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## A descriptive study of 113 unerupted supernumerary teeth in 79 pediatric patients in Barcelona

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### Abstract

Unerupted supernumerary teeth, depending on the morphology, number and distribution can give rise to various alterations in the eruption and development of those permanent teeth to which they are related.

Objectives: We aimed to make an epidemiological and descriptive study of the clinical characteristics of patients in Barcelona, their surgical treatment and how said treatment was hindered.

Materials and methods: A descriptive study including 113 supernumerary teeth from 79 healthy pediatric patients between 5 and 19 years of age, which underwent surgery in our hospital during a 2 year period (May 2005 / May 2007), taking into account the variables of personal data, gender, age, location, number, morphology, position-axis, radiological study, surgical treatment, related pathologies, and surgical complications.

Results: Male patients (51) were more frequently affected than female (28) patients mainly within the central incisors-mesiodens (53.16%), in which the unique form (68.52%) predominates in conoid morphology (69.62%). Surgical treatment was done by palatal/lingual extraction (49.37%), with few surgical complications (only 1 case of post-surgical bleeding).

Conclusion: Incidence in supernumerary teeth is higher among male patients (ratio M:F of 1.82:1). They are most frequently located in the maxilla (82%), specifically, in the premaxilla (77%). Most cases presented only one supernumerary tooth (68.5%) and, in multiple cases, the premolar region is predominant. The conoid shape is the commonest morphology (69.62%). Surgical extraction, was done by palatal/lingual in 49.37% of the cases, as opposed to the vestibular approach in 45.57%.

**Key words:** Supernumerary teeth, mesiodens, hyperdontia.

## Introduction

Among the alterations in the normal development of the oral and maxillofacial region we found differences in the number of teeth, in temporal dentition, as well as in permanent dentition: dental agenesis and supernumerary teeth.

Supernumerary teeth are a rare alteration of odontogenesis defined as the presence of a number of teeth greater than the normal dental formula: hyperdontia.

The prevalence reported in the literature of temporal dentition hyperdontia ranges between 0.3 and 0.8%, and in permanent dentition, between 0.8% and 3.8% of the population (1,2). In deciduous dentition, a lateral upper incisor often appears (3,4).

Supernumerary teeth are more frequent in men than in women (5-11). In addition, there is a greater incidence in patients suffering cleidocranial dysplasia and Gardner's syndrome (1), and in patients suffering lip and palatal fissure (12,13). In these cases, supernumerary teeth often appear in multiple forms (14). Multiple supernumerary teeth that are not related to any syndrome or systemic illness are very uncommon (14,15); in those patients they are normally found in the inferior premolar zone (16).

Supernumerary teeth can appear alone or in multiples in any zone of the maxilla and mandible and they can manifest in various forms. Moreover, the development stage of these supernumerary teeth and of affected teeth will determine the treatment plan. They can erupt or remain unerupted, and due to their shape and volume they often hinder eruption and development of the permanent tooth related to them, (3), causing crowding, displacement, diastema, retention, radicular resorption and, in some cases, dentigerous cyst formation. In other cases, supernumerary teeth are asymptomatic and are diagnosed in radiological examinations for unrelated studies (17-19).

The most frequent location is in the maxilla, the anterior medial region (mesiodens), where 80% of all supernumerary teeth are found (7). More rarely, they can be located in the superior distomolar zone, inferior premolar, superior premolar, inferior distomolar, superior canine zone, and inferior incisor (2).

Exact etiology of supernumerary teeth still remains unclear, and several theories to explain this pathology have been proposed: local and independent hyperactivity in the dental lamina theory is the most widely accepted (18,20), in which the lingual extension of an additional tooth bud forms a eumorphic tooth, while the rudimentary form arises from proliferation of the epithelial remains of the dental lamina induced by dentition pressure (21,22). Dental germ dichotomy theory where the dental lamina was divided into 2 parts of equal or different size, giving rise to two teeth of equal length, or one normal tooth and a dysmorphic one (22). Though

not widely accepted, some authors hold that multiple supernumerary teeth are part of post-permanent dentition, a theory that is gaining ground in Thesleff studies, in which ectodine has been described as a third dentition inhibitor protein (23-25).

Conventional radiological explorations have been used in order to pinpoint its position and plan its treatment and surgical removal (periapical and occlusal radiographs, orthopantomography or cephalometric radiographs). Nevertheless, in some cases, they do not provide all the information needed in order to situate them three-dimensionally in relation to the adjacent structures and to make decisions about therapeutic options. Computed tomography (CT) has emerged as a basic technique to assess patients with supernumerary teeth, and, recently, cone-beam computed tomography (CBTC) has been suggested as a substitute for CT due to its low radiation dose and lower cost (19).

Most supernumerary teeth treatment are extracted in order to avoid possible complications. Nevertheless, it is not entirely possible to ascertain the right time for surgical intervention (5,10,21). Cahuana et al. (11) established a borderline for early removal (before 9 years) and for later removal (after 9 years) by assessing the advantages and risks of supernumerary extraction. From our point of view, and, particularly when dealing with unerupted supernumerary teeth, we understand that each case must be fully studied with a multidisciplinary procedure (odontopediatry, orthodontics and oral surgery) so as to decide the prime moment for extraction. Likewise, evolutive monitoring should be done from this interdisciplinary point of view.

This article aims make a descriptive study of unerupted supernumerary teeth, and more specifically, to examine incidence according to gender, location, number of supernumerary teeth found in each patient, morphology, surgical approach for extraction, post-surgical complications, the relationship analysis between number and gender of the supernumerary teeth, as well as the relationship between location and number of supernumerary teeth.

## Patients and Method

A descriptive study has been carried out on healthy pediatric patients, between 5 and 19 years, who have been treated in the Oral and Maxillofacial Surgery service at the Children's Hospital of Barcelona, during a two-year period (2005-2007). Patients were referred from dental services of our and other clinics. Taking all this into account, an observational and descriptive study covering 79 patients that present a total number of 113 non-erupted supernumerary teeth.

Selection criteria of the samples included patients who were not diagnosed with any syndrome or illness that involved odontogenesis and dental eruption; patients

who presented non-erupted supernumerary teeth and those that can be operated surgically.

We recorded the clinical history and complementary radiological explorations, and filled in data research paper, which would complement the definitive data obtained from surgery. Other variables were also studied: personal data and day of intervention, gender, age, service from which he was referred, location (11 possible locations), number (unique, double, more than three), morphology, position-axis, complementary radiology, surgical treatment and surgical complications.

The anatomic location of those supernumerary teeth studied was divided into 11 possible maxillary zones, depending on the relationship with the kind of tooth it would become: superior interincisal, superior incisor zone, superior canine zone, superior premolar zone, inferior paramolar zone, superior distomolar zone, inferior distomolar zone and paramolar and premolar zone. In all cases, surgical interventions were performed by the same surgeon and surgical team, under loco-regional anesthesia and endovenous sedation.

Data was gathered in an Excel file, and a study was done with Statgraphics plus version 5.1. programme.

**Results**

A total number of 79 patients were surgically operated for an exodontia of 113 non-erupted supernumerary teeth (1.4:1): 51 male patients and 28 female patients with a 1.8:1 male-female ratio.

The patient age ranged between 5 and 19 years, with an average age of 10 years and 3 months at the time of surgery.

Table 1: shows the characteristics of the exodontied supernumerary teeth in 79 patients. The unique supernumerary tooth (SNT) was the most frequently found (65.82%), followed by the conoid morphology (69.62%), and lastly supplemental teeth (17.72%).

We defined 11 possible anatomical areas of both dentoalveolar arches, depending on the relationship presented between the supernumerary tooth and the anatomic-functional group of permanent teeth. Location zones for supernumerary teeth are described as follows (Fig.1) zone 1: between superior incisors, mesiodens. 42 SNT (53.16%), zone 2: superior incisors. 15 SNT (18.99%), zone 3: superior canines. 4 SNT (5.06%), zone 4: inferior canines. 1SNT (1.27%), zone 6: inferior premolars. 8 SNT (10.13%), zone 7: superior paramolar. 0 SNT, zone 8 inferior paramolar. 2 SNT (2.53%), zone 9: superior distomolar. 5 SNT (6.33%), zone 10: inferior distomolar. 0 SNT and zone 11: paramolar and premolar. 1 SNT (1.27%).

Results show that the superior maxillary is the most frequent location (82,28%), specifically in the premaxilla (77%), between the superior incisors (53.16%). In our samples we found no supernumerary in the superior paramolar zone or in the inferior distomolar.

Depending on the supernumerary teeth (unique, double or more than three), we obtained the following data:

**Table 1.** Characteristics of the 113 extracted supernumerary teeth.

Supernumerary tooth characteristics		N° cases	% cases
<b>Total number</b>		113	100
<b>Number:</b>	single	52	65,82
	double	22	27,85
	more than 3	5	6,33
<b>Location:</b>	Maxila	92	82
	Mandible	21	18
<b>Zone:</b>	Mesiodens	42	53,16
	Superior incisors	15	18,99
	Inferior Premolars	8	10,13
	Superior Distomolar	5	6,33
	Superior Canine	4	5,06
	Inferior Paramolar	2	2,53
	Inferior Canine	1	1,27
	Superior Premolars	1	1,27
	Premolar / paramolar zone	1	1,27
	Superior Paramolar	0	0
	Inferior Distomolar	0	0
	<b>Morphology:</b>	Conical	55
Supplemental		14	17,72
Tuberculate		9	11,39
Mixed		1	1,27
<b>Surgucal approach:</b>	Palatal / lingual	39	49,37
	Vestibular	36	45,57
	Combinated	4	5,06

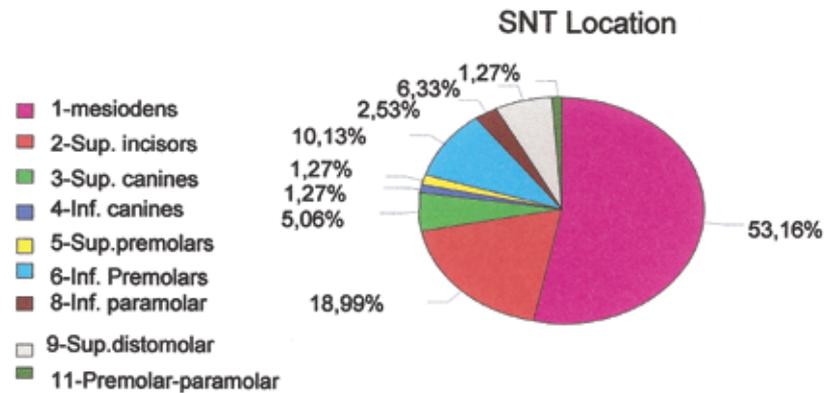


Fig. 1. Location of supernumerary teeth in maxilar jaws.

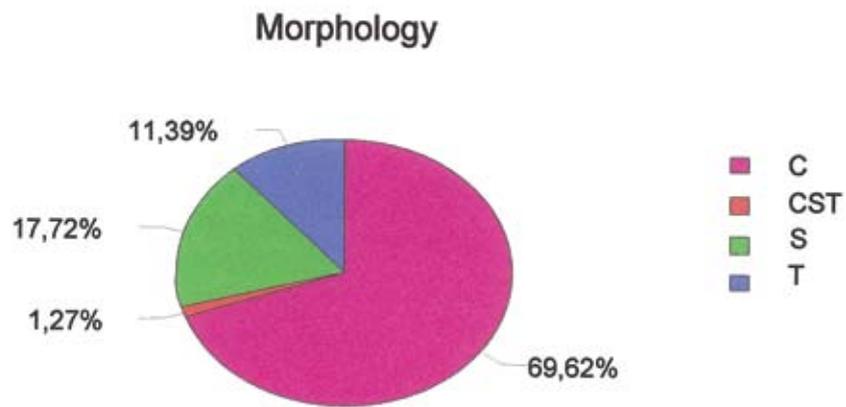


Fig. 2. Morphology of supernumerary teeth. C (Conic), CST (Mixed), S (Supplemental) and T (Tuberculate).

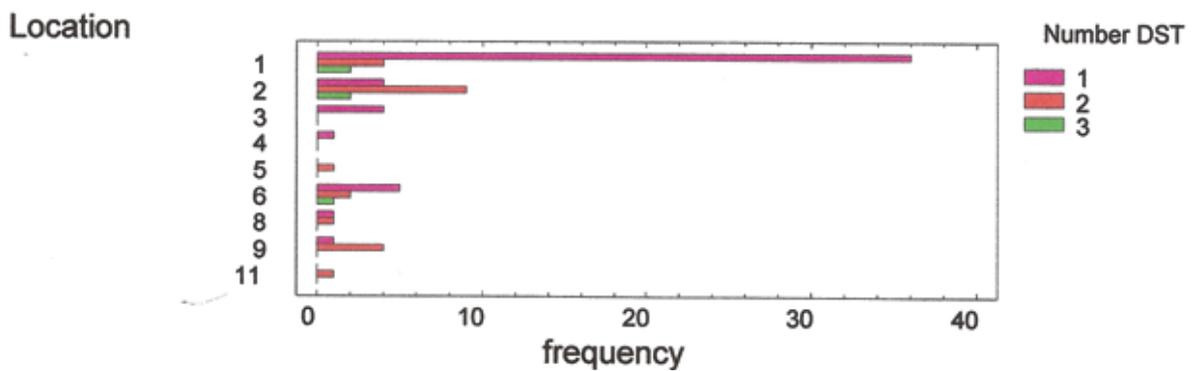


Fig. 3. Relationship between number of supernumerary teeth and their localization. Number of supernumerary teeth: 1 (unique), 2 (double) and 3 ( more than 3). Location: zone 1 (mesiodens), zone 2 (Superior incisors), zone 3 (Superior canines), zone 4 (Inferior canines), zone 5 (Superior premolars), zone 6 (Inferiors premolars), zone 7 (Superior paramolar), zone 8 (Inferior paramolar), zone 9 (Superior distomolar), zone 10 (Inferior distomolar) an zone 11 (premolar and paramolar).

in 65.82% they were presented as unique supernumerary (52 teeth), in 27.85% of the cases they were double (22 teeth) and in 6.33% there were more than three (5 teeth).

In terms of the results obtained according to the morphology of the supernumerary teeth, we registered 4 values: conoid (C), tubercular (T), supplemental (S) and combined: conoid-tubercular-supplemental (CST). Relative proportions of each of these forms were: 55 conoid, 14 supplementals, 9 tubercled and 1 combined. (Fig. 2). In our study, conoids were most frequent, 69% of the total of the unique supernumeraries, supplementals comprised 17.72%, and tuberculars, 11.39%, and 1.27% were mixed.

When dealing with surgical extraction, we considered 3 possible approaches: vestibular access (45.47% of the cases), palatine (49.37%) and mixed (5.06%).

We examined the possible relationship between gender and number of supernumerary teeth included. Of the 51 males, we found 33 unique supernumeraries (41.77%), 14 double (17.72%) and 4 of a number superior to 3 (5.06%). Of the 28 female patient, we found 19 unique supernumeraries (24.05%), 8 doubles (10.13%), and 1 of a number superior to three (1.27%). When analyzing these two variables we did not obtain any statistically significant values ( $p=0.75$ ), thus, no relationship exists between them.

Also, we studied relationship exists between their number (unique, double and more than three) and the anatomical presentation (Fig.3). We found 36 unique mesiodens (45.57%), 4 doubles (5.06%), and 2 in a number superior to three (2.53%); in the second zone 4 unique supernumeraries were found (5.06%); 9 doubles (11.39%) and 2 in a number superior to three (2.53%); in the 3rd zone we found 4 unique supernumeraries (5.06%); in the fourth zone we found 1 unique (1.27%); in the fifth zone we found 1 double (1.27%); in the sixth zone 5 unique supernumeraries appeared (6.33%), 2 doubles (2.53%) and 1 in a number superior to three 3 (1.27%); in the eighth zone we found 1 unique (1.27%) and 1 double (1.27%); in the ninth zone we counted 1 unique (1.27%) and 4 double supernumeraries (5.06%) and, lastly, in the eleventh zone we found a double supernumerary (1.27%). In the Chi-square analysis between these 2 variables (location and number of supernumeraries), the result is statistically significant, as we obtained a  $p$ -value = 0,0061, which can be related to location and number of supernumerary teeth.

In the cases of multiple supernumeraries, they often appear in the premolar zone.

All the surgical interventions were carried out under loco-regional anesthesia and endovenous sedation, using palatine-lingual treatment in 49.37% of the cases, vestibular treatment in 45.57% of the total cases, and mixed treatment was used (vestibular and palatine-lingual, for

the exeresis of the supernumerary teeth) in 5.06% of the cases.

In the 79 interventions done in the period of the present study, we observed only one case of complication (1.02%), in which post-surgical bleeding appeared, which required and was remedied at emergency hospital ward (compression and local application, topical, tranexamic acid).

## Discussion

Supernumerary teeth are a rare alteration in the development of the maxillas, which can appear in any part of the maxillas and can affect any tooth. They can be associated with a syndrome or they can be found in non-syndromic patients (2,19).

Hyperdontia etiology is still uncertain. A hereditary component has been suggested (28-30) and current genetic studies reveal the possible intervention of ectodine as an inhibitor protein against the third dentition (23-25).

Revising the literature we opted to conduct a comparative analysis of the results obtained from several studies with the results of this article, focusing on 7 specific articles and contrasting the findings according to number, age, gender, location, morphology and surgical treatment.

Our study was conducted on a total number of 79 non-syndromic patients, which presented a total number of 113 non-erupted supernumerary teeth, in the maxilla and the mandible, on which surgical exeresis was performed by the same surgical team. This is the fifth and the most comprehensive study done on supernumerary teeth (Table 2).

Our study confirmed sexual dimorfism of this pathology. Incidence is higher in males, corroborating other studies (2,5,10,18,19,26,27) on male ratios: females 1.82:1, in the studies oscillates between 2.64:1 by Liu et al. (19) done in China, and 1.18:1 by Salcido-Garcia et al. (27) done in Mexico. (Table 2). It seems that geographical differences exist, nevertheless, not enough studies have been published in some zones, such as South America. Regarding the location of diagnosed supernumerary teeth in our study, we found a larger proportion of supernumerary teeth in the superior maxillar than in the mandible, agreeing with other studies (2,5,10,18,19,26,27) whose percentages oscillate between 66% by Salcido-Garcia et al. (27) and 97% by Liu et al. (19). We described 6 specific anatomical zones (maxillar zone, superior premolar zone, superior molar zone, anterior mandibular, inferior premolar, and inferior molar), highlighting the importance of the premaxilla, which includes incisors and superior canines. We found a smaller proportion in the superior premolar zone. In the anterior zone of the inferior maxilla, in the inferior premolar zone and the molar zone the results mirror the average findings

**Table 2.** Demographic data, gender ratio and number of supernumerary teeth.

Study	Country	N pac	Ratio genderH:M	Age-range	Mean age	N snt	1 snt	2snt	>3 snt
1983. Nazif y cols (5)	EUA	50/50	NR	16m – 17 a	NR	57	43	7	0
2001. Patchett & cols (10)	RU-Austral	159/159	2.24:1	4 – 13 a	9 y 4 m	215	110	43	6
2002. Rajab & Hamdan (18)	Jordania	152/152	2.23:1	5-15 a	10 y 3 m	202	117	28	7
2004. Salcido-Garcia & cols (27)	Mexico	72/2.241	1.18:1	2-55 a	14 y 4 m	102	63	NR	NR
2006. Fernandez-Montenegro and cols (26)	Spain	102/36.057	1.42:1	5-56 a	17,6 years	147	77	14	9
2007. Liu DG & cols (19)	China	487/487	2.64:1	5-44 a	NR	626	351	133	3
2007. Leco-Berrocal & cols (2)	Spain	21/2.000	2.49:1	7 – 34 a	20 a y 2 m	24	NR	NR	NR
2007. Our study	Spain	79/79	1.82:1	5 -19 a	10 ay 3 m	113	52	22	5

NR= No reported

obtained in other studies. These findings corroborate the results recorded in other studies, except for Leco-Berrocal et al. (2), which differ significantly, maybe because they used fewer samples (n=21).

Supernumerary teeth are classified according to their morphology (22). They can be either eumorphic or supplemental and dysmorphic: conoid, tubercular and mixed (CTS conoid-tubercular-supplementals). The conoids comprise the commonest (69%) in this study, coinciding with the rest of the authors (10,18,19,26,27) except Nazif et al. (5), who describe 48% of tuberculars and 52% of mixed (CTS). The only article presenting results that differ to this proportion is Fernández-Montenegro et al. (26) who describe a 24.20% of supplemental morphology teeth in their sample.

With respect to the surgical treatment used: a) vestibular, b) palatine-lingual and c) combined (vestibular and palatine-lingual), our results concur with the description of the other 4 authors (5,18,19,26), in that most supernumerary teeth are positioned lingually, which is the extraction route most widely used. Percentages range between 85% reported by Rajab and Hamdan (18) in 2002, and 46% by Fernández-Montenegro et al. (26) in 2006. In 2007, Liu et al. (19) speculate that the difference in the mixed treatments (23.50%) derives from the study done with CBTC cone-base computed tomography and 3D reconstructions made for the pre-operation study.

Lastly, concerning complications, except for some commentaries in 2 articles, we found no statistical data in the literature. Nazif and cols (5) observe: “Complications associated with premature exeresis are infrequent

and are minor in nature”. In 2004, Salcido-Garcia et al. (27) writes in 2004: “Dental supernumerary organs were extracted surgically, and no posterior complications appeared”. In our study we recorded one case of post-operation bleeding (1.02%) that required attention in the hospital’s emergency service, and it was finally solved with no further complications.

The data collection for the present study lasted only 2 years, nevertheless our intention is to broaden this study, something that will allow us, to study more than 200 supernumerary teeth in the next 2 years.

## Conclusions

Supernumerary teeth are frequently the aetiology/ etiology of uneruption, ectopic eruption, and diastema for the definitive teeth to which they are related, and the treatment is to remove them. Incidence according to gender is more prevalent among males (ratio M-F is 1.8:1).

Supernumerary teeth are most frequently found in the maxilla, and most of these occur in the premaxilla region. Generally they are a single presentation, and, above all, between the upper central incisors zone (mesiodens). Of the 113 supernumerary teeth found in the 79 operated patients, 52 cases were unique (with 42 mesiodens among them), 22 cases were double and 5 cases had three or more. These results corroborate previous studies published.

There are many variations of supernumerary teeth morphology, yet the most frequent type is that of the conoid shape. Supplemental teeth, are the second most frequent morphology found in this study, followed by tubercu-

lar morphology teeth and, lastly, a mixed-intermediate form.

Surgical treatment, conditioned by the rest of dentoalveolar structures, conducted was palatine-lingual in 49.37% of cases, vestibular in 45.57%, and mixed, double approach from the alveolar ridge, in 5.06% of the cases. According to the literature, palatal-lingual approach is most frequently employed.

The mixed approach, sometimes unavoidable, is not so recurrent due to the pre-surgical evaluation made, and specifically, due to computed tomography.

Multiple supernumerary teeth (three or more) appear most of the time in the premolar zone.

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