6:40-8.
25. Sandhu S, Kaur T. Radiographic evaluation of the status of third molars in the Asian-Indian students. *J Oral Maxill Surg.* 2005;63(5):640-5.
26. Harris EF, Clark LL. Hypodontia: an epidemiologic study of American black and white people. *American Journal of Orthodontics and Dentofacial Orthopedics.* 2008;134(6):761-7.
27. Bedoya-Rodríguez A, Collo-Quevedo L., Gordillo-Meléndez I, Yusti-SalazarA, Tamayo-Cardona J, Pérez-Jaramillo A, Jaramillo-García M. Anomalías dentales en pacientes de ortodoncia de la ciudad de Cali, Colombia. *CES Odontología.* 2014;27(1):45-54.
28. Chappuzeau E, Cortés D. Anomalías de la dentición en desarrollo: agensis y supernumerarios. *Rev Dental de Chile.* 2008;99(2):3-8.