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Clinical epidemiological analysis of 173 supernumerary molars

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Abstract

Objectives: To determine the prevalence of supernumerary molars in a sector of the population of Madrid, as well as the possible complications associated with the presence of hypergenetic molars. ***Materials and methods:*** A retrospective, descriptive study was carried out, which included a data assessment of all patients (13557) seeking dental care at a hospital's department of oral surgery across 4 years. The proposed methodology consisted of preparing a medical record in order to obtain data on the medical record number, age and sex of the patient, radiological findings such as location and type of supernumerary molar, retained/erupted molar, related accidents and tooth morphology. ***Results.*** Supernumerary molars were found to be present in 130 patients, representing a prevalence of 0.96% of the total population studied. These patients had a total of 173 hypergenetic molars, consisting of 137 distomolars and 36 paramolars Mechanical-obstructive pathology was associated with 28.9%, whereas enlargement of the follicular sack bigger than 3 mm was present in 16.2% of the sample. ***Conclusion:*** Supernumerary molars are usually diagnosed as a coincidental radiological finding without any associated pathology. However a higher percentage of comorbidity was found than initially expected.

Key Words: *comorbidity, distomolars, morphology, paramolars, prevalence*

Introduction

Hyperodontia, hypergenesis or the presence of supernumerary teeth is defined as the existence of an excessive number of teeth in relation to the normal dental formula [1–3]. Nadal-Valldaura and Viader Codina [4] contend that supernumerary teeth exist when the number of teeth is greater than 20 for the primary teeth and greater than 32 for the permanent teeth. It is important to specify this increase in a particular group and not the total dental formula, as the same patient may present supernumerary teeth along with agenesis.

Supernumerary molars are supernumerary teeth that appear in the posterior part of the mouth. Following Bolk [5], we will divide the supernumerary teeth of the molar region into distomolars and paramolars. It should be noted that these are two different supernumerary formations. It was believed that paramolars were no more than a mesially displaced distomolar; however, more detailed observations revealed that one or the other can be present simultaneously.

Distomolars are also called 'fourth molars'. In sections of embryos, one often observes the formation of an epithelial outline behind the follicle of the third molar: an outline which usually suffers a regression until it eventually disappears, but sometimes the outline continues its evolution, forming the distomolar. They are more common in the upper jaw (Figure 1). They occur in distal position with respect to the third molar, following the line of the arch or with a slight palatal or lingual offset [4].

The paramolars appear outside the arch line, as vestibular (most common) or lingual/palatine teeth. They are located in the inter-dental triangle between

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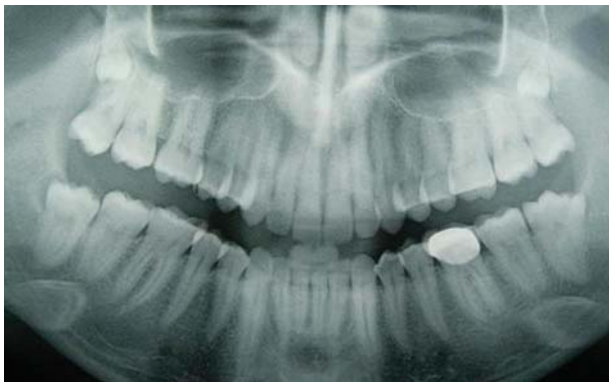

Figure 1. Supernumerary maxillary distomolars.

the second and third molar (Figure 2), rarely between the first and second molar and particularly seldom between the second premolar and the first molar [6,7].

Supernumerary molars are a developmental anomaly that are observed relatively often [7–11]. The prevalence of supernumerary molars ranges between 0.41% [10] and 3.8% [7] in permanent teeth. In addition to racial variations, the age difference in the patients studied and the different diagnostic methods used may explain this wide range of prevalence.

The etiology of supernumerary teeth is not entirely clear. The type of human dentition—diphyodont (primary and permanent dentition) and heterodont (different tooth morphology of each group of teeth)—and the different number of teeth for each type of dentition influence the appearance of supernumerary teeth [11].

The aim of the present study was to determine the prevalence of supernumerary molars in a sector of the population of Madrid, as well as the possible complications associated with the presence of hypergenetic molars. In turn, a statistical evaluation has been carried out on the results obtained and they have been compared with those established in other similar studies globally.

Figure 2. Maxillary paramolar.

Materials and methods

Data collection

This study included all patients (n = 13,557) who sought dental care at the Department of Oral Surgery and Implantology at the University Hospital of Madrid during the months of May 2005 and June 2009 and who had had a panoramic as well as periapical or occlusal radiographs taken at the radiodiagnostic department of said hospital. The radiographic diagnoses were made by the same examiner. However, to clear up any doubts, a consensus opinion was reached with the other members of the teamwork. On this sample, cases in which there was no presence of this anomaly (supernumerary molars) were discarded, keeping only those cases in which the anomaly was present in order to incorporate into our working protocol (n = 130).

A case history was created for each participant with supernumerary molars, that included clinical history, age and sex, radiological findings from panoramic, periapical or occlusal radiographs such as the location of the teeth, type of supernumerary molar and whether they were impacted or erupted, related clinical complications (mechanical or obstructive pathology, enlargement of the follicular sack more than 3 mm) and the supernumerary ('supplementary' or 'heteromorphic') tooth's morphology.

Ethical considerations

The Ethics Committee of the University Complutense of Madrid approved the research protocol for our retrospective, descriptive study on patients at the University Hospital of Madrid.

Statistics

The data to be studied or compared were entered into a spreadsheet (Microsoft Excel, Redmond, WA) and exported them into statistical software (SPSS, version 17.0 for Windows, Chicago, IL).

The statistical analysis used was divided into a univariate analysis (mean, standard deviation, median, etc.) and a bivariate analysis in order to compare different variables to each other and then analyze the variations observed in the data by using the Chi-square test, establishing the statistical significance with a confidence interval of 95% ($p < 0.05$).

Results

Univariate analysis

The results of this study revealed the existence of supernumerary molars (MS) in 130 patients, which represents a prevalence of 0.96% of the total population. The gender distribution corresponded

to 63 cases for males (48.46%) and 67 cases for females (51.53%), establishing a male-to-female ratio of 0.94:1. The age ranged between 14–70 years, with an average of 26.7 years of age. Taking a look at the age intervals, 80% of the patients included in this study were over the age of 20. The 130 participants with supernumerary molars in this study had a total of 173 hypergenetic molars altogether. A total of 20.8% of the participants had two supernumerary molars and 6.1% of the participants had three or more supernumerary molars.

The distomolars represented 79.2% of the sample, while paramolars accounted for only 20.8% of all supernumerary molars. If we consider the maxillary or mandibular distribution of the hypergenetic molars included in our research, the maxillary distomolar (63.6%) was the most frequent, followed by the maxillary paramolar (20.8%) and mandibular distomolar (15.6%). It is worth noting that no mandibular paramolars had been diagnosed in this study. Of the total sample, 146 molars were in the maxilla, which amounts to 84.4%; only 15.6% of these molars were presented in the jaw. In this study, 87.3% of the supernumerary molars were retained, while 12.7% appeared erupted.

Radiographic findings revealed an associated pathology in 81 molars; this represents 46.8% of the supernumerary molars included in the study. We found radiolucencies associated with the supernumerary molar (defined as enlargement of the follicular sack of more than 3 mm) in 16.2% of the sample and mechanical or obstructive pathology in 28.9%; 1.7% of the sample was even associated with both enlargement of the follicular sack of more than 3 mm and mechanical or obstructive pathology.

The morphology of the supernumerary molars included in this study was also analyzed. Ninty-seven (56.1%) had a heteromorphic morphology and 76 had a supplementary morphology (43.9%).

Bivariate analysis

While conducting the bivariate analysis, a statistically significant influence at 95% ($p = 0.004$) between the type of supernumerary molar and its location in the maxilla/mandible was observed. All paramolars included in this study were located in the maxilla. In contrast, the distomolars were present in both the maxilla (80.3%) and the mandible (19.7%).

In turn, a statistically significant influence of 95% ($p < 0.001$) between the type of supernumerary molar (SM) and the presence of an associated pathology (enlargement of the follicular sack of more than 3 mm or mechanical-obstructive pathology) was also observed. Thus, in this study paramolars were primarily associated with mechanical-obstructive pathology (58.3%) and enlargement of the follicular sack of more than 3 mm was present in only 5.6% of the paramolars. The distomolars, however, presented both mechanical-obstructive pathology as well as enlargement of the follicular sack of more than 3 mm in similar percentages (21.2% vs 19%). Both types of pathology were also combined in 2.2% of the distomolars (Table I).

By the same manner a statistically significant influence of 95% ($p < 0.001$) between the location of the supernumerary molars and the associated pathology was noticed. The maxillary molars were primarily associated with mechanical-obstructive pathology (30.1%), whereas the mandibular molars were associated primarily with an enlargement of the follicular sack of more than 3 mm (33.3%) (Table II).

A statistically significant influence of 95% ($p < 0.001$) between the type of supernumerary molar and its morphology was observed. Among the paramolars observed, 91.7% presented heteromorphic morphology, whereas the distomolars presented a more even distribution, although a supplementary morphology was the most common, representing 53.3% of the cases.

Discussion

There are numerous studies in the literature on the prevalence of supernumerary teeth. Authors like Nazif et al. [12], Davis [13], Peltola [14] and McKibben and Brearley [15] have conducted several research studies about hypergenesis throughout the world, taking all types of supernumerary teeth into account (mesiodens, canines, premolars and molars).

However, there are few studies that only focus on analyzing supernumerary molars and it is worth noting that just some of them distinguish between distomolars and paramolars. The largest case study ever on supernumerary molars, conducted by Stafne [10], dates back to 1932 and includes a total of 199 molars. The present study, with a total of 173 molars, represents the largest current series of supernumerary molars and that is precisely what makes this research important.

The authors reviewed determine the prevalence of supernumerary molars to range between 0.41–3.8% [7–10], in agreement with our results (0.96%).

In this study, the proportion of supernumerary molars with respect to the patient's sex did not reveal significant differences. In this regard, this research concurs with the studies conducted by Menardía-Pejuan et al. [16], Fleury et al. [17] and Grimanis et al. [18], in which no significant differences were found with respect to the sex of the patient. Conversely, a higher frequency of supernumerary molars in females (ratio 2.17:1) was found by Martínez-González et al. [7], while Tochihara [19] and Sugimura et al. [20] suggest a higher frequency in males. Analyzing these results, unlike that which occurs during hypergenesis at the general level (which

Table I. Contingency table. Type of supernumerary molar vs pathology.

	Pathology				
	No pathology	MOP	EFS >3 mm	MOP + EFS >3 mm	Total
Distomolar					
Count	79	29	26	3	137
% according to type	57.7%	21.2%	19.0%	2.2%	100.0%
Paramolar					
Count	13	21	2	0	36
% according to type	36.1%	58.3%	5.6%	0.0%	100.0%
Total					
Count	92	50	28	3	173
% according to type	53.2%	28.9%	16.2%	1.7%	100.0%

MOP, Mechanical-obstructive pathology; EFS >3 mm, Enlargement of the follicular sack bigger than 3 mm.

seems to indicate a higher incidence in males), supernumerary molars do not seem to follow a pattern of sex-linked occurrence.

Following the criteria used by Bolk [5], 137 (79.2%) of the supernumerary molars in this study were classified as distomolars or fourth molars. The remaining 53 molars (20.8%) were classified as paramolars. Menardía Perjuan et al. [16] did not find any paramolars on a sample of 53 supernumerary molars. Leco Berrocal et al. [21] also report not finding the presence of paramolars in a study on 2000 patients, in which nine distomolars were diagnosed. Our results, however, agree to a greater or lesser extent with those obtained by Stafne [10] in 1932, whose work still remains the baseline study at the European level. Out of a total of 199 molars, 141 were classified as distomolars and 58 as paramolars (Table III).

Taking into account the location of the molars, either in the mandible or maxilla, maxillary distomolars are the most represented in this study, accounting for 63.6% of the cases. These are followed by maxillary paramolars (20.8%) and inferior distomolars (15.6%). It is worth noting that no cases of mandibular paramolars were observed, a fact which once again coincides with the study by Stafne [10].

According to the literature, about a third of patients have more than one supernumerary tooth [22,23].

In this study, of the 130 cases observed, 95 (73.1%) presented only one supernumerary molar, 27 (20.8%) patients had at least two supernumerary molars and eight cases (6.1%) were found in which the patient presented more than two supernumerary molars (Figure 3). These results agree with other published reports. In this way, in a study involving a total of 38 patients with supernumerary molars, Martínez-González et al. [7] observed the presence of a single supernumerary molar in 81.57% of the cases and 15.78% of the sample had two and 2.63% three molars. In a meta-analytical study on supernumerary molars, the presence of bilateral molars was established in almost 24% of the cases [18].

The maxilla has a higher incidence of supernumerary teeth than the mandible, in a ratio that varies from 5:1 to 10:1, according to the authors [1,24,25]. In agreement with other published reports, supernumerary molars were more frequent in the maxilla (84.4%). Menardía-Pejuan et al. [16] obtained percentages similar to ours, whereas Stafne [10], Martínez-González et al. [7] and Fleury et al. [17] observed

Table II. Contingency table. Location of supernumerary molar vs pathology.

			Pathology				
			No pathology	MOP	EFS >3 mm	MOP + EFS >3 mm	Total
Location	MAND	Count	9	6	9	3	27
		% according to location	33.3%	22.2%	33.3%	11.1%	100.0%
	MAX	Count	83	44	19	0	146
		% according to location	56.8%	30.1%	13.0%	0%	100.0%
Total		Count	92	50	28	3	173
		% according to location	53.2%	28.9%	16.2%	1.7%	100.0%

MOP, Mechanical-obstructive pathology; EFS >3 mm, Enlargement of the follicular sack bigger than 3 mm.

Table III. Clinico-epidemiological analysis of supernumerary molars compared with other studies in the literature, part I.

Source	Prevalence (%)	1 Supernumerary molar (%)	2 or more molars (%)	Proportion (male/female ratio)	Distomolars (%)	Paramolars (%)
[7]	3.80	81.57	18.43	0.46/1	No cases reported	No cases reported
[8]	0.47	80.00	20.00	0.43/1	58.33	41.67
[10]	0.41	No cases reported	No cases reported	No cases reported	70.85	29.15
[16]	No cases reported	66.67	33.33	1.25/1	100.00	0.00
[17]	0.58	79.16	20.84	0.85/1	No cases reported	No cases reported
[18]	No cases reported	76.10	23.90	0.98/1	No cases reported	No cases reported
[19]	No cases reported	No cases reported	No cases reported	Higher in males	No cases reported	No cases reported
[20]	No cases reported	No cases reported	No cases reported	3.88/1	69.05	30.95
[26]	No cases reported	No cases reported	No cases reported	No cases reported	76.47	23.53
Present study	0.96	73.1	26.9	0.94/1	79.2	20.8

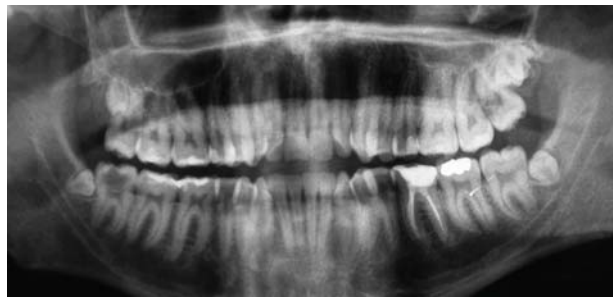

Figure 3. Multiple supernumerary molars. Supernumerary molars can be observed in maxillary and mandibular right and left quadrants.

an even higher percentage (~95%) of molars located in the maxilla (Table IV).

Generally, the presence of fourth molars is detected coincidentally on a radiograph, given that these supernumerary molars are usually impacted [7,18]. The high percentage of impacted fourth molars can be attributed to the fact that the development of these hypergenetic teeth is rather delayed compared to their 'normal' predecessors. Of the 173 supernumerary molars included in this clinical review, 151 remained impacted (87.3%). Most authors estimate the retention of these supernumerary molars to be ~90–95% [7,16,18].

Of the supernumerary molars included in this study, 56.1% exhibited heteromorphic morphology which is lower than the previously reported rates [7,26]. Martínez-González et al. [7] observed heteromorphic morphology in 78.25% of the cases, whereas Fernández Montenegro et al. [26] calculated heteromorphic morphology in 88.24% of the cases studied.

Estimates should be viewed with knowledge of the inherent difficulties involved in determining the dental morphology on panoramic, periapical or occlusal radiographs, although it is true that we tried to standardize the detection of the morphology in all molars and we verified their anatomy in all cases where they were extracted surgically.

A statistically significant influence has been observed between the type of supernumerary molar and its morphology. Usually, paramolars are elementary supernumerary formations that are tapered at the end, although sometimes they have a wider crown with a central pit and show the beginnings of two or three small rounded protrusions [4]. We concurred with that description of paramolars. However, we did not find any studies that cross these two variables (type of molar vs morphology). In this study, 53.3% of distomolars adopted a supplementary morphology, whereas paramolars were present in 91.7% of the cases as smaller-size teeth with an irregular shape (heteromorphic morphology).

One of the objectives of this study was also to analyze the clinical complications of supernumerary molars. The enlargement of the follicular sack of more

Table IV. Clinico-epidemiological analysis of supernumerary molars compared with other studies in the literature, part II.

Source	Supernumerary molars (*n*)	Maxillary (%)	Mandibular (%)	Impacted (%)	Erupted (%)	Associated pathology (%)	No pathology (%)
[7]	46	97.82	2.18	95.65	4.35	52.17	47.83
[8]	12	75.00	25.00	No cases reported	No cases reported	No cases reported	No cases reported
[10]	199	94.97	5.03	No cases reported	No cases reported	No cases reported	No cases reported
[16]	53	86.79	13.21	94.34	5.66	7.55	92.45
[17]	29	93.10	6.90	No cases reported	No cases reported	No cases reported	No cases reported
[18]	113	79.70	20.30	88.70	11.30	No cases reported	No cases reported
[19]	81	93.83	6.17	No cases reported	No cases reported	No cases reported	No cases reported
[26]	34	82.40	17.60	94.12	5.88	41.18	58.82
Present study	173	84.4	15.6	87.3	12.7	46.8	53.2

than 3 mm has been studied by authors such as Eliasson et al. [27] and Sewerin and von Wowern [28] in patients with the third lower molar impacted. These authors concluded that this enlargement is not very frequent, 6% and 5.45%, respectively. However in these cases the histological studies were compatible with follicular cysts (Figure 4).

To a greater or lesser extent, our results coincide with those obtained by Martínez-González et al. [7], who estimate the general pathology of supernumerary molars to be 52.17%. In this research, however, we found a higher percentage of enlargement of the follicular sack of more than 3 mm (16.2% vs 2.17%) and a lower frequency of mechanical-obstructive pathology (28.9% vs 50%) than the results obtained by Martínez-González et al. [7]. Nevertheless, Menardía Pejuan et al. [16] found a lower percentage of associated pathology with distomolars; they only found an associated pathology in 7.55% of the 53 molars included in their study.

In this case study, a statistically significant influence between the type of supernumerary molar and the presence of pathology was noted. Paramolars were associated mainly with mechanical-obstructive pathology (58.3%). In contrast, the distomolars were associated with mechanical-obstructive pathology and enlargement of the follicular sack of more than 3 mm in similar percentages (Table I). Fernández Montenegro et al. [26] noted the presence of a mechanical-obstructive pathology in 19.2% of the 26 distomolars and in 25% of the eight paramolars included in their study. However, they did not find any cystic pathology in any of the 34 molars included in their study.

The bivariate analysis also determined a statistically significant influence between the location of the supernumerary molars and the associated pathology. First, a higher rate of comorbidity in mandibular molars (66.7%) was noted, compared with maxillary

Figure 4. Maxillary distomolar in left quadrant with enlargement of the follicular sack of more than 3 mm.

molars, which were affected in only 43.2% of the cases. Secondly, it is worth noting that the maxillary molars were primarily associated with mechanical-obstructive pathology, whereas the mandibular molars were associated primarily with an enlargement of the follicular sack bigger than 3 mm (Table II). We did not find any articles in the literature relating these two variables (Location of SM/Pathology).

In this article the clinical and epidemiological characteristics of a series of 173 supernumerary molars have been summarized. Generally, fourth molars are detected as a coincidental finding during an x-ray, given that these supernumerary molars are usually impacted and asymptomatic. However, the results of this study noted a higher rate of comorbidity than those obtained in similar studies. It should be noted, however, that this series represents a total of 173 supernumerary molars, the largest current series of this type of hypergenesis.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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