Evaluation of Impacted Lower Third Molars Using Cone Beam Computed Tomography

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Abstract: The aim of the study was to define the prevalence of impacted lower third molars using cone beam computed tomography and to classify according to Winter, Pell and Gregory and Maglione. The sample consisted of 250 CBCT exams. The evaluation of the selected images was performed using CS 3D imaging software using axial, cross-section and panoramic reconstruction sections. Data collection was performed by filling out the forms containing the classifications of Winter, Pell and Gregory and Maglione. Data analysis was performed through the distribution of frequencies (absolute and relative) associated with the construction of 95% confidence intervals of proportions. Of the 250 tomography exams analyzed, 113 (45.2%) were male and 137 (54.8%) were female. The positions and differences between the most frequent sides according to the Winter, Pell & Gregory and Maglione classification, respectively, were: Mesioangular - 29.8% (95% CI: 25.8% -33.8%), right side (30.4 %), left side (29.2%); Class II - 31.2% (95% CI: 27.1% - 35.3%); position A, right side (30.4%) left side (32.0%); Class 1A - 39.8% (95% CI: 35.5% -44.1%), right side (40.0%), left side (39.6%). Thus, there was a higher prevalence in the mesioangular position according to the Winter classification and, in relation to the Pell and Gregory classification, the class II / A position; while, according to Maglione's classification, the most prevalent position is Class 1A.

Keywords: Cone beam computed tomography, Third molar, Impacted tooth.

1. INTRODUCTION

The eruption of permanent teeth is part of a complex series of genetically controlled events. Through these events, a tooth germ develops and the tooth erupts in the archway in its functional position. During this evolutionary process, numerous occurrences can occur that eventually interfere with tooth eruption, causing inclusion [1].

The name tooth included is given to the dental element that is completely covered by bone and / or mucous tissue, and can be viewed only through auxiliary diagnostic means, such as radiographs or tomographies, regardless of being in a physiological process of eruption or suffering some physical obstruction. to prevent it from breaking out. In the latter case, it is subclassified as impacted. Being a very frequent clinical picture of tooth retention inside the arch [2].

The inadequacy of the length of the dental arch in relation to the space required for the eruption of all teeth is the main cause of dental impaction. This occurs because the eruption is hampered by the adjacent teeth, by a dense bone lining, by excess of overlapping soft tissue or pathological reasons. It can also occur due to the early extraction of deciduous elements, sequelae of carious lesions in deciduous teeth, poor primary position of the dental germ, presence of an obstacle in the path of eruption, ankylosis in the deciduous tooth and changes in the dental follicle [3, 4].

The third molars are, among all teeth, those with the highest frequency of impaction and / or inclusion, reaching values around 90%. In descending order of frequency, impaction is seen as lower premolars, lower canines, upper premolars, upper central incisors, upper lateral incisors and lower second molars. First maxillary molars and second maxillary molars are rarely affected [5].

The presence of the included third molar is frequent in adolescent patients and young adults. Often, dental impaction determines local pain, discomfort or dental malocclusion, which leads patients to seek the Maxillofacial Surgeon for consultation. There is little controversy about the value of removing the included third molars that cause pathological changes or severe symptoms. However, prophylactic removal has been discussed and studied for many years [6, 7].

In order to facilitate the understanding of the different positions in which third molars can arise, several classifications have been presented: Winter (1926), Pell & Gregory (1933), Durbeck (1957), Howe

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(1966), Maglione *et al*. (2015). The most used by professionals for their effectiveness in communicating and describing cases are Winter's and Pell & Gregory's [8-10].

The removal of lower third molars is one of the most constant procedures performed in dental clinics, and it is essential when there is no satisfactory space for the eruption of these dental elements, when they are poorly positioned or when there is a risk of odontogenic cysts or tumors. The appropriate surgical procedure must be determined based on the preoperative findings, exams to assess the morphology of the third molar and its connection with adjacent structures [11].

Although panoramic radiography is highly requested in preoperative evaluations, it may show limitations. Cone beam computed tomography (CBCT) is the test that assists in the diagnosis and surgical procedures when the relationship between the roots of the third molars is in a close relationship with some noble structure. Regarding the lower third molar, its proximity to the mandibular canal is common. This situation is initially analyzed with panoramic radiography and then more accurate on tomographic image. CBCT exams allow a satisfactory evaluation of the three-dimensional anatomical relationships between the third and surrounding molars [11, 12].

However, the TCFC image must be duly justified for each patient and should only be requested when there is the potential to provide new information that may impact management decisions not offered by conventional radiography [13].

Thus, the study aimed to assess the relationship of impacted lower third molars by placing them in categories with respect to the classification of Winter, Pell and Gregory and Maglione, by means of cone beam computed tomography.

2. MATERIALS AND METHODS

The research carried out was an observational, cross-sectional and retrospective study and was submitted to and approved by the CEP of the Federal University of Paraíba \ HU under opinion - nº 3.785.966.

2.1. Determination of the Sample

Initially, tomographic images were selected according to the inclusion and exclusion criteria. The inclusion criteria were: patients aged 21 to 40 years, exams previously requested by professionals for surgical planning of the lower impacted 3rd molars. The exclusion criteria were images with inadequate visualization, exams of patients who had already undergone surgery of the lower 3rd molars, exams of patients who had pathologies that made it difficult to visualize the relationship between the tooth root and the mandibular canal. After applying the criteria, 250 exams were selected and evaluated individually and on the side of the face using the CS 3D imaging software (Carestream Dental, Atlanta, USA).

2.2. Analysis of Positioning of Third Molars

Using axial, cross-section slices and panoramic reconstruction (Figure **1**), generated by manipulating the images in the software used, data were collected by filling out the form according to Winter's classifications (1926) [8] (Figure **2**), Pell & Gregory (1933) [9] (Figure **3**) and Maglione *et al*. (2015) [10] (Figure **4**).

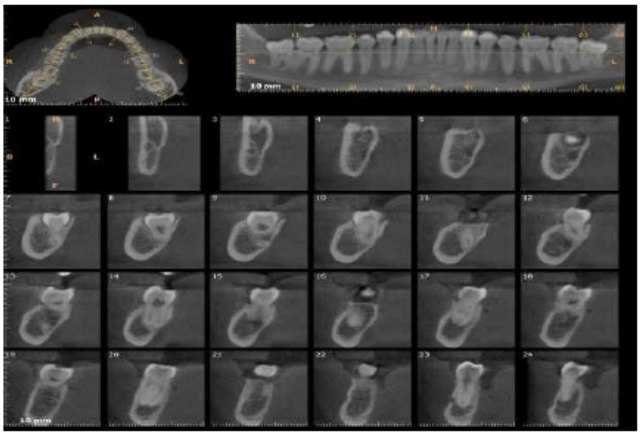

Figure 1: Axial, cross-section and panoramic reconstructions generated by CS 3D software.

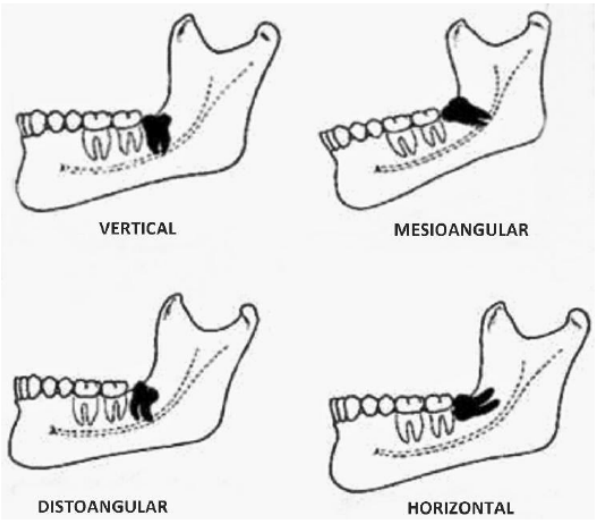

Figure 2: Winter's classification (1926).

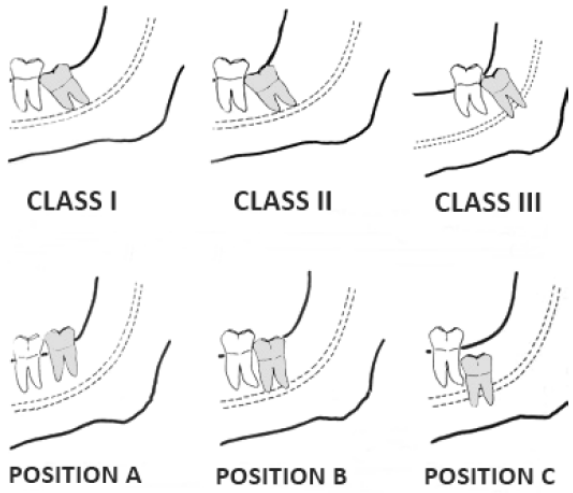

Figure 3: e Pell & Gregory classification (1933).

2.3. Statistical Analysis

After data collection, they were entered and tabulated in the Excel 2010 program and then using the R (R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria) of statistical analysis, in which the frequency distribution (absolute and relative) of the positioning of the teeth was performed according to the classification of Winter, Pell and Gregory and Maglione. 95% confidence intervals of proportions were also constructed.

3. RESULTS

Regarding Winter's classification (1926) [8] (Table **1**), it is noted that the most frequent positions were mesioangular, being found in 29.8% (95% CI: 25.8% -33.8%) of the teeth vertical, found in 25.2% (95% CI: 21.4% -29.0%) of the teeth and horizontal in 23.6% (95% CI: 19.9% -27.3%) of the teeth. Channel relationship was observed in 17.8% (95% CI: 14.4% - 21.2%) of the teeth.

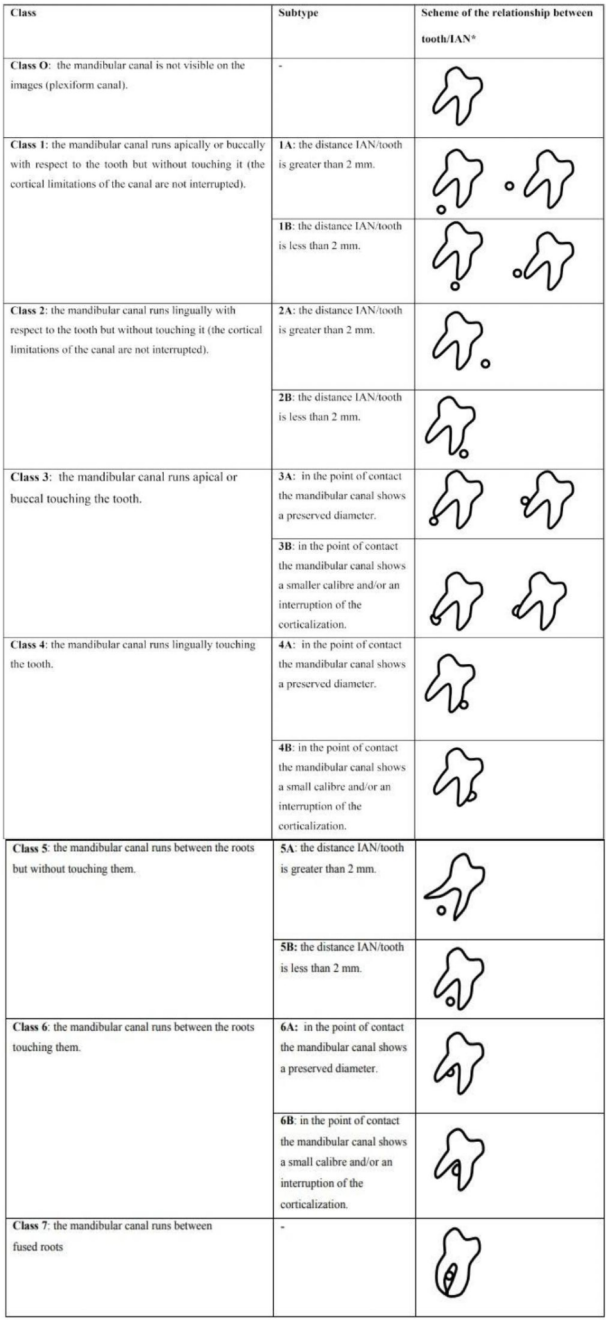

Figure 4: Maglione *et al*. (2015) classification.

Table 1: Frequency Distribution of the Positioning of the Lower Third Molars According to Winter's Classification

Classification	Tooth				Total	
	48 (Right)		38 (Left)			
	Frequency (%)	[1]CI95%	Frequency (%)	CI95%	Frequency (%)	CI95%
Vertical	66 (26,4%)	20,9%-	60 (24,0%)	18,7%-	126 (25,2%)	21,4%-
Mesioangular	76 (30,4%)	24,7%-	73 (29,2%)	23,6%-	149 (29,8%)	25,8%-
Horizontal	55 (22,0%)	16,9%-	63 (25,2%)	19,8%-	118 (23,6%)	19,9%-
Distoangular	9 (3,6%)	1,3%-5,9%	4 (1,6%)	0,0%-3,2%	13 (2,6%)	1,2%-4,0%

[1]95% confidence interval

Table 2: Frequency Distribution of the Positioning of the Lower Third Molars According to Pell and Gregory Classification

Classification	Tooth				Total	
	48 (Right)		38 (Left)			
	Frequency (%)	[1]CI 95%	Frequency (%)	CI 95%	Frequency (%)	CI95%
Class I	58 (23,2%)	18,0%-28,4%	44 (17,6%)	12,9%-22,3%	102 (20,4%)	16,9%-23,9%
Class II	76 (30,4%)	24,7%-	80 (32,0%)	26,2%-	156 (31,2%)	27,1%-
Class III	12 (4,8%)	2,2%-7,4%	11 (4,4%)	1,9%-6,9%	23 (4,6%)	2,8%-6,4%
Position A	61 (24,4%)	19,1%-	45 (18,0%)	13,2%-	106 (21,2%)	17,6%-
Position B	35 (14,4%)	9,7%-18,3%	64 (25,6%)	20,2%-31,0%	99 (19,8%)	16,3%-23,3%
Position C	8 (3,2%)	1,0%-5,4%	6 (2,4%)	0,5%-4,3%	14 (2,8%)	1,4%-4,2%
Total	250 (100,0%)	-	250 (100,0%)	-	500 (100,0%)	-

[1]95% confidence interval

According to the classification by Pell and Gregory (1933) [9] (Table **2**), the most frequent positions were class II, found in 31.2% (95% CI: 27.1% -35.3%), Position A, found in 21.2% (95% CI: 17.6% -24.8%), Class I, found in 20.4% (95% CI: 16.9% -23.9%) and Position B found in 19, 8% (95% CI: 16.3% -23.3%).

Table **3** shows the classification of the position of the lower third molars according to the classification of Maglione *et al*. (2015) [10]. Note that the most frequent position is Class 1 (mandibular canal runs apical or buccal in relation to the tooth, but without touching it, and the cortical limitations of the canal are not interrupted), found in 73.6% (95% CI: 69.7% -77.5%) of the teeth. Still regarding this position, in Class 1A (tooth - canal distance greater than 2 mm) 39.8% (95% CI: 35.5% -44.1%) of teeth were found and in Class 1B (tooth - canal distance) less than 2 mm), 33.8% (95% CI: 29.7% -37.9%) of teeth were found. The class 3 B position (mandibular canal runs apical or vestibular touching the tooth, at the point of contact, the mandibular canal shows a smaller caliber and / or an interruption of corticalization) was found in 11.4% (95% CI: 8.6 % -14.2%) of the teeth.

4. DISCUSSION

As a way to favor surgical planning, some classifications have emerged in the literature for unerupted third molars, allowing the prevention of possible impediments during the operation.

In this study, the classifications of Winter (1926) [8], Pell and Gregory (1933) [9], Maglione *et al*. (2015) [10], respectively: the first classifies the angles of the included element, and the second evaluates, in addition to the depth of inclusion, its relationship with the mandibular branch, while the third classification ranges from class 0 to 7. These categorizations they become a correct elaboration of the surgical intervention, analyzing the degree, being of high, medium and low risk.

Indications for third molar surgeries have numerous complications, in which displacement of the root of the tooth or the tooth itself is one of the most dangerous [14].

With the help of TCFC, a precise relationship can be obtained between the lower alveolar canal and the apexes of the tooth roots, which cannot be done by conventional radiographic methods. [14] Being an indispensable resource for obtaining clear and necessary images for an adequate preoperative evaluation [11].

In this study, an overview was given of the position of the lower third molar and the relationship of intimacy between its apexes and the mandibular canal. In relation to sex, the highest percentage of prevalence was female, corresponding to 54.8% of the 250 exams observed. Similar results were found by Pinto *et al*. (2015) [15].

According to Milloro *et al*. (2016) [16], mesioangular impaction of a third molar is the most common, reaching 45% of impacted mandibular teeth, followed by the vertical position with 40% and horizontal with 10% of cases.

Table 3: Frequency Distribution of the Positioning of the Lower Third Molars According to the Classification of Maglione *et al.* (2015)

Classification	Tooth				Total	
	48 (right)		38 (left)			
	Frequency (%)	[1]CI95%	Frequency (%)	CI95%	Frequency (%)	CI95%
Class 0	0 (0,0%)	-	1 (0,4%)	0,0%-1,2%	1 (0,2%)	0,0%-0,6%
Class 1A	100 (40,0%)	33,9%-46,1%	99 (39,6%)	33,5%-45,7%	199 (39,8%)	35,5%-44,1%
Class 1B	86 (34,4%)	28,5%-40,3%	83 (33,2%)	27,4%-39,0%	169 (33,8%)	29,7%-37,9%
Class 2A	6 (2,4%)	0,5%-4,3%	7 (2,8%)	0,8%-4,8%	13 (2,6%)	1,2%-4,0%
Class 2B	5 (2,0%)	0,3%-3,7%	5 (2,0%)	0,3%-3,7%	10 (2,0%)	0,8%-3,2%
Class 3A	15 (6,0%)	3,1%-8,9%	11 (4,4%)	1,9%-6,9%	26 (5,2%)	3,3%-7,1%
Class 3B	24 (9,6%)	5,9%-13,3%	33 (13,2%)	9,0%-17,4%	57 (11,4%)	8,6%-14,2%
Class 4A	3 (1,2%)	0,0%-2,5%	4 (1,6%)	0,0%-3,2%	7 (1,4%)	0,4%-2,4%
Class 4B	1 (0,4%)	0,0%-1,2%	1 (0,4%)	0,0%-1,2%	2 (0,4%)	0,0%-1,0%
Class 5A	4 (1,6%)	0,0%-3,2%	2 (0,8%)	0,0%-1,9%	6 (1,2%)	0,2%-2,2%
Class 5B	1 (0,4%)	0,0%-1,2%	2 (0,8%)	0,0%-1,9%	3 (0,6%)	0,0%-1,3%
Class 6A	3 (1,2%)	0,0%-2,5%	0 (0,0%)	-	3 (0,6%)	0,0%-1,3%
Class 6B	2 (0,8%)	0,0%-1,9%	2 (0,8%)	0,0%-1,9%	4 (0,8%)	0,0%-1,6%
Class 7	0 (0,0%)	-	0 (0,0%)	-	0 (0,0%)	-
Total	250 (100,0%)	-	250 (100,0%)	-	500 (100,0%)	-

[1]95% confidence interval

In the analyzes made in this study, the mesioangular position presented a greater number of cases when the total of all teeth in the sample was analyzed. However, the differences between the three positions with the highest quantity (mesioangulated, vertical and horizontal) found in this work are close to those mentioned by Milloro *et al*. (2016) [16]. Still, according to these authors, the mesioangular position has a degree of difficulty in its surgical removal, reaching a greater degree of difficulty when associated with other factors such as: tearing of the roots, conical and fused roots.

The classification for the lower third molar recommended by Pell and Gregory (1933) [9] is as follows: class I when it is anterior to the fully ascending mandibular branch, class II when it is partially in the mandibular branch, and class III when it is completely in the business. When considering the position of the lower second molar in relation to the occlusal plane, the classification of the lower third molar is as follows: class A when it is at the level of the occlusal plane of the second molar, class B when it is between the cervical and the occlusal plane of the second molar, class C when presented below the cervical of the second molar [17].

Pinto *et al*. (2015) [15] analyzing 202 patients found the prevalence of female patients compared to male, according to these findings the classification of Pell and Gregory (1933) [9] were in Class II / 27.30%, being the position The most prevalent. Such data are in line with this research, where the prevalence of females was higher than that of males and the most prevalent positions were class II, found in 31.2%, Position A, found in 21.2% Class I, found in 20 , 4%, and Class III (4.6%).

According to Maglione *et al*. (2015) [10], the classification proposed in his study is the first systematic classification that identifies all possible relationships between the third molar and the mandibular canal. In a sample of 130 lower third molars, no cases were found for classifications 0, 2A, 5A, 5B, 7. This finding was expected for classes 0 and 7, considering that the plexiform canal or the fused root around the nerve inferior aveolar (NAI) are very rare situations. Thus, these results corroborate with the present study, which found for the classes: 0 = (0.0%), 2A = (2.6%), 5A = (2.6%), 5B = (0.6 %), 7 = (0.0%), 1A = (39.8%), 1B = (33.8%) 3 B = (11.4%).

Therefore, the current study provides the dental literature with valuable information regarding the need

to perform the CFFC to assist the Dental Surgeon, moving towards better surgical planning of the impacted third molars and consequently a correct assessment in identifying the position of the unit included with the relation of the roots and the inferior alveolar nerve, decreasing the considerable cases of iatrogenic acts.

5. CONCLUSION

According to the analysis of the results obtained in this research, it could be concluded that:

- Winter's most prevalent position was mesioangular;
- The most prevalent Pell and Gregory classification was Class II / A;
- In the Maglione classification, the most prevalent was Class 1A.

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