



Prevalence, types and etiologic factors of mandibular crowding in orthodontic patients in Tabasco, Mexico, 2015-2016

Prevalencia, tipos y factores etiológicos de apiñamiento mandibular tardío en pacientes de ortodoncia en Tabasco, México, 2015-2016

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ABSTRACT

Late mandibular crowding is a frequent malocclusion that develops between 15 and 20 years of age and has been associated with a number of etiological factors, mainly: the eruption of lower third molars, anterior tooth discrepancy, mandibular length and growth pattern. The aim of this investigation was to evaluate the prevalence, types and etiological factors of late mandibular crowding in orthodontic patients, in Tabasco, Mexico, 2015-2016. It was an observational, analytical, case-control study. The sample consisted of 74 new patients from the Postgraduate Clinic of Orthodontics of the Juárez Autonomous University of Tabasco who came to the clinic between August 2015 and December 2016. Clinical records, models and radiographs were reviewed. It was found that the prevalence of late mandibular crowding was 83.7%; the most common types were severe 26% and very severe 27%. Seventy percent of the patients showed more dentoalveolar discrepancy on the lower arch. Twenty six percent of patients with crowding showed reduced mandibular length. The horizontal growth pattern predominated in 49% of the case groups and in 58% of the controls. The C position of the third molars predominated on both sides. It was concluded that no patient with crowding had a diminished mandibular body or a vertical growth pattern. Crowding can occur regardless of whether or not the lower third molars are present.

Key words: Prevalence, crowding, etiology.

Palabras clave: Prevalencia, apiñamiento, etiología.

RESUMEN

El apiñamiento mandibular tardío es una maloclusión frecuente que se desarrolla entre los 15 y 20 años de edad, y que se ha asociado con diversos factores etiológicos, principalmente, a la erupción de los terceros molares inferiores, así como la discrepancia dentaria anterior, la longitud mandibular y el patrón de crecimiento de la misma. El objetivo de la presente investigación fue evaluar la prevalencia, tipos y factores etiológicos de apiñamiento mandibular tardío en pacientes de ortodoncia en Tabasco, México, 2015-2016. Fue un estudio observacional, analítico, de casos y controles. La muestra se conformó por 74 pacientes de nuevo ingreso de la Clínica de Posgrado de Ortodoncia de la Universidad Juárez Autónoma de Tabasco, entre agosto del 2015 y diciembre del 2016. Se revisaron expedientes clínicos, modelos y radiografías. Se obtuvo que la prevalencia de apiñamiento mandibular tardío fue de 83.7%, los tipos más comunes fueron el severo 26% y muy severo 27%. El 70% de los pacientes presentó mayor discrepancia dentaria anteroinferior. 26% de pacientes con apiñamiento mostraron longitud mandibular reducida. El patrón de crecimiento horizontal predominó en grupo de casos con 49% y en grupo control con 58%. La posición C de los terceros molares predominó en ambos lados. Se concluye que ningún paciente con apiñamiento presentó un cuerpo mandibular disminuido ni patrón de crecimiento vertical. El apiñamiento puede presentarse independientemente de si están o no presentes los terceros molares inferiores.

INTRODUCTION

Dental crowding is a very frequent malocclusion that has been present in humanity for centuries. It is defined as the discrepancy between teeth size and the available space for their correct functional and aesthetic position, which may affect oral health by increasing susceptibility to dental caries and periodontal disease, with repercussions on the dental and facial aesthetics of the patients. It is one of the main reasons for consultation of patients.¹

According to its severity, it is classified as mild, moderate, or severe, however Van der Linden, classified

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crowding depending upon the time at which it appeared in the dentition, thus establishing the classification in primary, secondary and tertiary crowding. The latter is that which develops between 15 and 20 years of age, also known as late dental crowding, since it occurs in the mandibular incisors during adolescence and the period after. Its etiologic factors range from genetic to local.² However, it has been associated mainly with the eruption of the lower third molars, followed by other factors such as tooth mass ratio, mandibular length and mandibular growth pattern.³

Mesiodistal size of tooth crowns influences the development of this malocclusion. The literature mentions that in the last few decades there has been a trend toward the reduction of the mandibular base size without a decrease in the size of teeth, making it necessary to perform extraction or interproximal reduction treatments.⁴ Puri and colleagues conducted a study to determine if biometric dental size contributed to crowding. They found that in the group with poor alignment, the teeth were significantly wider compared to the control group.⁵

With regard to mandibular length, cephalometric studies have determined that when a mandible has poor growth and reduced body length, there is greater incisor retroclination and verticalization, which leads to an increase in lower anterior crowding. Janson and colleagues conducted a study focused on verifying the relationship between mandibular length and dental crowding, finding that the decrease in the mandibular length is an important factor associated with dental crowding.⁶

Relevant to mandibular growth pattern, the literature shows that the more vertical growth is, more eruption of the incisors to compensate for the vertical space created; this eruption decreases the likelihood to maintain contacts between the teeth and thus, the risk of crowding increases.⁷

In relation to third molars and their possible influence on the development of lower anterior crowding, it has not been clarified in the dental literature if these teeth are conducive or not to this anomaly. There is a

debate among clinicians who support the removal of third molars as a preventive measure and those who do not.⁸

Being a malocclusion that affects both the smile aesthetics as well as the proper function of the masticatory system, one that can be expressed in different degrees of severity and is associated with several risk factors, the need to know the magnitude of this problem in the state of Tabasco arose. The aim was that at the moment of establishing a diagnosis and treatment plan, the clinician may choose the therapeutic alternative that can best be used for the correction of this anomaly and to be able to provide the patient acceptable aesthetics with correct function, which is the main desire of the patient and of every ethical and responsible clinical institution. Therefore, the main objective of this research was to evaluate the prevalence, types, and etiologic factors of late mandibular crowding in orthodontic patients, in Tabasco, Mexico, from 2015 to 2016.

MATERIAL AND METHODS

This was an observational, analytical, cases and controls study. The universe was composed of 200 patients of the Orthodontic Post-Graduate Program of the Juarez Autonomous University of Tabasco who attended the clinic from August 2015 until December 2016. A non-probabilistic sampling for convenience was selected. Seventy-four patients constituted the sample. Their clinical records, models and panoramic and lateral headfilm radiographs were reviewed. The group of cases was composed of 62 patients, all with late mandibular crowding; and the control group comprised 12 patients, which had a perfect alignment or spaces between teeth (*Table I*).

The following inclusion criteria were determined: patients without previous orthodontic treatment, with complete permanent dentition, 15 years of age and older, healthy and whose clinical records were in excellent conditions; with radiographs and study models in optimal conditions.

Table I. Prevalence of late mandibular crowding by gender.

Patients	n	%	Male		Female		p
			n	%	n	%	
With crowding	62	83.7	16	84.2	46	83.6	0.95
Without crowding	12	16.2	3	15.7	9	16.3	

p = χ^2 test.
Source: direct.

Patients were excluded if they had had previous orthodontic treatment, had primary or mixed dentition, extractions; patients with dental anomalies of shape, size and number; patients under 15 years of age, with syndromes or cleft lip and palate and those patients whose clinical records, study models and X-rays were not in optimal conditions.

In the lateral headfilms, we identified the following anatomical points: gonion nasion, sella, and menthon, which are necessary to measure the mandibular base length (Go-Me), anterior face height (N-M) and posterior face height (S-Go). When performing the percentage relationship between these last two the growth pattern of the patient was obtained according to Jarabak. From panoramic radiographs we observed those who had third molars and those that did not; we analyzed the position of the lower third molar with respect to the second molar, as indicated by the classification of Pell and Gregory.

With the study models we calculated the severity of the dental crowding according to Little's Irregularity Index, for which we performed a linear measurement of the contact points' displacement of each of the four mandibular incisors; starting from the contact point between right canine and lateral incisor up until the left lateral incisor and the contact point with the left canine, thus obtaining five segments. The sum of these five segments represents the degree of irregularity that the incisors of the patient have. There are five ways to classify it: when the sum of the five segments is equal to zero, the patient has a «perfect alignment»; when the sum ranges between one and three millimeters, it is said that the irregularity is mild; a summation of four to six millimeters is classified as amoderate irregularity; a sum of seven to nine millimeters is considered a severe irregularity and a sum of more than 10 millimeters would be a very severe irregularity.⁹

The collected information was introduced in a database designed in Excel (Microsoft). Using the same program or the statistical package SPSS (Statistical Product and Service Solutions) 2.2 version, we performed the descriptive statistics, proportions for qualitative variables, measures of central tendency and dispersion for the quantitative variables. χ^2 tests were carried out to find the statistical relationship between variables. The results are presented in frequency tables and graphs.

The predictable risks and the potential benefits of the research were considered and we had the written informed consent of each of the patients, which was signed at the start of treatment. Freedom to leave the study when the patient so wished was given and

respected, in accordance with the Nuremberg Code and the Declaration of Helsinki of the World Medical Association. The investigation was conducted by the interests of science and society and not for the welfare of third parties.

RESULTS

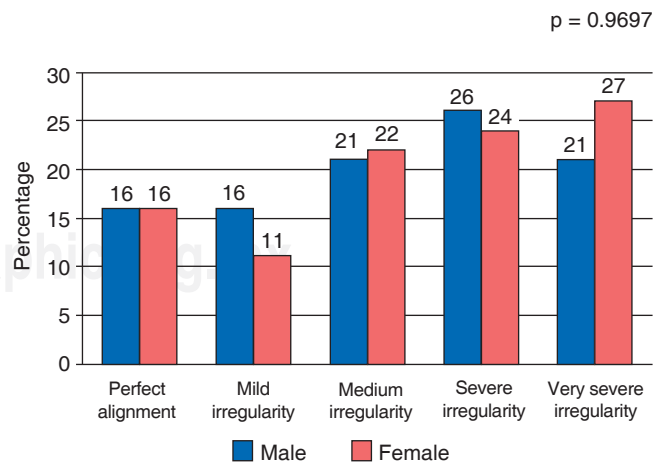
The total study sample were 74 clinical records and diagnostic models; 55 were female, representing 75 per cent and 19 were male, representing a 25% of the sample. With respect to age, 54 patients were found within the range of 15 to 20 years, which represented 73% of the sample; 16 patients were between 21 and 30 years, (22%) and 4 patients were older than 30 years (5%).

The χ^2 test determined that there was no statistically significant difference between late mandibular crowding by gender.

Figure 1 shows the types of dental crowding found in the study sample according to gender using Little's classification. When the χ^2 test was performed, it was determined that there was no statistically significant difference between the type of late mandibular crowding in relation to the gender.

The χ^2 test found a statistically significant difference, which indicates that there is a relationship between the presence of an excess of lower anterior tooth mass and the development of late mandibular crowding (Figure 2).

The χ^2 test revealed that there was no statistically significant difference, which indicates that there is no relationship between mandibular body length and late mandibular crowding (Figure 3).



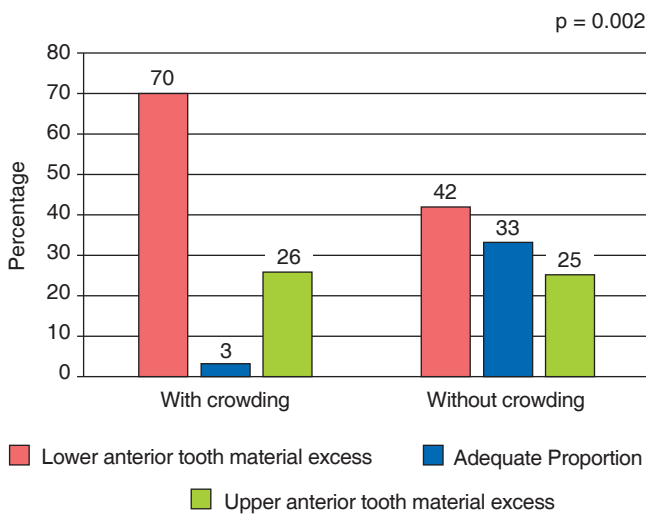
p = χ^2 test.
Direct source.

Figure 1. Crowding types according to gender.

Upon performance of the χ^2 test, it was found no statistically significant difference, which indicates that there is no relationship between the growth pattern and development of late mandibular crowding (Figure 4).

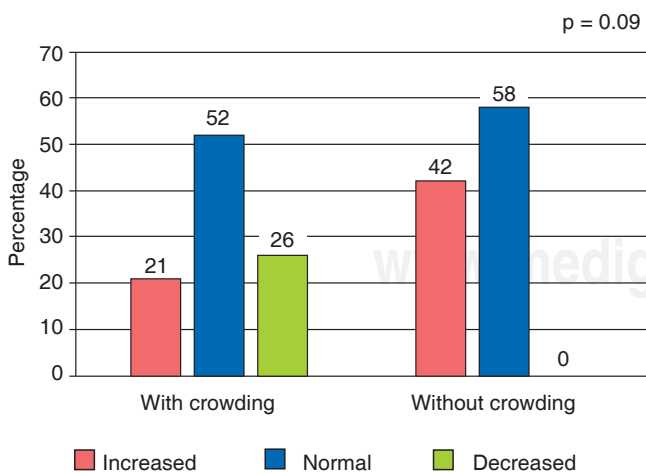
No statistically significant difference was found; there may or may not be lower anterior crowding, regardless of whether or not the third molars are present and their position (Figure 5).

No statistically significant difference was found; there may or may not be lower anterior crowding,



$p = \chi^2$ test.
Direct source.

Figure 2. Dental discrepancy with and without late mandibular crowding.



Direct source.

Figure 3. Mandibular body length and late mandibular crowding.

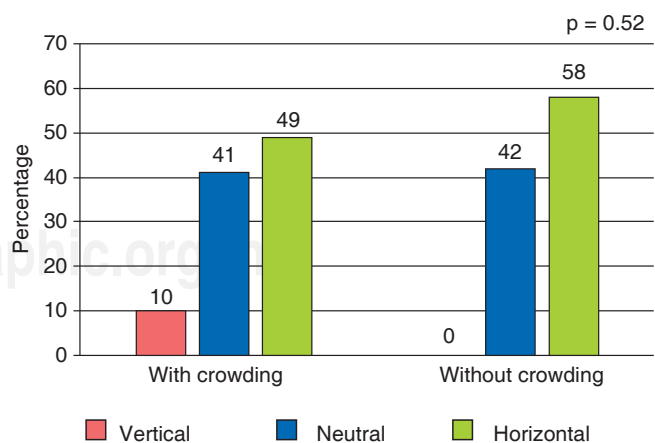
regardless of whether or not the third molars are present and their position (Figure 6).

DISCUSSION

The present study determined that the prevalence of late dental crowding was 83.7% (n 62); the most common crowding types type were severe and very severe, with discrepancies ranging from 7 to 9 mm and 10 mm respectively. Lakhani and collaborators reported a slightly lower prevalence of 61%, but with crowding types with irregularities from 5 to 10 mm; the mean age was 17.5 years.¹⁰ Qutub and collaborators obtained a prevalence of 59.9%, finding milder crowdings that ranged between 3 and 4 mm.¹¹

By studying tooth discrepancy through the Bolton index, it was determined that in patients with and without crowding there is an excess in lower anterior dental mass, which indicates that the dimensions of the lower crowns are larger in relation to the upper. In the group with crowding this was observed in 70% of patients, whereas in the control group it was 43% thus coinciding with Bugaighis and Elorfi, who obtained in their study that the coronary dimensions of mandibular teeth were larger in patients who had dental crowding in comparison with patients with normal occlusion and diastemas.¹² Likewise, Bansal and collaborators found a correlation between the size of teeth and dental crowding: the larger the tooth size, the more severe the malocclusion would be; and the smaller, there would be more diastemas between the teeth.¹³

We found a statistically significant difference that demonstrates the relationship between excess



Direct source.

Figure 4. Growth pattern and late mandibular crowding.

in tooth mass and late mandibular crowding: the larger the mesiodistal dimension of the lower teeth, the greater predisposition to this malocclusion will be. This statement coincides with Santiesteba et al, who demonstrated that as dental crowding gets worse from mild to moderate, the size of the dental mass also increases. When they compared the size of the tooth mass in mild crowding with that present in the moderate and severe forms, they found that statistically they were not equal.¹⁴

With regard to mandibular body length, it was observed that in both groups there is a greater number of patients who have a normal mandibular length, 52% in patients with crowding and 58% in the control group. However, among patients without crowding any presented a decreased mandibular body, the size of their mandibles was in norm or increased. Ijaz and collaborators claim that the length of the basal bone is directly related to the amount of crowding, regardless of the type of malocclusion. In addition to the size of the crowns, mandibular length is a factor that must be considered during the treatment because if a patient has mild to moderate crowding and at the same time it is noted that the crown proportions are large, then it is most likely to follow a treatment with interproximal reduction or expansion. However if the patient presents moderate to severe crowding, and the crown dimensions are adequate, it is likely that this patient needs extractions.¹⁵ On the other hand, Khoja, Fida and Shaik, argue that the increase in crowding severity of the dental arch is weakly associated with the lengths of the mandibular base, but there is a

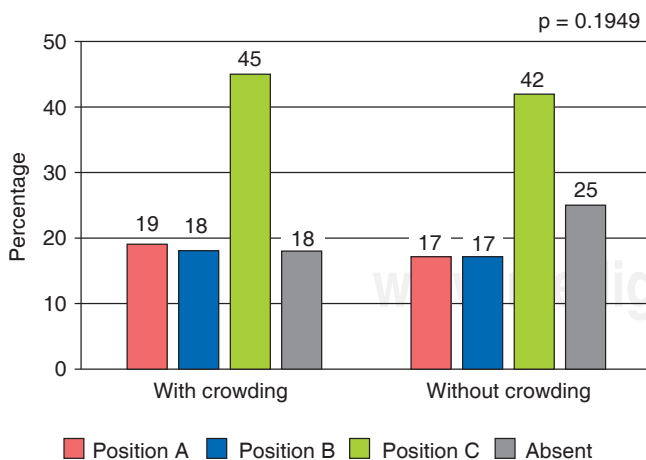
moderate positive correlation between the lengths of the base of the mandible and crowding in this arch.¹⁶

No study was found in the last five years that relates the variables of mandibular growth pattern and lower anterior crowding using the index of irregularity of Little.

As to the position of the left and right third molar, the position that prevailed was located below the crown of the second molar. It was observed that in the control group of the left and right side, the absence of the third molar was greater than in the group with crowding; however the difference was minimal, thus it is safe to say that lower anterior crowding can occur regardless of whether or not lower third molars are present. These results coincide with those of Hasegawa and collaborators, who showed that there was not a close relationship between the position of the third molars and lower anterior crowding as determined by Little's irregularity index. Likewise, Esan and Schepartz, determined that the presence of third molars is not associated with lower anterior crowding, since they had patients with agenesis of this tooth and presented this malocclusion. In against part Cherian and Ravi, were able to demonstrate that the presence of the third molar does have an influence on the development of lower anterior crowding and that the morphological characteristics of the patient were not significant.¹⁷

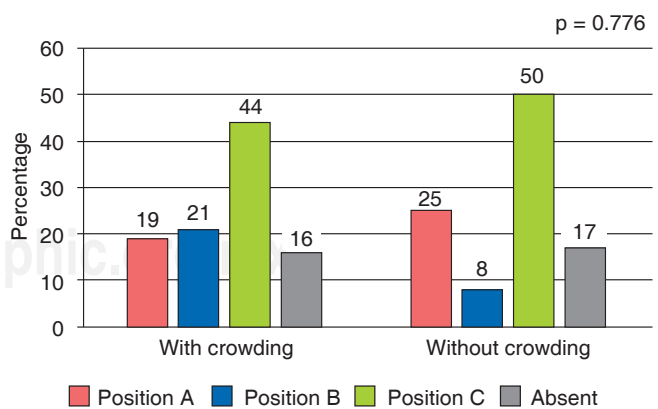
CONCLUSIONS

The development of late mandibular crowding is a consequence of the combination of several factors.



p = χ^2 test.
Direct source.

Figure 5. Presence of right lower third molar and its position in patients in patients with and without crowding.



p = χ^2 test.
Direct source.

Figure 6. Presence of the left lower third molar and its position, in patients with and without crowding.

The knowledge of these factors and the influence of each one of them are necessary because it helps determine the best treatment for the patient. With regard to the influence of the position of the lower third molar it was determined by means of this study that regardless of its presence and position in the mandibular bone, the third molar does not have an influence on dental crowding, as this malocclusion was observed in patients who had this tooth and in patients with agenesis.

The finding of this investigation with respect to the influence of the lower third molar provides a scientific ground regarding the management of these teeth. In spite of the literature that revolves around this theme, it does not clarify the issue of whether or not the third molar should be extracted for being a causal agent of crowding.

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