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ORIGINAL RESEARCH

Prevalence of supernumerary teeth in children with cleft lip and/or palate

Prevalencia de dientes supernumerarios en niños con labio y/o paladar fisurado

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ABSTRACT

The aim of the present study was to establish the prevalence of supernumerary teeth in children afflicted with cleft lip and/or palate. A cross-sectioned study was conducted on 608 orthopantomographies from pediatric patients who attended the stomatology and orthodontics clinics of the «Dr. Manuel Gea González» Hospital in Mexico City. Cases in reviewed files revealed a ratio of 53.9% male and 46.1% female, with 7.2 year age average. Prevalence of supernumerary teeth was found to be 15.4%: 19.8% in males and 9.1% in females. 97% of all supernumerary teeth were found on the side of the cleft. Main location was the lateral incisor region (84.8%). Most cases occurred in primary dentition (51.5%). These patients experienced high prevalence of supernumerary teeth. Prevalence was observed to be higher in male patients, in primary dentition and the lateral incisor region.

RESUMEN

El objetivo del estudio fue conocer la prevalencia de dientes supernumerarios en niños con labio y/o paladar fisurado. Se realizó un estudio transversal, se revisaron 608 ortopantomografías de expedientes de pacientes pediátricos que acuden a las clínicas de estomatología y ortodoncia del Hospital General «Dr. Manuel Gea González» en la Ciudad de México. Del total de expedientes revisados, 53.9% son niños y 46.1% niñas, con una edad promedio de 7.2 años. Se encontró una prevalencia de dientes supernumerarios de 15.4%, entre los hombres de 19.8% y entre las mujeres de 9.1%, presentándose 97% en el lado de la fisura. Su principal localización corresponde a la región del incisivo lateral (84.8%), presentándose la mayoría en la primera dentición (51.5%). La prevalencia de dientes supernumerarios es alta en estos pacientes, predominando en el sexo masculino, en la primera dentición y en la región del incisivo lateral

Key words: Cleft lip and palate, dental anomalies, supernumerary teeth.
Palabras clave: Labio y paladar fisurados, anomalías dentales, dientes supernumerarios.

INTRODUCTION

Cleft lip and palate are anomalies which develop due to the lack of fusion of lateral and middle nasal processes with maxillary processes, as is the case with cleft lip,[1] as well as lack of fusion of lateral palatal processes among themselves or with the nasal septum or the primary palate as would be the case of cleft palates. They can appear separately or together and can be unilateral or bilateral.[2] They can originate during the fourth to seventh month of intrauterine life. Lack of fusion between mid-nasal and maxillary processes is possibly due to a deficiency of mesenchymal mass which can cause these disorders;[3] associated etiological factors can be genetic or environmental.

In several European regions, reported incidence of lip/palate clefts ranges from 1.45 to 1.57 out of 1,000 subjects.[4] The left side is most commonly affected than the right side in a 2:1 proportion. This proportion also applies to male versus female (2:1).[5,6] Higher frequency has been reported in Caucasian subjects.[7,8] In Mexico, estimated incidence is 1.39 cases per 1,000 live births.[9]

Dental anomalies are most frequently present in children with cleft lip and / or palate than in normal peer population: they affect both dentitions.[10-12] Hypodontia and hyperdontia[1] can be observed among these

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anomalies; they are most commonly found around the fissured area (lateral incisor area). Other additional circumstances found are changes in position, tooth shape and size alterations, as well as delays in tooth eruption and development.[3,5,10,12-15]

Supernumerary teeth are defined as increase in the number of teeth when compared to the normal dental formula.[7,16-18] They are mainly located (90-98%) in the upper jaw, exhibiting predilection for the pre-maxillary area.[16] Development of supernumerary teeth can be associated to genetic and environmental factors. Their etiology is as yet unknown. Several theories have attempted to offer explanations as to their origin: dental lamina hyperactivity, the dichotomy theory which consists on the complete division of the dental bud, or phylogenetic reversal.[6,7,10,16,17,19] According to shape, they are classified as supplementary or rudimentary. Supplementary teeth have identical shape and size to a normal tooth. Rudimentary teeth exhibit abnormal shape which can be conical, tuberculate and molariform.[7,16-19] Development of these teeth can cause complications such as crowding, delayed eruption, displacement or root resorption of adjacent teeth, diastema, rotations, cystic lesions, or eruption into the nasal cavity.[6,7,16]

Presence of supernumerary teeth is the second most common anomaly found in subjects afflicted with cleft lip and palate.[3] It can be due to the fragmentation of the dental lamina during the process of cleft formation.[7] Reports differ with respect to the type of dentition where supernumerary teeth appear, nevertheless, some authors suggested that when they occur in subjects afflicted with cleft lip and/or palate, they are more common in primary dentition, especially in cases of isolated cleft lip. In some studies it has been reported that prevalence of supernumerary teeth in these patients is higher than in general population, since it varies from 6.4 to 28%.[1,3,6,7,10,12,14,15,19] Moreover, it has been revealed that it is more common to find a supernumerary primary lateral incisor than a permanent one.[8,14] Hypodontia and hyperdontia located outside of the cleft area are more common in the permanent dentition than in primary dentition, percentages being 24.1 and 4.4% respectively.[14]

Several statistical differences have been obtained concerning number and placement of dental anomalies. Some authors have stated that prevalence of supernumerary teeth decreased as the complexity of the fissure increased.[7] Delayed eruption and late root development have been observed in the side of the cleft; this could be associated to the presence of a supernumerary tooth which would exhibit altered shape, insufficient bone support and presence of the fissure.[20] Some authors found a relationship between dental age delay and cleft severity.[1,3]

It is worth mentioning that within the clinical implications exhibited by these patients, one of them could be the presence of anterior and/or posterior cross-bite, which could be unilateral or bilateral as well as with or without functional deviation of the mandible,[21,22] maxillary hypoplasia, skeletal discrepancies,[22] lack of bony base, or mobile pre-maxilla.[23]

When speaking about treatment, early diagnosis might be the key in order to prevent serious complications.[21] Treatment must be tailored after careful case analysis, and after having undertaken orthodontic and surgical consultations, which are necessary to determine the urgency and time of performed surgical treatment.[24]

Many studies do not support the early surgical treatment of supernumerary teeth based on malocclusion prevention unless they cause problems in the eruption, occlusal development and pathological interferences.[25] Some authors mention that according to the state of these teeth after having emitted diagnosis, immediate intervention should be executed.[24] Other authors recommend postponement of surgical extirpation until the moment when root formation of the permanent incisor is completed, so as to prevent a case of iatrogenesis.[25]

When devising orthodontic treatment, the fundamental criterion for initiation is not the chronological age, but rather to count with complete permanent dentition or the sole presence of second primary molars.[23] No evidence has been found on the benefits of treatment during primary dentition.[22,26] In newborn, early treatment and use of orthodontic appliances require a prolonged follow-up period in order to assess results when the child reaches adolescence.[22]

In these patients, orthodontic treatment in mixed dentition purports the aim of decreasing cross bite, creating as far as possible, a functional dental environment, decreasing the severity of the problem as well as onset of malocclusion at later dates.[23]

The aim of the present work was to assess prevalence of supernumerary teeth in children afflicted with unilateral or bilateral cleft lip and/or palate and who attended the «Dr. Manuel Gea González»

General Hospital (Mexico City) in 2006. The aim of the study was to acquire comprehensive information on the oral-dental characteristics exhibited by this type of patients so as to establish the most appropriate treatment plan.

It is important to mention that, to our knowledge, to this date we could find no studies on the prevalence of dental anomalies in patients afflicted with cleft lip and/or palate in Mexican population. Additionally there are very few articles on supernumerary teeth in Mexican children in general population.[19]

MATERIAL AND METHODS

A cross-sectional study was conducted at the orthodontics and stomatology clinics of the «Dr. Manuel Gea González» Hospital in Mexico City. This study examined 608 pediatric files gathered from year 2000 to 2006. Patients were of both genders, aged 2-12 years and had been subjected to a panoramic X-ray (orthopantomography). Patients with X-rays of deficient quality or image were excluded.

A standardized observer analyzed X rays with the help of a negatoscope in order to assess the presence of supernumerary teeth. Findings were later corroborated with photographs. Presence of supernumerary teeth in the upper jaw was assessed. In patients with cleft lip and/or palate, assessment included the cleft side as well as the side devoid of fissure. In the X-ray, dental age was determined through the Demirjian method, to then be compared with the chronological age of the subject.

Variables described in *table I* were taken into account when conducting radiographic examination. Data obtained were recorded in an Excel calculus sheet, and they were later analyzed with statistical program SPSS version 13.0 in order to conduct a χ^2 bi-variate analysis in order to assess associations between presence of supernumerary teeth and cleft lip and/or palate cases.

RESULTS

608 X rays were analyzed, 53.9% male and 46.1% female. General average age was 7.2 years ± 2.8. No statistical significant difference was found with respect to total generation gender distribution (χ^2 = 3,789, p = .052).

It was determined that prevalence of cleft lip and/or palate in studied population was 74.7% (n = 454). It was present in males in 58% and females in 42%. 52.3% was unilateral, 39.2% for male gender and 31.0% for female gender, whereas 21.2% presented bilateral cleft lip and/or palate, out of which 18.5% were male and 9.7% female. Only 1.8% of studied population presented solely cleft palate. Statistically significant difference was found with respect to type of cleft lip and/or palate according to gender (χ^2 = 18,533, p = .001) *(Figure 1)*. With respect to location of the cleft in unilateral cases, the left side was observed as mainly bearing the defect with a 54.8% proportion, while the right side exhibited 45.2%. No statistically significant difference was found with respect to the side where the cleft was found (χ^2 = 801, p = .371).

Table I. Included variables.

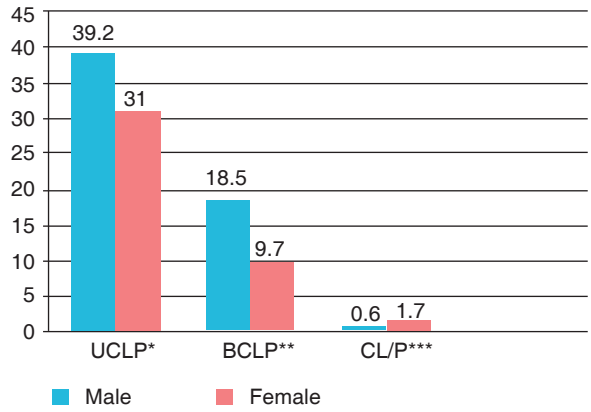
Variable	Recording	Variable	Recording
Gender	Male/female	Dentition type	Primary/permanent/both
Age	Full years	Location of supernumerary	Midline/central incisor/lateral incisor/canine
Type of fissure	Unilateral CLP Bilateral CLP Cleft lip Cleft palate	Type of supernumerary	Conical Tuberculate Supplementary
Side of fissure	Right Left Both	Eruption stage	Erupted Non erupted Both
Presence of supernumerary	Yes/no	Number of supernumerary	One/two
Presence of supernumerary at cleft side	Yes/no		

Out of the 454 X-rays corresponding to patients with cleft lip and/or palate, 25 were discarded due to poor image quality.

It was thus found that prevalence of supernumerary teeth was 15.4% only in patients with cleft lip and/or palate; of these 19.8% were male cases and 9.1% female cases. Statistically significant difference was observed with respect to presence of supernumerary teeth according to gender (χ^2 = 9.081, p = .003).

Prevalence of supernumerary teeth on the side of the fissure amounts to 97% (n = 66); distributed in 40.9% in the right side, 39.4% in the left side and 19.7% in both sides. No statistically significant difference was observed with respect to presence of supernumerary teeth according to the side of the fissure (χ^2 = 3,737, p = .154) *(Table II)*.

When studying supernumerary teeth location with respect to dentition type, it could be observed that 84.8% of cases was present in the lateral incisor section; 51.5% were found in primary dentition, 16.6% in permanent dentition and 16.6% in both dentitions. 7.6% of all supernumerary teeth was found in the central incisor region; 1.5% was found in the primary dentition while 6.0% was found in the permanent dentition. Only 6.1% was located in the canine region, permanent dentition exhibited 6.0%. Statistically significant difference was found in the location of supernumerary teeth and the type of dentition (χ^2 = 20,458, p < .002) *(Table III)*.



* UCLP = unilateral cleft lip and palate. ** BCLP = bilateral cleft lip and palate. *** CL/P = cleft lip or palate.
χ^2 = 18,533 p < .001. n = 454. Direct source.

Figure 1. Prevalence of cleft lip and/or palate based on type of fissure and gender.

With respect to morphology of supernumerary teeth and their location, it was found that 1.5% was located in the midline region; 1.5% were of the supplementary type, 7.6% corresponded to the region of the central incisor, 1.5% exhibited conical shape, 4.5% tuberculate shape, and 1.5% were supplementary. 84.8% was present in the lateral incisor region; 25.8% were of conical shape, 21.2% presented tuberculate shape and 37.8% were of supplementary type. Finally, 6.1% were found in the canine region; 4.5% were of conical shape, and 1.5% of tuberculate shape. No statistically significant difference was observed with respect to the type of morphology and location in which supernumerary teeth could be found (χ^2 = 8.484, p = .205) *(Table III)*.

When studying the eruption moment of supernumerary teeth, the following could be observed: 47.0% were fully erupted, out of which 77.1% were present in primary dentition, 15% in permanent dentition and 9.1% in mixed dentition. On the other hand, 39.4% had not erupted, out of which 22.9% were in primary dentition, 85.0% in permanent dentition and 9.1% in mixed dentition. Statistically significant difference was observed with respect to eruption stage and type of dentition in which these appear (χ^2 = 75,050, p < .001) *(Table IV)*.

It was found that in most patients at least one supernumerary tooth was present, this percentage was 75.8%, distributed in 74.% for males and 26.0% for females; 24.2% of all cases exhibited two

Table II. Prevalence of supernumerary teeth based on side of cleft and gender.

		Right cleft	Left cleft	Both sides	Total
Gender		N/n = %	N/n = %	N/n = %	N/n = %
Male	Presence	21/84 = 25.0	18/86 = 20.9	11/83 = 13.3	50/253 = 19.8
Female	Presence	6/56 = 10.7	8/81 = 9.9	2/39 = 5.1	16/176 = 9.1
	Total	27/140 = 40.9	26/167 = 39.4	13/122 = 19.7	66/429 = 100

χ^2 = 3,737 p = .154 n = 429. Direct Source.
N/n= children by gender who present prevalence of supernumerary teeth based on fissure location / total of children with cleft lip and/or cleft palate.

Table III. Presence of supernumerary teeth according to location and type of dentition in which they are found.

	Primary		Permanent		Both		Total	
Location	n	%	n	%	n	%	n	%
Midline	0	.0%	1	1.5%	0	.0%	1	1.5%
Central incisor	1	1.5%	4	6.0%	0	.0%	5	7.6%
Lateral incisor	34	51.5%	11	16.6%	11	16.6%	56	84.8%
Canine	0	.0%	4	6.0%	0	.0%	4	6.1%
Total	35	53%	20	30.3%	11	16.6%	66	100%

χ^2 = 20,458 p < .002

Supernumerary	Conical		Tuberculate		Supplementary		Total	
Midline	0	.0%	0	.0%	1	1.5%	1	1.5%
Central incisor	1	1.5%	3	4.5%	1	1.5%	5	7.6%
Lateral incisor	17	25.8%	14	21.2%	25	37.8%	56	84.8%
Canine	3	4.5%	1	1.5%	0	.0%	4	6.1%
Total	21	31.8%	18	27.2%	27	40.9%	66	100%

χ^2 = 8.484 p = .205 n = 66. Direct source.

Table IV. Supernumerary teeth eruption based on dentition type.

	Primary		Permanent		Mixed		Total	
Eruption stage	n	%	n	%	n	%	n	%
Erupted	27	77.1%	3	15.0%	1	9.1%	31	47.0%
No erupted	8	22.9%	17	85.0%	1	9.1%	26	39.4%
Both	0	.0%	0	.0%	9	81.8%	9	13.6%
Total	35	100%	20	100%	11	100%	66	100%

χ^2 =75,050 p < .001 n = 66. Direct source.

Table V. Presence of supernumerary teeth number with respect to gender.

	One		Two		Total	
Number of teeth	n	%	n	%	n	%
Male	37	74.0%	13	81.3%	50	75.8%
Female	13	26.0%	3	18.8%	16	24.2%
Total	50	100%	16	100%	66	100%

χ^2 = 347 p = .556 n = 66. Direct source.

supernumerary teeth, 81.3% in males and 18.8% in females. No statistically significant difference was found with respect to presence of supernumerary teeth based on gender (χ^2 = 347, p = .556) *(Table V)*.

DISCUSSION

The present study was conducted in a hospital where stomatological services attract high number of patients with cleft lip and/or palate. Equally attending this hospital were patients with some type of syndrome or systemic disease, therefore, results obtained in the present study cannot be extrapolated to the general population.

It is worth mentioning that results obtained describing distribution of cleft lip and/or palate cases are similar to those recorded by Drs. Tsai[13] and Capelozza.[5] They found 53.0 to 62.0%

prevalence in males and 42.3% in females. Other research work, such as that conducted by Drs. Vichi,[10] Lourenço,[3] Heidbüchel[13] and Carvalho[5] reported prevalence of 61.0-73.0% in males and 27.0-39.0% in females. It is worth mentioning that in the present study a 1.3:1 ratio was obtained, with predilection for male gender. These results differ from those reported in other studies, where a 2:1 ratio was reported (male/female).[8,11,16] In other studies, lower male prevalence was reported, 35.8-47.9% as well as higher female prevalence 52.1-64.2%.[12,15]

With respect to fissure type prevalence we found that Dr. Anderson[11] reported 45.0% prevalence for cleft lip and palate, 31.6% for cleft lip and 23.3% for cleft palate. These results differ from those obtained in our study, since we found a very high cleft lip and palate prevalence (98.5%) and very low prevalence in isolated cleft lip or palate (1.5%).

With respect to cleft lip and/or palate prevalence based on fissure type, other studies reported 70.0% for unilateral type and 30.0% for bilateral type[10] which concurred with the present study, where 71.6% was obtained for the unilateral type, and 28.4% for the bilateral type. When studying unilateral cases in the present work, we found the left side as the location where defects appeared with greater frequency, 54.8%, and the right side with 45.2%. These findings differ from those reported by Dr. Vichi,[10] who stated that the right side was more affected, in 51.9%, whereas the left side exhibited 48.1%. Dr. Tsai[14] reported 68.3% prevalence for the left side and 31.4% for the right side.

It is worth mentioning that in the present study higher prevalence of supernumerary teeth (15.4%) was found when compared to other research projects, which studied only one type of fissure. This would be the case of work conducted by Drs. Lourenço,[3] Tsai,[14] Schroeder,[14] Nagai[14] and Heliövaara[12] who reported percentages of 3.0 to 8.0%. No supernumerary teeth were found in the research project conducted by Dr. Larson[15] on patients afflicted with isolated cleft palate. Nevertheless, our results differed from other reported results inasmuch as supernumerary tooth prevalence was much higher. Such would be the work conducted by Vichi,[10] Nagai and Hansen[1] where reported prevalence was 40.0-73.0%. It is worth mentioning that in other research projects conducted on supernumerary teeth prevalence, these have been mainly observed in patients with isolated cleft lip[8] and with cleft lip and palate. These differ from studies covering only cleft palate, in which there are no reports.[12]

Prevalence of supernumerary lateral incisors in primary dentition was 14.3% in Dr. Vichi's[10] study, 16.7% in Dr. Hansen's study,[1] 3.6%. I Dr. Tsai's study[14] and 60.0% in Dr. Böhn's[1] study, whereas in the present study it was 51.5%. With respect to permanent dentition, Dr. Vichi's study[10] reported 22.1%, Dr. Hansen's[1] reported 16.7% and Dr. Böhn[1] reported 42.0%. Our study revealed 16.6% finally with respect to both dentitions it was found the Vichy's work was 5.2% and Hansen's[1] 40%. This differed from our results where 16.6% was obtained. It is worth mentioning that supernumerary teeth prevalence in the central incisor region was 3.9% in Dr. Vichi's study[10] and 0.7% in Dr. Tsai's study,[14] whereas results in our study were 7.6%.

In the present research project it was found that 97% of all supernumerary teeth were located in the cleft area, this differed from Dr. Tsai's study, where he found a percentage similar to ours (90%) of supernumerary teeth in permanent dentition, but they were located outside of the cleft area. Moreover, he mentioned that lateral incisors are the most observed supernumerary teeth, and they are more frequently found in patients with clefts when compared to general population, where they are more frequently located in the central incisor area (mesiodens). These data concur with results achieved in our study. Dr. Tsai[14] mentioned that numerical anomalies of teeth located outside of the cleft area are more common in permanent dentition than in primary dentition, with respective percentages of 24.1% and 4.4%. In studies conducted by Drs. Vichi,[10] Hellquist[10] and Weise[10] it was reported that frequency of permanent supernumerary teeth was 6.7-22.2% in the cleft area; this differed from studies conducted by Drs. Böhn,[14] Ranta[14] as well as our own study, where it was observed that it was easier to find a primary lateral incisor than a permanent one. Therefore we can mention that presence of a supernumerary primary lateral incisor cannot be considered as a predictive sign of a supernumerary tooth in the permanent dentition.

Drs. Hansen[1] and Larson[15] found very high prevalence of supernumerary teeth in patients with clefts, when compared with that found in the general population, which ranges from 0.3 to 3.8%.[1,7,12,14,15,19] In these, genetic factors could exert great influence.[15] Moreover, it has been reported that males exhibit greater predisposition to dental anomalies than females.[12] It might be mentioned that Dr. Demirjian[3,20] observed that

mechanisms which control dental development are independent from somatic and sexual maturity, and that they appear to be greatly influenced by etiological factors such as fissures. With respect to the aforementioned, in the present study we were able to ascertain that male gender exhibited greater predisposition to suffering cleft lip and/or palate as well as supernumerary teeth, since statistically significant difference was found to that effect. We can also suggest the fact that fissure does play an important role in the presence of the aforementioned, since most of them were found in the cleft area.

The present study was subject to certain limitations due to having used former files, since not all necessary information was available to conduct clinical measurements or perform clinical exploration in patients. Moreover, since files did not include dental-alveolar X rays, it was not possible to determine the sagittal position in which the supernumerary teeth could be found.

It is important to point out that in our country there are no studies on the prevalence of dental anomalies in patients with cleft lip and/or palate. This hinders the possibility of establishing comparisons with results obtained in the present research project, since studies found were mainly conducted in European countries. It is equally worth mentioning that there is a lack of reports with respect to the type of supernumerary tooth, eruption and number of teeth in these patients, and for this reason it was impossible to establish a comparison with other research projects.

CONCLUSIONS

- Prevalence of supernumerary teeth is greater in males, nevertheless, when they were found, there was no significant difference with respect to side of the fissure.
- Supernumerary teeth were mainly located in primary dentition and the lateral incisor region.
- No supernumerary tooth morphology predisposition was found.
- Greater presence of a single supernumerary tooth was found.
- It is suggested to conduct further research on prevalence of dental anomalies in patients with cleft lip and/or palate. These studies should be of a prospective nature and cover greater population segments; they should include clinical examination and dental-alveolar X-rays, in order to be able to conduct all measurements deemed necessary for the achievement of a more comprehensive study.

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