UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ODONTOLOGIA DE BAURU

DANELIN PEÑA REYES

Third molar comparison in extraction and nonextraction orthodontic cases

Comparação dos terceiros molares em casos tratados com e sem extrações

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Orientador: Prof. Dr. Marcos Roberto de Freitas

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ABSTRACT

ABSTRACT

Third molar comparison in extraction and nonextraction orthodontic cases

Introduction: This study aimed to compare the third molars angulation and eruption status in Class I and II malocclusions in orthodontic treatment with and without first premolar extractions. **Methods:** The sample was comprised by 96 patients divided into four groups: Group 1 Class I malocclusion treated with first premolars extraction; Class I malocclusion treated without extractions; Group 3 Class II malocclusion treated with first premolars extraction; Group 4 Class II malocclusion treated without extractions. Panoramic radiographs were used to evaluate third molars mesiodistal angulations at T1, T2 and at T3. Third molar eruption status was assessed in dental casts. Intergroup angulations and eruption status comparisons were performed using ANCOVA followed by Tukey tests and Kruskal-wallis test, respectively. **Results:** Significantly greater mesial angulation and percentage of erupted right maxillary third molars were found in Class I extraction group. Significantly greater distal angulation and percentage of erupted right mandibular third molars were found in Class II extraction group. **Conclusion:** Class I and II extraction treatment exhibited more favorable angulations and greater number of erupted third molars than nonextraction treatment. Regardless the treatment performed third molars showed a more uprighted position in each malocclusion type.

Keywords: Third molar, Orthodontic treatment, Premolar extraction.

RESUMO

RESUMO

Comparação dos terceiros molares em casos tratados com e sem extrações

Introdução: Este estudo comparou as angulações mesiodistais e o grau de irrompimento dos terceiros molares nas más oclusões de Classe I e II no tratamento ortodôntico com e sem extrações dos primeiros pré-molares. **Métodos:** Foram avaliados 96 pacientes divididos em quatro grupos. Grupo 1, indivíduos com má oclusão de Classe I tratada com extrações dos primeiros pré-molares. Grupo 2, má oclusão de Classe I tratada sem extrações. Grupo 3 indivíduos com má oclusão de Classe II tratada com extração dos primeiros pré-molares. Grupo 4 má oclusão de Classe II tratada sem extrações. As angulações mesiodistais dos terceiros molares foram avaliadas em radiografias panorâmicas e o grau de irrompimento em modelos de estudo. Para comparar as angulações e o grau de irrompimento entre os grupos, utilizou-se o teste ANCOVA seguido do teste Tukey e o teste de Kruskal-wallis, respectivamente. **Resultados:** O grupo 1 apresentou significativamente maior angulação mesial do terceiro molar superior direito assim como uma porcentagem maior de molares irrompidos. O grupo 2 apresentou significativamente maior angulação distal do terceiro molar inferior direito e uma porcentagem maior de molares irrompidos. **Conclusão:** Os tratamentos de Classe I e II com extrações apresentaram angulações mais favoráveis e uma porcentagem maior de terceiros molares irrompidos do que os tratamentos sem extrações. Independentemente do tratamento realizado, os terceiros molares apresentaram uma posição mais vertical.

Palavras-chave: Terceiros Molares, Tratamento Ortodôntico, Extração de Pré-molares.

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1 INTRODUCTION

1 INTRODUCTION

Third molars are the most distally positioned tooth in the maxilla and mandible, as well as, the last tooth to calcify and erupt in the oral cavity, commonly presenting variability of anatomy, formation, development and eruption time.(SAYSEL et al., 2005; ALMPANI; KOLOKITHA, 2015) Therefore, the space available for its eruption would be the remained after the eruption of all the teeth in the dental arches. However, this space would be conditionated to the position and size of the preceding teeth that are already present in the oral cavity. Many authors affirm that the earliest time third molars have been seen in panoramic x-rays has been at its first Nollan stage, at five years old, varying depending on the child's development.(JAFARI et al., 2012; JUNG; CHO, 2014) Nevertheless, its eruption does not occur until the late teens, frequently around twenty years old, and in most cases even later.

As a consequence of the limited space the third molar is the most frequently impacted tooth.(GISAKIS et al., 2011; PEDRO et al., 2014) Consequently, when the space is not enough, eruption delays, ectopic eruption and even tooth impaction can occur. This abnormalities in its eruption can develop in to complications and pathologies, such as pericoronaritis, cyst, infections and second molar root reabsorption,(LIVAS; DELLI, 2017) compromising the mouth integrity. Even tough, the third molar itself is not the etiology of this pathologies, its localization makes it a preponderant factor. Therefore, frequently, the dentist conduct is prevention, deciding a premature extraction of this tooth in order to prevent future outcomings of extraction complications or pathologies.(ALMPANI; KOLOKITHA, 2015; LIVAS; DELLI, 2017) Furthermore, frequent cases of dental agenesis of this tooth have caused a misconception of the tooth importance considering it as useless and worthless, inducing unnecessary prophylactic extractions without a correct evaluation, diagnosis and prognosis of the tooth situation, and its repercussions in the oral cavity.

Authors like Dewey, support that the lack of space for the third molar eruption is a result of important modifications that have happened in the environment where humans develop as well as in their alimentary and daily activities.(DEWEY, 1917) This outcoming is clearly defined by Begg, who affirms that the reason of the space deficiency is due to the absence of interproximal attrition observed in old human

skulls.(BEGG, 1954) Nonetheless, some authors support that there is an influence of the mandibular growth in the third molar impaction, affirming that a more vertical growth pattern would have a greater tendency to impaction, theory later demonstrated by Rickets and Breik et al.(RICKETTS, 1972; BREIK; GRUBOR, 2008) In 1959, Bjork proposed that besides the direction of the condylar growth, the amount of growth and the distal position of the posterior teeth are important factors in the third molar impaction.(BJORK, 1957) Years later, Capelli confirmed Bjork proposal adding the influence of the mesial inclination of the third molar crown as another important factor.(CAPELLI, 1991)

In orthodontics it has been suggested that orthodontic extraction treatment could bring a solution for reducing the third molar impaction, considering the posterior teeth mesial movement frequently performed in this type of mechanics.(FAUBION, 1968) Based on this idea, many authors such as Dierkes studied the feasibility of this theory assessing the space gain in cases treated with first and second premolar extraction, reporting a greater posterior space when compare to an nonextraction group.(DIERKES, 1975) Later, Kaplan, besides the space gain, evaluated the difference in the mandible growth, reporting no significant differences between an extraction and non-extraction group in the mandible growth. However, confirming an augmentation in the posterior space in cases treated with premolar extractions.(KAPLAN, 1975) Richardson corroborates this findings but acknowledging that extraction space would favor the posterior teeth mesial movement in cases with less severe dental crowding.(RICHARDSON, 1989) Some authors coincides with this affirmations, also outlining a mesiodistal angulation change of the third molar crowns.(CELIKOGLU et al., 2010; TURKOZ; ULUSOY, 2013)

In order to assess the maxillary and mandibular third molar changes during orthodontic treatment some authors had measured its mesiodistal angulation before and after treatment.(ELSEY; ROCK, 2000; JAIN; VALIATHAN, 2009; RUSSELL et al., 2013) Staggers *et al*., evaluated the third molar angulation between cases treated with first premolar and second molar extraction treatment using as reference the occlusal plane and the third molar crown long axis in panoramic x-rays.(STAGGERS, 1990) They concluded that even though it was not statistical significant there was an improvement in maxillary third molars mesiodistal angulation in both groups but an unfavorable angulation for the mandible third molars. However, in a later study,

comparing a premolar extraction with a non-extraction group no differences were found.(STAGGERS; GERMANE; FORTSON, 1992) Notwithstanding, Elsey *et al.* have reported an improvement of the third molar position in orthodontic treatment with lower premolar extraction when compared with a non-orthodontically treated control group, using as a reference structure the nasal septum and the hard palate.(ELSEY; ROCK, 2000) Janson *et al.* also reported a decreased of mesiodistal maxillary third molars angulations in Class II malocclusion cases treated with first premolar extractions.(JANSON et al., 2006) Some studies, have reported similar results in skeletal and dental Class I malocclusion,(JAIN; VALIATHAN, 2009; CELIKOGLU et al., 2010) although others did not found third molar angulation changes in the extraction group.(GUNGORMUS, 2002; MICLOTTE et al., 2017)

Even though the existing literature, a systematic review reported that the evidence available is still limited to confirm whether orthodontic treatment with premolar extraction can favors the angulation and subsequent eruption of the third molars, however, it highlights the possibility of a potential benefit.(LIVAS; DELLI, 2017) They emphasize that the limitations to determine the success or otherwise of the treatment have been the lack of accurate description on the compared samples, and the assessing the following third molar eruption and occlusal functionality.

Therefore, based on the need of more scientific evidence on the subject, together with the doubts about the significant improvement and in which cases there could be a better prognosis. The purpose of this study was to compare the third molars angulation and eruption status in Class I and II malocclusions in orthodontic treatment with and without first premolar extractions.

2 ARTICLE

2 ARTICLE

The article presented in this Dissertation was formatted according to the American Journal of Orthodontics and Dentofacial Orthopedics instructions and guidelines for article submission.

THIRD MOLAR COMPARISON IN EXTRACTION AND NONEXTRACTION ORTHODONTIC CASES

ABSTRACT:

Introduction: This study aimed to compare the third molars angulation and eruption status in Class I and II malocclusions in orthodontic treatment with and without first premolar extractions. **Methods:** The sample was comprised by 96 patients divided into four groups: Group 1 Class I malocclusion treated with first premolars extraction; Class I malocclusion treated without extractions; Group 3 Class II malocclusion treated with first premolars extraction; Group 4 Class II malocclusion treated without extractions. Panoramic radiographs were used to evaluate third molars mesiodistal angulations at T1, T2 and at T3. Third molar eruption status was assessed in dental casts. Intergroup angulations and eruption status comparisons were performed using ANCOVA followed by Tukey tests and Kruskal-wallis test, respectively. **Results:** Significantly greater mesial angulation and percentage of erupted right maxillary third molars were found in Class I extraction group. Significantly greater distal angulation and percentage of erupted right mandibular third molars were found in Class II extraction group. **Conclusion:** Class I and II extraction treatment exhibited more favorable angulations and greater number of erupted third molars than nonextraction treatment. Regardless the treatment performed third molars showed a more uprighted position in each malocclusion type.

Keywords: Third molar, orthodontic treatment, premolar extraction.

INTRODUCTION AND STATEMENT OF THE PROBLEM

Third molars are the teeth with the highest rate of impaction, therefore causing various complications frequently found in the dental practice.[1,2] Many factors are involved in its impaction such as morphology, growth, retromolar space, anatomy and position.[3] Numerous of them have been researched, in order to predict its future impaction.[4,5] It has been stablished that some of those factors can be modify in order to enhance the third molar to erupt. Thereupon, it has been suggested that the orthodontic treatment, mainly in extraction therapy, could help to prevent its impaction bringing an extra retromolar space.

Some researchers have proposed that a forward movement of the posterior teeth might improve the third molars position by allowing them to develop further and consequently in more uprighted position.[6] In order to prove or deny the influence of the orthodontic treatment in the third molar eruption, many authors have assessed the third molars before and after treatment. Many of them have compared extraction and no extraction groups assessing the retromolar space gain.[1,7] The results of some of those studies have shown significant gains in the retromolar space, however, that did not significate a posterior eruption.[7,8]

Therefore, some authors have proposed that furthermore than the additional space, significant angulation changes should occur in order to avoid impaction.[9] Recent studies that evaluated third molar angulation changes have shown significant differences in the third molar position especially after the extraction therapy.[3,10] However, some have not found that these changes were enough to avoid impaction, while others do affirm that eruption does occur.[11, 12]

Even though the existing literature, it has reported that the evidence available is still limited to confirm whether orthodontic treatment with premolar extraction can favor the angulation and subsequent eruption of the third molars, however, it highlights the possibility of a potential benefit.[13] Some have emphasize that the limitations to determine the success or otherwise of the treatment have been the lack of accurate description on the compared samples, and the assessing the following third molar eruption.[14,15]

Therefore, based on the need of more scientific evidence on the subject, together with the doubts about the significant improvement and in which cases there

could be a better prognosis. Therefore, the purpose of this study was to compare the third molars angulation and eruption status in Class I and II malocclusions in orthodontic treatment with and without first premolar extractions.

MATERIAL AND METHODS

This project was approved by the Research Ethics Committee of the Bauru Dental School- University of Sao Paulo, Brazil (protocol number 72143817.5.0000.5417 Decision number: 2.235.936).

Sample characteristics

Sample size calculation was performed based on an alpha level of significance of 5% (0.05) and beta test power of 80%. The value for the standard deviation, necessary to perform the sample size calculation, was taken from the article by Jain et al.,[16] considering a deviation of 6 degrees for the third molar angulation variable, and a minimum difference to be found between the groups of 6 degrees, resulting in a minimum sample of 21 participants in each group.

The sample was comprised by 96 patients records with Class I and II malocclusion treated with fixed appliances (standard or preadjusted edgewise mechanotherapy) with moderate anchorage (extraoral headgear in the maxillary teeth in extraction treatments and in Class II nonextraction treatment), with and without first premolar extraction and with unerupted third molars. The records were selected retrospectively from the files of the Orthodontics Department at Bauru Dental School, University of São Paulo, Brazil.

The inclusion criteria for the sample selection were patients with unerupted third molars that could be seen in panoramic radiographs at the initial stage, without dental anomalies of number and form, as well as, the presence of all permanent teeth, excluding the first premolars in the extraction cases. All participants records must had the initial, final and the last follow-up panoramic radiographs and dental casts with the third molar presence in a 1 to 5 years interval after debonding. Patients with erupted third molars at the initial stage, Class III malocclusion, with previous orthodontic treatment or with asymmetrical extractions were not included in the study.

The sample was divided into four groups according to the malocclusion type and the orthodontic treatment performed, with or without first premolar extractions:

Twenty-five records of patients with a Class I malocclusion treated with first premolars extraction comprised the group 1 (13 female and 12 male) with a mean treatment and follow up time of 2.71 years (SD +/- 1.11) and 4.82 years (SD +/- 1.53), respectively. The group exhibited a mean age of 13.44 years (SD +/- 1.35) at the initial stage,16.15 years (SD +/- 1.70) at the final stage of the treatment and 20.67 years (SD +/- 2) at the last follow-up examination.

Group 2 was comprised by 23 records of patients with a with Class I malocclusion treated without extractions (14 female and 9 male) during a mean treatment time of 2.29 years (SD +/- 0.85) and follow-up time of 4.37 years (SD +/- 1.85). Initial stage mean age was 13.36 years (SD +/- 1.35), at the final stage was 15.65 years (SD +/- 1.58) and at the last follow-up examination was 20.03 years (SD +/- 2.37).

Twenty-five Class II malocclusion patients treated with first premolars extractions comprised the group 3 (12 female and 13 male). The group presented a mean treatment time of 2.61 years (SD +/- 0.88) with a mean follow-up time of 4 years (SD +/- 1.67). At the initial stage the group exhibited a mean age of 12.76 years (SD +/- 1.33) a mean age at the final stage of 15.37 years (SD +/- 1.62) and a mean age of 19.38 years (SD +/- 1.86) at the last follow-up examination.

Class II malocclusion patients treated without extractions comprised the group 4 with 23 records in total (11 female and 12 male). The mean treatment time was 2.28 years (SD +/- 0.48) and follow-up time 4.15 years (SD +/- 1.52). The mean age was 12.47 years (SD +/- 1.23) at the initial stage, 14.75 years (SD +/- 1.17) at the final stage and a mean age of 18.90 years (SD +/- 1.85) at the last follow-up examination.

To assess the third molar angulation changes, angular measurements were made in panoramic radiographs at the initial (T1) and final stage (T2) of the treatment, and at the last follow-up with the third molar presence (T3) in an interval of one to five years after debonding. To assess the third molar eruption status dental casts were used at T3.

Methods

Panoramic radiographs

The panoramic radiographs were digitized using Microtek ScanMaker i800 scanner and save in .tif format. Later, they were digitally traced using Dolphing Imaging Software Version 11.5 (Dolphin® Imaging and Management Solutions, Patterson Dental Supply, Inc., Chatsworth, California, USA).

Third molar angulation

Third molars mesiodistal angulations were assessed using angular measurements traced on panoramic radiographs. The nasal septum, anterior nasal spine, hard palate and the maxillary and mandibular third molars were used as the anatomical reference structures. The reference lines were: A) the Midline Reference Plane (MRP), as a vertical line traced outlining the nasal septum and the anterior nasal spine, B) a Horizontal Reference Plane (HRP) build as a perpendicular line to the MRP bilaterally extended through the palatal shadow[16-18] (Fig. 1). Thus, the long axis of the maxillary and mandibular third molars was traced as a line bisecting the middle of the crown and the root furcation. To determine the third molars angulation the outer angles formed between the third molars axis with the HRP were measured (Fig. 1 and 2). Increases of the angular measurements denoted mesial angulations in the maxilla and distal angulations in the mandible. They also indicated a more uprighted position of the third molar.

Third molar eruption

Third molar eruption was assessed in the last follow-up dental casts with the third molars presence. The eruption stage was classified according the third molar clinical crown position, criteria reported by Gungormus.[19] It was classified as unerupted when the clinical crown cannot be seen in the dental casts, partially erupted when the crown is partially visible or erupted when the clinical crown can be fully seen (Fig. 3). Thus, the eruption stages were scored in an ascending scale from one to three, assigning a score one when unerupted, two when partially erupted and three when erupted.

Statistical analysis

Error study

Thirty panoramic radiographs were randomly selected and re-measured at an interval of 30 days from the first measurement by the same examiner (DPR). Random error of the variables was assessed using the formula ($Se^2 = \Sigma (d^2 / 2n)^2$), proposed by Dahlberg,[20] for an average variation between the first and second measurements. To calculate the systematic error dependent t tests were performed at $P < 0.05$.[21] Thirty dental casts were also randomly selected and re-evaluated, after a 30-day interval, to assess the reproducibility of the eruption status evaluation. Then, intraexaminer agreement was calculated with Kappa statistics.[22]

Statistical Analysis

Normal distribution of the variables was assessed with Kolmogorov-Smirnov normality test. Intergroup comparability regarding sex distribution was evaluated with Chi-square test. One-way Analysis of Variance (ANOVA) followed by the Tukey test were used for the intergroup comparability regarding Initial, final and follow-up ages, treatment and follow-up times. Intergroup comparability between each malocclusion type was also assessed regarding sex distribution using Chi-square test, and regarding Initial, final and follow-up ages, treatment and follow-up times using T-test.

Since the groups were not matched for the initial and follow-up ages, intergroup comparisons for the third molars angulations at T1, T2 and T3 were performed using the Analysis of Covariance (ANCOVA) followed by the Tukey test. T-test was also used for the intergroup comparisons for the third molars angulations at T1, T2 and T3 in each malocclusion type.

Descriptive statistics were performed to assess the third molar eruption status score frequency at T3. Intergroup comparisons for the third molar eruption were made with the Kruskal-Wallis test. Mann-Whitney test was also performed for the intergroup comparisons for the third molar eruption in each malocclusion type. All statistical tests were performed with Statistica software (Statistica for Windows, version 7.0, StatSoft Inc., Tulsa, Okla, USA), at $P < 0.05$.

RESULTS

Random errors ranged from 1.92º (right mandibular third molar angulation) to 2.52° (left maxillary third molar angulation) and were within the acceptable limits[23] (Table I). None of the variables showed significant systematic errors. Intraexaminer reproducibility of the eruption status assessment showed almost perfect and substantial agreement between the first and second evaluations (Table I).

Groups were comparable regarding sex distribution, final age, treatment and follow-up times; however, Class I extraction group showed significantly greater initial and follow-up ages than Class II nonextraction group (Table II). Intergroup comparisons in each malocclusion type (Class I and II) showed that the extraction and nonextraction groups were also comparable regarding sex distribution, initial, final and follow-up ages, and treatment and follow-up times (Table III).

Intergroup comparisons in each stage showed a significantly greater angulation of the right maxillary third molar in the Class I extraction group at T2 and T3 when compared to the Cl. II nonextraction group (Table IV).

Intergroup comparison in the Class I malocclusion showed a significantly greater angulation of the right maxillary third molar in the Class I extraction group at T2 and T3 when compared to Class I nonextraction group (Table V). Intergroup comparison in the Class II malocclusion showed a significantly greater angulation of the right mandibular third molar in the Class II extraction group at T3 compared to the Class II nonextraction.

Descriptive statistics for the third molar eruption status score showed a frequency of erupted maxillary third molars of 60% in the Class I extraction group, 54.35% were unerupted in the Class I nonextraction group, and in the Class II extraction and nonextraction groups, 48% and 63.04%, respectively, were unerupted (Table VI).

For the mandibular third molars, the erupted frequency was 50% in the Class I extraction group and 47.83% were unerupted in Class I nonextraction group. In the Class II extraction group 56% were erupted, and 56.52% were unerupted in Class II nonextraction group.

Intergroup third molar eruption status comparisons showed a significantly greater percentage of erupted maxillary third molars in the Class I extraction when compared with the Class II nonextraction group. A significantly greater percentage of erupted right mandibular third molars was also found in the Class I and II extraction groups, compared with the Class II nonextraction group (Table VII).

Intergroup third molar eruption status comparisons in each malocclusion type exhibited a significantly greater percentage of erupted maxillary third molars in the Class I extraction group when compared with the Class I nonextraction group (Table VIII). In addition, a significantly greater percentage of erupted mandibular third molars was found in the Class II extraction group compared with the Class II nonextraction group.

DISCUSSION

Group Comparability

The groups were comparable regarding sex, final stage ages, treatment and follow-up times (Table II). However, significantly greater Initial and follow-up ages were found in the Class I extraction group when compared to the Class II non-extraction group at the initial and follow-up stages. Therefore, to correct any possible effects that this could have in the angulation and eruption status variables, Analysis of Covariance (ANCOVA) was used.

Intergroup comparability was also assessed in each malocclusion type. The Class I extraction and nonextraction group were comparable regarding sex, initial, final and follow-up ages, and treatment and follow up times (Table III). Thus, Class II extraction and nonextraction groups, also were comparable regarding the previous mentioned variables. Since Class I and II malocclusions present different characteristics, the treatment objectives to correct each malocclusion will be different.[8,10]. It has been reported that one the greatest limitation was the heterogenicity of the samples.[14,15,24] Therefore, they were compared separately according each malocclusion type, so the influence of each mechanic could be correctly assessed.

The groups also did not exhibit significant differences for the third molars angulations at T1 (Table IV). Thus, showing comparability of the groups at the initial stage.

Panoramic analysis

Third molar angulation was measured on panoramic radiographs. Most third molar angulation measurements have been made in lateral cephalograms. Though, they can present difficulties, because of the superimposed images, that cause some bias.[12,16] Previous studies have supported the reliability and accuracy of third molar angular measurements made in panoramic radiographs, since they present less angular distortion.[9,17,25] Furthermore, even when changes in the patient head position occurs, angular measurements do not present significant alterations.[26]

Many studies had used the occlusal plane, mandibular plane and second molar longs axis as anatomical references to measure the third molar angulation.[13,27] However, these structures are susceptible to growth and treatment changes.[10,28] In the present study the hard palate and the anterior nasal spine were used as references, since they are stable bone structures which show minimal changes with growing and are not usually affected by the orthodontic treatment.[16,29]

Third molars angulation measurements made at the initial stage could be criticized because of the third molar crown formation, that might not be completed due to the patients mean age. However, it has been reported that based on the dental crown, measurements can be made, even though the root has not completed its development.[23]

Third molar angulation

Third molar mesiodistal angulations were assessed in the maxilla and in the mandible to confirm if the orthodontic treatment has some influence in its position and posterior eruption. The present study showed a more uprighted position for the right maxillary third molars in Class I patients treated with first premolar extraction at T2 and T3, when compared with Class II nonextraction cases (Table IV). Artun et al.[30] also assessed third molar posttreatment angulation, though not differentiating the malocclusion type, finding a more uprighted position of the maxillary third molars in the extraction group agreeing with the current study. The results for the maxillary third molars in this study were as expected, since maxillary posterior teeth are more mesially positioned in Class II patients than in Class I patients.[11] Therefore, in most Class II

cases, a restriction of an anterior movement of the posterior teeth is imperative in order to correct sagittal discrepancies;[31] contrary to Class I treatment where no sagittal correction is needed.[10] Consequently, additional space could be obtain and this might have influenced the third molar angulation.[32]

Mandibular third molar angulation comparisons showed no significant differences, as reported in previous studies.[33] Many studies have also shown that after orthodontic treatment the mandibular third molars exhibit similar angulations in extraction and nonextraction cases.[12] Tarazonda,[32] affirmed that independently of extraction or nonextraction therapy, the third molars angulation will improve over time. The results also contradict previous studies which showed a worsening of the mandibular third molars angulation in nonextraction treatment.[2,34] Therefore, the present study cannot affirm that nonextraction treatment can enhance the third molar impaction.

In order to assess if the results were affected by the malocclusion type, third molar angulation was also compared regarding each malocclusion (Table V). The results showed that in the Class I, only the right maxillary third molar showed a significantly more uprighted position in the extraction group after treatment, when compared with the nonextraction group. The left maxillary third molar also showed a more uprighted position at T2 in the extraction group when compared to the noextraction group, however, these results were not statistically significant. Previous studies coincide with these results, affirming that, in the maxilla, the anterior movement of the posterior teeth might have enhanced the pre-eruptive rotational movements of the third molars.[10] Other important factor that might had influenced the third molars angulation, could have been related to the changes in the tuberosity region, that commonly happens in growing patients.[10] Mandibular third molars showed an improved angulation after treatment in both groups. Similar results have been reported in previous studies.[13,17,27,28]

Class II intergroup comparisons only showed significant differences for the right mandibular third molar, presenting a more uprighted position of this tooth in the extraction group only at T3. This might be explained by a greater retromolar space gain that Class II correction mechanics produced associated with a greater mesial displacement of the mandibular molars to attain a Class I molar relationship.[10,27] Furthermore, some authors have suggested that in the final stages of root formation,

third molar angulation changes can occur.[12] This might explain why significant differences were only reported at T3. Similar results were also found by Uslu-Akçam et al.,[35] where no significant uprighted positions were found for maxillary third molars, in the extraction group, and only the mandibular third molars were significantly more uprighted.

The present study results differ from the findings of a previous study,[23] where significant differences were found for the maxillary third molars angulations between Class II extraction and nonextraction groups. This discrepant result can be explained by the different extraction protocols in each treatment. In the current study extractions of the maxillary and mandibular four first premolars were carried out, while in the other one, only the maxillary premolars were extracted. Then, different amounts of anchorage loss of the maxillary posterior teeth could be found. In addition, the four first premolar extraction protocol requires greater anchorage, because of the posterior segment distalization needed to achieve a Class I molar relationship at the end of treatment.[36]

Erupted third molars

A significantly greater percentage of erupted maxillary third molars were observed in the Class I extraction group when compared with the Class II nonextraction group (Table VII). A greater percentage was also found for the right mandibular third molars in the Class I and II extraction groups when compared with the Class II nonextraction group. These results confirm that the extraction treatment favors the third molars eruption, due to a greater space gain in the retromolar space after the space closuring especially in the maxilla, in Class I, and in the mandible, in Class II treatments.[10,27]

Furthermore, the significantly more uprighted position of the maxillary and right mandibular third molars in the Class I and II extraction group, respectively, previously showed in our results, might have had an important effect in their eruption. Therefore, it can be suggested a cause-effect relationship between the third molars angulation with its posterior eruption. Some authors have even proposed that is the third molars angulation, and not the retromolar space, the leading factor for impaction.[9] Similar results were reported by Kim et al.[1] were more than the 50% of the maxillary and

mandibular third molars were erupted in the extraction group. Contrarily, Gungormus[19] showed that only 15% of the mandibular third molars were erupted in the extraction group and none of them were unerupted in the nonextraction group.

Comparisons according each malocclusion type showed a greater percentage of erupted maxillary third molars in the Class I extraction group when compared with the Class I nonextraction group, which showed a greater percentage of unerupted maxillary third molars (Table VIII). This greater percentage of erupted maxillary third molars in the extraction group might have occurred due to a more uprighted position of the maxillary third molars, as showed above, generating a more favorable position for its eruption. In contrast, no significant differences were found for the erupted mandibular third molars, however a greater percentage of them showed a partially erupted status, in the extraction group, and an unerupted status in the nonextraction group. It might have been due to a smaller uprighted position that unable the third molar eruption. Other factors such as growth, retromolar space and the second molar position might have also influenced its eruption status.[18,37]

The current study findings disagree with previous studies in which only a 24% of the mandibular third molars in the extraction group erupted.[9] This might be due to differences between samples, since they included nongrowing patients. It has been reported that in growing patients the third molar is still developing and pre-eruptive movements can occur, which favor its eruption.[13,16]

A significantly greater percentage of erupted mandibular third molars were found in the Class II extraction group than in the Class II nonextraction group, that in contrast, showed a greater percentage of unerupted third molars (Table VIII). Once more, the groups with the greater percentage of erupted molars where the same ones that presented improved angulations after treatment. Maxillary third molars did not show significant differences between the groups in its eruption status, however, a greater percentage of third molars were unerupted in Class II extraction and nonextraction groups. Nevertheless, a previous study showed a significantly greater percentage of erupted maxillary third in the Class II extraction group.[23] Again, this could be explained by the different extraction protocols and anchorage loss between the extraction patients in each study.[36]

Clinical implications

Evaluation of unerupted third molars position must be an important part of the diagnosis. Factors as its angulation and root development should be taken into account to avoid an overdiagnosis or underdiagnosis of its potential of impaction.[9] Furthermore, the effect of an extraction or nonextraction treatment in the third molars eruption should be considered during treatment planning. In some cases, an extraction treatment could help the third molars eruption, nevertheless, it will depend on other factors to guarantee it.[8] Also, if the root development is not completed an impaction cannot be predicted.[9]

Even though the results of the present study did not show a worsening of the third molar angulation with the nonextraction therapy, it should be considered the frequency of nonerupted third molars in these treatments. Therefore, it is important to remember that a “nonextraction treatment” could be prone to third molar extraction in some cases.

The authors recommend an evaluation of the third molars position before and after the orthodontic treatment and to follow-up its eruption process until the root development is completed. Then, unnecessary extractions or future complications of the third molar can be prevented.

CONCLUSIONS

Based on the results of this study, it could be concluded that:

- Premolars extraction in Class I malocclusion treatment favors maxillary third molars angulation and eruption, showing a frequency of 60% of the maxillary third molars erupted.
- Class II extraction treatment has a positive effect in mandibular third molars angulation and posterior eruption, showing a frequency of 66% of erupted mandibular third molars.
- Less than 32.60% of the third molars erupted in the nonextraction groups.
- Third molars showed a more uprighted position after treatment regardless of the malocclusion type or the extraction protocol.
- The results suggest that third molars angulation can influence its posterior eruption.

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REFERENCES

1. Kim TW, Artun J, Behbehani F, Artese F. Prevalence of third molar impaction in orthodontic patients treated nonextraction and with extraction of 4 premolars. Am J Orthod Dentofacial Orthop 2003;123:138-45.
2. Saysel MY, Meral GD, Kocadereli I, Tasar F. The effects of first premolar extractions on third molar angulations. Angle Orthod 2005;75:719-22.
3. Miclotte A, Grommen B, Cadenas de Llano-Perula M, et al. The effect of first and second premolar extractions on third molars: A retrospective longitudinal study. J Dent 2017;61:55-60.
4. Bjork AJ, E. Palling M. Mandibular growth and third molar impaction. Acta odont scandinav 1957:231-72.
5. Ricketts RM, Turley P, Chaconas S, Schulhof RJ. Third molar enucleation: diagnosis and technique. J Calif Dent Assoc 1976;4:52-7.
6. Tait RV. Mesial Migration and Lower Third Molar Tilt. Br J Orthod 1982;9:41-47.
7. Richardson ME. The effect of mandibular first premolar extraction on third molar space. Angle Orthod 1989;59:291-4.
8. Behbehani F, Artun J, Thalib L. Prediction of mandibular third-molar impaction in adolescent orthodontic patients. Am J Orthod Dentofacial Orthop 2006;130:47-55.
9. Turkoz C, Ulusoy C. Effect of premolar extraction on mandibular third molar impaction in young adults. Angle Orthod 2013;83:572-7.
10. Gohilot A, Pradhan T, Keluskar KM. Effects of first premolar extraction on maxillary and mandibular third molar angulation after orthodontic therapy. J Oral Biol Craniofac Res 2012;2:97-104.
11. Staggers JA, Germane N, Fortson WM. A comparison of the effects of first premolar extractions on third molar angulation. Angle Orthod 1992;62:135-8.
12. Artun J, Thalib L, Little RM. Third molar angulation during and after treatment of adolescent orthodontic patients. Eur J Orthod 2005;27:590-6.

13. Durgesh BH, Gowda KH, AlShahrani OA, et al. Influence of premolar extraction or non-extraction orthodontic therapy on the angular changes of mandibular third molars. Saudi J Biol Sci 2016;23:736-40.
14. Livas C, Delli K. Does Orthodontic Extraction Treatment Improve the Angular Position of Third Molars? A Systematic Review. J Oral Maxillofac Surg 2017;75:475-83.
15. Brezulier D, Fau V, Sorel O. Influence of orthodontic premolar extraction therapy on the eruption of the third molars: A systematic review of the literature. J Am Dent Assoc 2017;148:903-12.
16. Jain S, Valiathan A. Influence of first premolar extraction on mandibular third molar angulation. Angle Orthod 2009;79:1143-8.
17. Elsey MJ, Rock WP. Influence of orthodontic treatment on development of third molars. Br J Oral Maxillofac Surg 2000;38:350-3.
18. You TM, Ban BH, Jeong JS, et al. Effect of premolar extraction and presence of the lower third molar on lower second molar angulation in orthodontic treatment. Oral Surg Oral Med Oral Pathol Oral Radiol 2014;118:278-83.
19. Gungormus M. Pathologic status and changes in mandibular third molar position during orthodontic treatment. J Contemp Dent Pract 2002;3:11-22.
20. Dahlberg G. Statistical methods for medical and biological students. Statistical Methods for Medical and Biological Students. 1940.
21. Houston W. The analysis of errors in orthodontic measurements. Am J Orthod 1983;83:382-90.
22. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159-74.
23. Janson G, Putrick LM, Henriques JF, de Freitas MR, Henriques RP. Maxillary third molar position in Class II malocclusions: the effect of treatment with and without maxillary premolar extractions. Eur J Orthod 2006;28:573-9.
24. Almpani K, Kolokitha OE. Role of third molars in orthodontics. World J Clin Cases 2015;3:132-40.
25. Stramotas S, Geenty JP, Darendeliler MA, et al. The reliability of crown-root ratio, linear and angular measurements on panoramic radiographs. Clin Orthod Res 2000;3:182-91.

26. Nikneshan S, Sharafi M, Emadi N. Evaluation of the accuracy of linear and angular measurements on panoramic radiographs taken at different positions. Imaging Sci Dent 2013;43:191-6.
27. Mihai AM, Lulache IR, Grigore R, et al. Positional changes of the third molar in orthodontically treated patients. J Med Life 2013;6:171-5.
28. Celikoglu M, Kamak H, Akkast I, Oktay H. Effects of orthodontic treatment and premolar extractions on the mandibular third molars. Aust Orthod J 2010;26:160-4.
29. Nanda RS. Reappraising "Wits". Am J Orthod Dentofacial Orthop 2004;125:18A.
30. Artun J, Behbehani F, Thalib L. Prediction of maxillary third molar impaction in adolescent orthodontic patients. Angle Orthod 2005;75:904-11.
31. Miclotte A, Grommen B, Lauwereins S, et al. The effect of headgear on upper third molars: a retrospective longitudinal study. Eur J Orthod 2017;39:426-32.
32. Tarazona B, Paredes V, Llamas JM, Cibrian R, Gandia JL. Influence of first and second premolar extraction or non-extraction treatments on mandibular third molar angulation and position. A comparative study. Med Oral Patol Oral Cir Bucal 2010;15:e760-6.
33. Dierkes DD. An investigation of the mandibular third molars in orthodontic cases. Angle Orthod 1975;45:207-12.
34. Staggers JA. A comparison of results of second molar and first premolar extraction treatment. Am J Orthod Dentofacial Orthop 1990;98:430-6.
35. Uslu-Akçam ÖG, H. A study to evaluate the changes in 3rd molar angulation with extraction of four premolars in class II malocclusion therapy. J Orofac Sci 2015;7:113-18.
36. Janson G, Brambilla Ada C, Henriques JF, de Freitas MR, Neves LS. Class II treatment success rate in 2- and 4-premolar extraction protocols. Am J Orthod Dentofacial Orthop 2004;125:472-9.
37. Ledyard BC. A study of the mandibular third molar area. American Journal of Orthodondics 1959;39:366-73.
38. Yadav SS, Sonkurla S. Sarjeev's supernumerary tooth notation system: a universally compatible add-on to the Two-Digit system. Indian J Dent Res 2013;24:395-6.

FIGURE LEGENDS

Fig.1 Third molar angulation measurements. A) Horizontal Reference Plane (HRP), B) HRP and right maxillary third molar long axis angle C) HRP and left maxillary third molar long axis angle**.**

Fig. 2 A) HRP and right mandibular third molar long axis angle and B) HRP and left mandibular third molar long axis angle

Fig. 3 Eruption status score: 1- unerupted, 2- partially erupted and 3- erupted

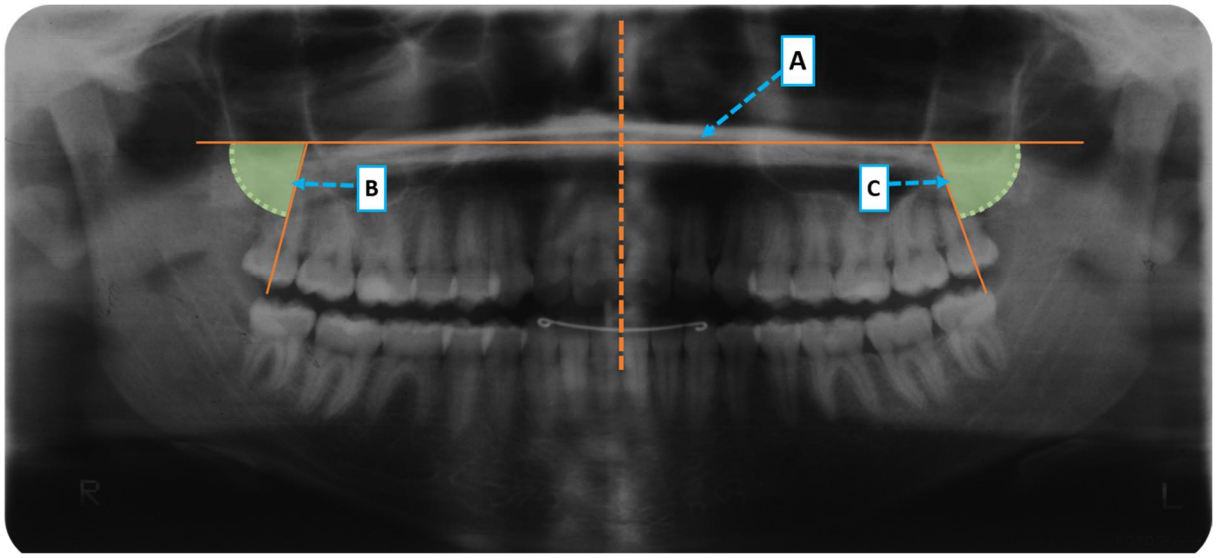

Fig. 1

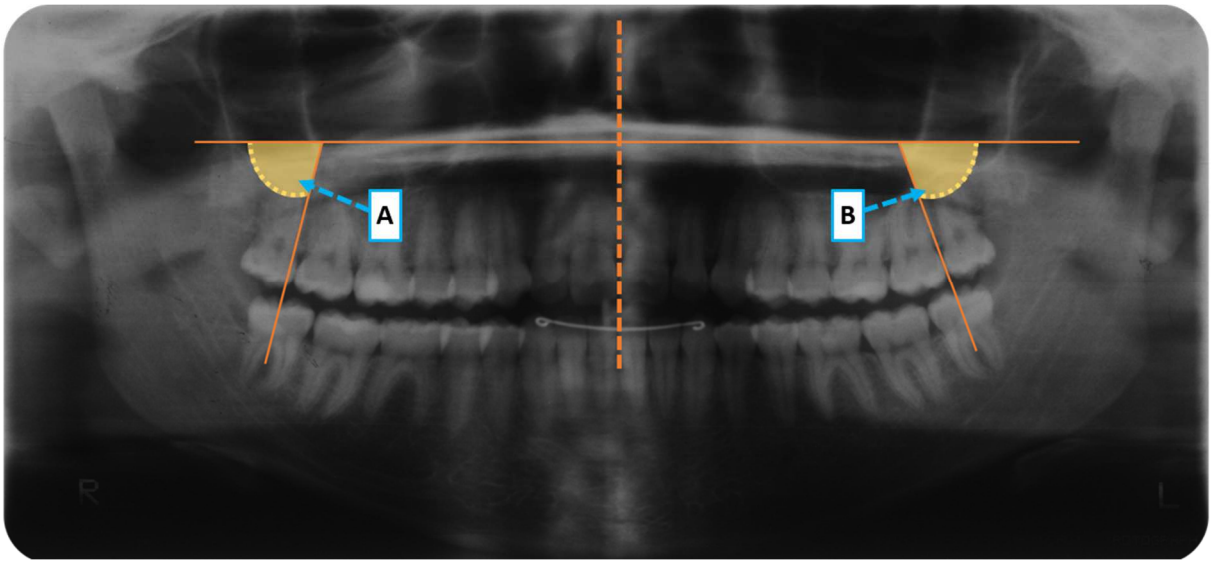

Fig. 2

Fig. 3

Table I. Results of the random and systematic errors for third molar angulations (Dahlberg's formula and dependent t tests, respectively) and intraexaminer agreement for the eruption status (Kappa statistics) (N=30).

ANGULATIONS

Variable†	1st Measurement		2nd Measurement			
	Mean	S.D.	Mean	S.D.	Dalhberg	P
18	55.97	15.21	57	16.46	2.45	0.057
28	53.95	14.33	53.86	13.99	2.52	0.870
38	43.90	14.34	43.46	15.64	1.97	0.324
48	42.68	15.66	43.24	16.12	1.92	0.185

ERUPTION STATUS

Tooth number	Kappa	Observed Agreement (%)	Strength of agreement*
18	1.00	100	Almost Perfect
28	0.68	80	Substantial
38	0.80	86.67	Substantial
48	0.84	90	Almost Perfect

†International Numbering System.[38]

*According to the classification suggested by Landis and Koch[22] for kappa test results.

Table II. Intergroup comparison of sex distribution, initial and final ages, treatment and follow up times. (Chi-square and one-way ANOVA tests).

Variables	Group 1 Class I Ex N =25	Group 2 Class I Non-Ex N =23	Group 3 Class II Ex N =25	Group 4 Class II Non-Ex N =23	P
Sex	n (%)	n (%)	n (%)	n (%)	
Female	13 (52.00)	14 (60.87)	12 (52.00)	11 (47.17)	0.839†
Male	12 (48.00)	9 (39.13)	13 (48.00)	12 (52.83)	
	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)	
Initial age	13.44 (1.35)^{A}	13.36 (1.35)^{AB}	12.76 (1.33)^{AB}	12.47 (1.23)^{B}	0.036††*
Final Age	16.15 (1.70)	15.65 (1.58)	15.37 (1.62)	14.75 (1.17)	0.962††
Follow-up age	20.67 (2.00)^{A}	20.03 (2.37)^{AB}	19.38 (1.86)^{AB}	18.90 (1.85)^{B}	0.020††*
Treatment time	2.71 (1.11)	2.29 (0.85)	2.61(0.88)	2.28 (0.48)	0.206††
Follow-up time	4.82 (1.53)	4.37 (1.85)	4.00 (1.67)	4.15 (1.52)	0.696††

† Chi-square test.
†† One-way ANOVA.
* Statistically significant at $P<0.05$.

Different letters in a row indicate the presence of a statistically significant difference among the groups, indicated by the Tukey test.

Table III. Intergroup comparisons of sex distribution, initial, final and follow up ages, treatment and follow up times in each malocclusion type (Chi-square test and T-test)

Variables	Class I			Class II		
	Ex N =25	Non-Ex N =23		Ex N=25	Non-Ex N =23	
Sex	n (%)	n (%)	P	n (%)	n (%)	P
Female	13 (52.00)	14 (60.87)	0.537[a]	12 (52.00)	11 (47.17)	0.773[a]
Male	12 (48.00)	9 (39.13)		13 (48.00)	12 (52.83)	
	Mean (S.D.)	Mean (S.D.)		Mean (S.D.)	Mean (S.D.)	
Initial age	13.44 (1.35)	13.36 (1.35)	0.998[b]	12.76 (1.33)	12.47 (1.23)	0.710[b]
Final age	16.15 (1.70)	15.65 (1.58)	0.304[b]	15.37 (1.62)	14.75 (1.17)	0.136[b]
Follow-up Age	20.97 (2.00)	20.03 (2.37)	0.402[b]	19.38 (1.86)	18.90 (1.85)	0.924[b]
Treatment Time	2.71 (1.11)	2.29 (0.85)	0.216[b]	2.61(0.88)	2.28 (0.48)	0.005[b]
Follow-up Time	4.82 (1.53)	4.38 (1.85)	0.365[b]	4.01 (1.67)	4.15 (1.52)	0.924[b]

[a] Chi-square test.
[b] T-test

Table IV. Intergroup comparisons for the third molars angulations at T1, T2 and T3 (ANCOVA).

ANGULATION COMPARISONS						
Variables	Stage	Class I Ex	Class I Non-Ex	Class II Ex	Class II Non-Ex	P
		MEAN (S.D.)	MEAN (S.D.)	MEAN (S.D.)	MEAN (S.D.)	
18	T1	55.91 (15.10)	53.72 (16.53)	49.75 (14.04)	51.75 (11.13)	0.645
	T2	65.63 (15.50)^{A}	56.94 (13.34)^{AB}	56.72 (13.15)^{AB}	51.79 (15.04)^{B}	0.035*
	T3	69.19 (13.33)^{A}	58.96 (10.59)^{AB}	59.87 (14.29)^{AB}	58.78 (19.37)^{B}	0.033*
28	T1	48.39 (11.90)	48.35 (15.70)	44.14 (12.16)	50.91 (13.94)	0.320
	T2	61.89 (16.97)	52.91 (13.96)	54.70 (14.27)	49.90 (13.76)	0.101
	T3	64.09 (17.42)	56.75 (13.89)	59.62 (15.15)	56.09 (16.87)	0.277
38	T1	36.46 (8.94)	37.36 (8.22)	36.88 (10.05)	38.11 (11.93)	0.906
	T2	42.06 (12.63)	41.68 (14.00)	35.59 (13.26)	39.93 (10.24)	0.433
	T3	42.82 (22.55)	49.71 (23.10)	51.22 (21.75)	39.62 (20.28)	0.382
48	T1	39.70 (9.81)	38.67 (8.08)	35.64 (12.18)	36.04 (10.39)	0.888
	T2	44.34 (13.80)	39.85 (12.84)	40.62 (12.47)	37.05 (9.64)	0.637
	T3	45.44 (0.70)	45.97 (25.54)	55.98 (17.73)	44.63 (23.06)	0.068

* Statistically significant at $P<0.05$

Different letters in a row indicate the presence of a statistically significant difference among the groups, indicated by the Tukey test.

Table V. Intergroup comparisons for the third molars angulations in each malocclusion type at T1, T2 and T3 (T-test).

CLASS I ANGULATIONS				
Variables	Stage	Class I Ex	Class I Non-Ex	P
		MEAN (S.D.)	MEAN (S.D.)	
18	T1	55.91 (15.10)	53.72 (16.53)	0.634
	T2	65.63 (15.50)	56.94 (13.34)	0.044*
	T3	69.19 (13.33)	58.96 (10.59)	0.005*
28	T1	48.39 (11.90)	48.35 (15.70)	0.993
	T2	61.89 (16.97)	52.91 (13.96)	0.052
	T3	64.09 (17.42)	56.75 (13.89)	0.115
38	T1	36.46 (8.94)	37.36 (8.22)	0.718
	T2	42.06 (12.63)	41.68 (14.00)	0.922
	T3	42.82 (22.55)	49.71 (23.10)	0.300
48	T1	39.70 (9.81)	38.67 (8.08)	0.694
	T2	44.34 (13.80)	39.85 (12.84)	0.250
	T3	45.44 (0.70)	45.97 (25.54)	0.934
CLASS II ANGULATIONS				
Variable	Stage	Class II Ex	Class II Non-Ex	P
		MEAN (S.D.)	MEAN (S.D.)	
18	T1	49.75 (14.04)	51.75 (11.13)	0.589
	T2	56.72 (13.15)	51.79 (15.04)	0.232
	T3	59.87 (14.29)	58.78 (19.37)	0.825
28	T1	44.14 (12.16)	50.91 (13.94)	0.079
	T2	54.70 (14.27)	49.90 (13.76)	0.243
	T3	59.62 (15.15)	56.09 (16.87)	0.449
38	T1	36.88 (10.05)	38.11 (11.93)	0.700
	T2	35.59 (13.26)	39.93 (10.24)	0.213
	T3	51.22 (21.75)	39.62 (20.28)	0.286
48	T1	35.64 (12.18)	36.04 (10.39)	0.905
	T2	40.62 (12.47)	37.05 (9.64)	0.276
	T3	55.98 (17.73)	44.63 (23.06)	0.008*

* Statistically significant at $P<0.05$

Table VI. Descriptive statistics of the eruption status of the maxillary and mandibular third molars at T3.

ERUPTION STATUS						
Third molars	Score	Class I Ex N = 25	Class I Non-ex N = 23	Class II Ex N = 25	Class II Non-ex N = 23	Total
		N (%)	N (%)	N (%)	N (%)	
Maxillary	1	10 (20)	25 (54.35)	24 (48)	29 (63.04)	88
	2	10 (20)	8 (17.3)	11 (22)	9 (19.57)	38
	3	30 (60)	13 (28.26)	15 (30)	8 (17.39)	66
Mandibular	1	13 (26)	22 (47.83)	13 (26)	26 (56.52)	74
	2	12 (24)	9 (19.57)	9 (18)	7 (15.22)	37
	3	25 (50)	15 (32.60)	28 (56)	13 (28.26)	81
Total number of teeth		100	92	100	92	384
Total number of patients (N = 96)		25	23	25	23	96

Eruption score: (1) unerupted, (2) partially erupted, (3) erupted.

Table VII. Intergroup eruption status comparisons (Kruskal-Wallis).

		ERUPTION STATUS				
Tooth Number	Score	Class I Ex (N = 25)	Class I Non-Ex (N=23)	Class II Ex (N=25)	Class II Non-Ex (N=23)	P
		N (%)	N (%)	N (%)	N (%)	
18	1	5 (20)^{A}	13 (56.52)^{AB}	12 (48)^{AB}	15 (65.22)^{B}	0.006*
	2	6 (24)^{A}	4 (17.39)^{AB}	6 (24)^{AB}	4 (17.39)^{B}	
	3	14 (56)^{A}	6 (26.09)^{AB}	7 (28)^{AB}	4 (17.39)^{B}	
28	1	5 (20)^{A}	12 (52.17)^{AB}	12 (48)^{AB}	14 (60.87)^{B}	0.006*
	2	4 (16)^{A}	4 (17.39)^{AB}	5 (20)^{AB}	5 (21.74)^{B}	
	3	16 (64)^{A}	7 (30.43)^{AB}	8 (32)^{AB}	4 (17.39)^{B}	
38	1	7 (28)	11 (47.83)	6 (24)	13 (56.52)	0.146
	2	8 (32)	4 (17.39)	6 (24)	3 (13.04)	
	3	10 (40)	8 (34.78)	13 (52)	7 (30.43)	
48	1	6 (24)^{A}	11 (47.82)^{AB}	7 (28)^{A}	13 (56.52)^{B}	0.019*
	2	4 (16)^{A}	5 (21.74)^{AB}	3 (10)^{A}	4 (17.39)^{B}	
	3	15 (60)^{A}	7 (30.43)^{AB}	15 (60)^{A}	6 (26.09)^{B}	

Eruption score: (1) unerupted, (2) partially erupted, (3) erupted.

* Statistically significant at $P<0.05$

Different letters in a row indicate the presence of a statistically significant difference among the groups.

Table VIII. Intergroup comparisons of the eruption status in each malocclusion type (Mann-Whitney).

CLASS I ERUPTION STATUS				
Tooth Number	Score	Class I Ex (N = 25)	Classe I Non-ex (N=23)	P
		N (%)	N (%)	
18	1	5 (20)	13 (56.52)	0.011*
	2	6 (24)	4 (17.39)	
	3	14 (56)	6 (26.09)	
28	1	5 (20)	12 (52.17)	0.023*
	2	4 (16)	4 (17.39)	
	3	16 (64)	7 (30.43)	
38	1	7 (28)	11 (47.83)	0.358
	2	8 (32)	4 (17.39)	
	3	10 (40)	8 (34.78)	
48	1	6 (24)	11 (47.82)	0.057
	2	4 (16)	5 (21.74)	
	3	15 (60)	7 (30.43)	
CLASS II ERUPTION STATUS				
Tooth number	Score	Class II Ex (N=25)	Class II Non-ex (N=23)	P
		N (%)	N (%)	
18	1	12 (48)	15 (65.22)	0.295
	2	6 (24)	4 (17.39)	
	3	7 (28)	4 (17.39)	
28	1	12 (48)	14 (60.87)	0.335
	2	5 (20)	5 (21.74)	
	3	8 (32)	4 (17.39)	
38	1	6 (24)	13 (56.52)	0.041*
	2	6 (24)	3 (13.04)	
	3	13 (52)	7 (30.43)	
48	1	7 (28)	13 (56.52)	0.033*
	2	3 (10)	4 (17.39)	
	3	15 (60)	6 (26.09)	

Eruption score: (1) unerupted, (2) partially erupted, (3) erupted.

* Statistically significant at $P<0.05$

3 DISCUSSION

3 DISCUSSION

Third molars have been vastly studied in the literature. The main topics researched in the orthodontic field have been its influence on the anterior inferior crowding and the influence of the orthodontic treatment in this eruption or impaction.(JAIN; VALIATHAN, 2009; MICLOTTE et al., 2017) The last one, has been evaluated parting form the idea that extraction treatments can afford and extra retromolar space that can prevent the third molars impactions.(TAIT, 1982) However, most of those studies did not showed homogenic samples regarding the malocclusion type or did not presented important facts such as the third molar subsequent eruption.(BREZULIER; FAU; SOREL, 2017; LIVAS; DELLI, 2017) Therefore, the present study main goal was to clarify what happened in those cases treated with and without extractions and stablish the different outcomes between them.

Patients with erupted third molars were excluded from the sample because the main objective of this study was to evaluate the improvement of the third molar angulation and to assess whether it would erupt or not with the orthodontic treatment. If the third molar was already erupted, comparisons would have been difficult, since generally when a third molar is an unfavorable position or impacted frequently an extraction is performed. Furthermore, comparability of the sample was needed as well as similar angulations at the initial stage, therefore, that would have been impossible to accomplish. Also, the eruption stage assessment could not be made if the third molar was already erupted at T1. In the existing literature, most study samples in this topic were comprised by growing patients with unerupted third molars as the current one.(ELSEY; ROCK, 2000; KIM et al., 2003; BEHBEHANI; ARTUN; THALIB, 2006; GOHILOT; PRADHAN; KELUSKAR, 2012; DURGESH et al., 2016)

Panoramic radiographs and dental casts were used to assess the third molars angulations and eruption stage, respectively. In previous studies lateral cephalograms have been used as well as panoramic radiographs.(ELSEY; ROCK, 2000; ARTUN; THALIB; LITTLE, 2005; BEHBEHANI; ARTUN; THALIB, 2006; JANSON et al., 2006) The current methodology were panoramic radiographs since they present less distortion and bias.(LEDYARD, 1959) Would have been ideal a clinical assessment of the third molars eruption stage, instead of using dental casts. However, it could not be

possible since the retrospect nature of the study. Many of the patients would have been difficult to contact and in many cases, some patients would have presented some dental absences that would have excluded them from the sample.

The results of this study exhibited that all variables showed an increase of the third molar angular measurements after the orthodontic treatment. Therefore, demonstrating that regardless the treatment performed in each malocclusion type third molars tend to accomplish a more uprighted position. Many studies corroborates our findings.(STAGGERS; GERMANE; FORTSON, 1992; DURGESH et al., 2016) This can be explained by the young age presented by the patients of this study, therefore, it could have been possible that third molars did not exhibited a full apical closure when the treatment was performed. It has been stablished that pre-eruptive changes of angulation can occur when the third molars bud is developing,(JAIN; VALIATHAN, 2009; DURGESH et al., 2016) this might be an important factor that influenced an increase of the third molars angulations. Other factors might have influenced these results as the growth rate, reabsorption at the anterior border of the ramus, mesiodistal width of the teeth and third molar morphology, that have also been said important.(BJORK, 1957; TURKOZ; ULUSOY, 2013)

The type of mechanics performed in each malocclusion also prove to be an important factor to determine which teeth will erupt.(BREZULIER; FAU; SOREL, 2017) In extraction treatment the gain of space, when space closuring is performed, might be conditionate by molar relationship discrepancy correction, requiring more mesial displacement of the posterior teeth of one of the arches than the other.(ELSEY; ROCK, 2000; KIM et al., 2003) This can be observed in the teeth that presented significant more uprighted positions in the current study results. Also, this space gain could be modified by the malocclusion severity and the dental crowding, diminishing the quantity of space gained for the retromolar space.(KIM et al., 2003)

The limitations of this study were its retrospective nature which might have caused some selection bias. Therefore, prospective studies with more control of the variables involved would generate more conclusive results.

4 CONCLUSION

4 CONCLUSION

Based on the results of this study, it could be concluded that:

- Premolars extraction in Class I malocclusion treatment favors maxillary third molars angulation and eruption, showing a frequency of 60% of the maxillary third molars erupted.
- Class II extraction treatment has a positive effect in mandibular third molars angulation and posterior eruption, showing a frequency of 66% of erupted mandibular third molars.
- Less than 32.60% of the third molars erupted in the nonextraction groups.
- Third molars showed a more uprighted position after treatment regardless of the malocclusion type or the extraction protocol.
- The results suggest that third molars angulation can influence its posterior eruption.

REFERENCES

REFERENCES

Almpani K, Kolokitha OE. Role of third molars in orthodontics. World J Clin cases. 2015 Feb 16;3(2):132-40.

Artun J, Thalib L, Little RM. Third molar angulation during and after treatment of adolescent orthodontic patients. Eur J Orthod. 2005 Dec;27(6):590-6.

Begg P. Stone Age man's dentition. Am J Orthod Dentofac Orthop. 1954;40:298-312.

Behbehani F, Artun J, Thalib L. Prediction of mandibular third-molar impaction in adolescent orthodontic patients. Am J Orthod Dentofac Orthop. 2006 Jul;130(1):47-55.

Bjork AJ, E. Palling M. Mandibular growth and third molar impaction. Acta odont scandinav. 1957;14:231-72.

Breik O, Grubor D. The incidence of mandibular third molar impactions in different skeletal face types. Aust Dent J. 2008 Dec;53(4):320-4.

Brezulier D, Fau V, Sorel O. Influence of orthodontic premolar extraction therapy on the eruption of the third molars: A systematic review of the literature. J Am Dent Assoc. 2017 Dec;148(12):903-12.

Capelli J, Jr. Mandibular growth and third molar impaction in extraction cases. Angle Orthod. 1991 Fall;61(3):223-9.

Celikoglu M, Kamak H, Akkast I, Oktay H. Effects of orthodontic treatment and premolar extractions on the mandibular third molars. Aust Orthod J. 2010 Nov;26(2):160-4.

Dewey M. Third molars in relation to malocclusion. Int J Orthod c. 1917;3:529-33.

Dierkes DD. An investigation of the mandibular third molars in orthodontic cases. Angle Orthod. 1975 Jul;45(3):207-12.

Durgesh BH, Gowda KH, AlShahrani OA, Almalki AD, Almalki WD, Balharith MM, et al. Influence of premolar extraction or non-extraction orthodontic therapy on the angular changes of mandibular third molars. Saudi J Biol Sci. 2016 Nov;23(6):736-40.

Elsey MJ, Rock WP. Influence of orthodontic treatment on development of third molars. Br J Oral Maxillofac Surg. 2000 Aug;38(4):350-3.

Faubion BH. effects of extraction of premolars on erruption of mandibular third molars. J Am Dent A. 1968;76:316-20.

Gisakis IG, Palamidakis FD, Farmakis ET, Kamberos G, Kamberos S. Prevalence of impacted teeth in a Greek population. J Investig Clin Dent. 2011 May;2(2):102-9.

Gohilot A, Pradhan T, Keluskar KM. Effects of first premolar extraction on maxillary and mandibular third molar angulation after orthodontic therapy. J Oral Biol Craniofac Res. 2012 May-Aug;2(2):97-104.

Gungormus M. Pathologic status and changes in mandibular third molar position during orthodontic treatment. J contemp Dent Pract. 2002 May 15;3(2):11-22.

Jafari A, Mohebbi S, Khami M, Shahabi MS, Naseh M, Elhami F, et al. Radiographic evaluation of third molar development in 5- to 25 year olds in tehran, iran. J Dent (Tehran). 2012 Spring;9(2):107-15.

Jain S, Valiathan A. Influence of first premolar extraction on mandibular third molar angulation. Angle Orthod. 2009 Nov;79(6):1143-8.

Janson G, Putrick LM, Henriques JF, de Freitas MR, Henriques RP. Maxillary third molar position in Class II malocclusions: the effect of treatment with and without maxillary premolar extractions. Eur J Orthod. 2006 Dec;28(6):573-9.

Jung YH, Cho BH. Radiographic evaluation of third molar development in 6- to 24-year-olds. Imaging Sci Dent. 2014 Sep;44(3):185-91.

Kaplan RG. Some factors related to mandibular third molar impaction. Angle Orthod. 1975 Jul;45(3):153-8.

Kim TW, Artun J, Behbehani F, Artese F. Prevalence of third molar impaction in orthodontic patients treated nonextraction and with extraction of 4 premolars. Am J Orthod and Dentofac Orthop. 2003 Feb;123(2):138-45.

Ledyard BC. A study of the mandibular third molar area. Am J Orthod. 1959 39(5):366-73.

Livas C, Delli K. Does Orthodontic Extraction Treatment Improve the Angular Position of Third Molars? A Systematic Review. J Oral Maxillofac Surg. 2017 Mar;75(3):475-83.

Miclotte A, Grommen B, Cadenas de Llano-Perula M, Verdonck A, Jacobs R, Willems G. The effect of first and second premolar extractions on third molars: A retrospective longitudinal study. J Dent. 2017 Mar 27.

Pedro FL, Bandeca MC, Volpato LE, Marques AT, Borba AM, Musis CR, et al. Prevalence of impacted teeth in a Brazilian subpopulation. J Contemp Dent Pract. 2014 Mar 01;15(2):209-13.

Ricketts RM. A principle of arcial growth of the mandible. Angle Orthod. 1972 Oct;42(4):368-86.

Richardson ME. The effect of mandibular first premolar extraction on third molar space. Angle Orthod. 1989 Winter;59(4):291-4.

Russell B, Skvara M, Draper E, Proffit WR, Philips C, White RP, Jr. The association between orthodontic treatment with removal of premolars and the angulation of developing mandibular third molars over time. Angle Orthod. 2013 May;83(3):376-80.

Saysel MY, Meral GD, Kocadereli I, Tasar F. The effects of first premolar extractions on third molar angulations. Angle Orthod. 2005 Sep;75(5):719-22.

Staggers JA. A comparison of results of second molar and first premolar extraction treatment. Am J Orthod Dentofac Orthop. 1990 Nov;98(5):430-6.

Staggers JA, Germane N, Fortson WM. A comparison of the effects of first premolar extractions on third molar angulation. Angle Orthod. 1992 Summer;62(2):135-8.

Tait RV. Mesial Migration and Lower Third Molar Tilt. Br J Orthod. 1982 9(1):41-7.

Turkoz C, Ulusoy C. Effect of premolar extraction on mandibular third molar impaction in young adults. Angle Orthod. 2013 Jul;83(4):572-7.

APPENDIX

APPENDIX A - DECLARATION OF EXCLUSIVE USE OF THE ARTICLE IN DISSERTATION/THESIS

We hereby declare that we are aware of the article "Third molar comparison in extraction and nonextraction orthodontic cases" will be included in Dissertation of the student Danelin Peña Reyes and may not be used in other works of Graduate Programs at the Bauru School of Dentistry, University of São Paulo.

Bauru, December 5th, 2018.

Danelin Peña Reyes _____ _____
Author Signature

Marcos Roberto de Freitas _____ _____
Author Signature

Karina Maria Salvatore de Freitas _____ Karina Freitas
Author Signature

_____ _____
Author Signature

ANNEXES

ANNEX A. Ethics Committee approval, protocol number 72143817.5.0000.5417 (front).

USP - FACULDADE DE ODONTOLOGIA DE BAURU DA USP

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Comparação dos terceiros molares em casos tratados com e sem extrações.
Pesquisador: Danelin Peña Reyes
Área Temática:
Versão: 1
CAAE: 72143817.5.0000.5417
Instituição Proponente: Faculdade de Odontologia de Bauru
Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 2.235.936

Apresentação do Projeto:
Para a realização da pesquisa, serão selecionadas documentações de 120 pacientes do arquivo da disciplina de Ortodontia da Faculdade de Odontologia de Bauru – USP. As documentações serão divididas em casos de pacientes de
Classe I (n=30) e Classe II (n=30) tratados ortodonticamente sem exodontias, e casos de pacientes Classe I (n=30) e
Classe II (n=30) tratados ortodonticamente com exodontia dos primeiros pré-molares. A avaliação será realizada em radiografias panorâmicas inicias, finais e em média 5 anos após o tratamento ortodôntico, verificando a presença dos terceiros molares e mensurando as angulações mesio-distais dos mesmos representadas pela intercepção formada pelo seu longo eixo e planos construídos a partir de estruturas de referência como o septo nasal e a espinha nasal (Linha Perpendicular à espinha nasal), os contornos das tuberosidades maxilares conjunto com o palato duro (linha intertuberosidades) e os contornos inferiores das órbitas com o ponto mais superior do meato acústico externo (Linha interorbitaria). Além disso, será realizada uma avaliação da irrupção dentária através de modelos de estudo. Para a comparação será feito o teste de normalidade Kolmogorov-Smirnov das variáveis dos grupos na fase inicial, final e no controle de 5 anos pós-tratamento e depois será usado o teste estatístico ANOVA de medidas repetidas, se houver distribuição normal dos resultados, ou, se não houver, o teste de Friedman e o teste de Tukey. O

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ANNEX A. Ethics Committee approval, protocol number 72143817.5.0000.5417 (verso).

USP - FACULDADE DE ODONTOLOGIA DE BAURU DA USP

Continuação do Parecer: 2.235.936

teste de Kruskal- Wallis será aplicado nos grupos para avaliar a variável de irrompimento ao final do tratamento.

Objetivo da Pesquisa:

Este estudo tem por objetivo comparar a presença e posição dos terceiros molares superiores e inferiores após o tratamento ortodôntico com e sem extrações dos primeiros pré-molares.

Avaliação dos Riscos e Benefícios:

Os riscos descritos estão relacionados aos possíveis danos aos arquivos de documentação da disciplina, pela quebra de modelos de gesso e perda de radiografias panorâmicas, desde que serão utilizados apenas documentos previamente obtidos. Portanto, os riscos diretos aos participantes do estudo são mínimos. Os benefícios da pesquisa estão relacionados ao conhecimento prévio do participante sobre a necessidade da exodontia preventiva de seus terceiros molares.

Comentários e Considerações sobre a Pesquisa:

A pesquisa será capaz de ampliar o nível de evidência científica sobre o conhecimento do efeito da exodontia dos primeiros pré-molares sobre os resultados do tratamento ortodôntico.

Considerações sobre os Termos de apresentação obrigatória:

Os pesquisadores requerem a dispensa do termo de consentimento livre e esclarecido, desde que a pesquisa não requer a participaçâo direta de participantes, com a utilização de dados secundários do arquivo da disciplina de Ortodontia.

Conclusões ou Pendências e Lista de Inadequações:

O estudo cumpre adequadamente as normas estabelecidas e não apresenta potencial prejuízo aos seus participantes.

Considerações Finais a critério do CEP:

Esse projeto foi considerado APROVADO na reunião ordinária do CEP de 09.08.2017, com base nas normas éticas da Resolução CNS 466/12. Ao término da pesquisa o CEP-FOB/USP exige a apresentação de relatório final. Os relatórios parciais deverão estar de acordo com o cronograma e/ou parecer emitido pelo CEP. Alterações na metodologia, título, inclusão ou exclusão de autores, cronograma e quaisquer outras mudanças que sejam significativas deverão ser previamente comunicadas a este CEP sob risco de não aprovação do relatório final. Quando da apresentação deste, deverão ser incluídos todos os TCLEs e/ou termos de doação assinados e rubricados, se pertinentes.

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ANNEX A. Ethics Committee approval, protocol number 72143817.5.0000.5417 (front).

USP - FACULDADE DE ODONTOLOGIA DE BAURU DA USP

Continuação do Parecer: 2.235.936

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_968733.pdf	28/07/2017 15:19:15		Aceito
Outros	CartaEncaminhamento.pdf	27/07/2017 15:48:53	Danelin Peña Reyes	Aceito
Outros	QuestionarioTecnico.pdf	27/07/2017 15:48:08	Danelin Peña Reyes	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	DispensaTCLE.pdf	27/07/2017 15:47:13	Danelin Peña Reyes	Aceito
Declaração de Pesquisadores	DeclaracaoCompromisso.pdf	27/07/2017 15:46:39	Danelin Peña Reyes	Aceito
Projeto Detalhado / Brochura Investigador	ProjetodePesquisa.pdf	27/07/2017 15:45:43	Danelin Peña Reyes	Aceito
Folha de Rosto	FOLHADEROSTO.pdf	27/07/2017 15:45:05	Danelin Peña Reyes	Aceito

Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

BAURU, 23 de Agosto de 2017

Assinado por:
Ana Lúcia Pompéia Fraga de Almeida
(Coordenador)

Endereço: DOUTOR OCTAVIO PINHEIRO BRISOLLA 75 QUADRA 9
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ANNEX B. Patient´s informed consent exoneration (front).

Universidade de São Paulo
Faculdade de Odontologia de Bauru

Departamento de Odontopediatria, Ortodontia e
Saúde Coletiva

Bauru, 03 de Julho de 2017.

Dispensa de Termo de Consentimento Livre Esclarecido e Termo de Assentimento

Como parte da documentação solicitada pelo Comitê de Ética em Pesquisa para a avaliação de projetos de pesquisas envolvendo seres humanos, encaminho justificativa para a dispensa de TCLE e Termo de Assentimento no Projeto de Pesquisa **"Comparação dos terceiros molares em casos tratados com e sem extrações"** tendo como Responsável Principal Danelin Peña Reyes, sob orientação de Prof. Dr. Marcos Roberto de Freitas.

A pesquisa prevê dispensa de TCLE e Termo de Assentimento, devido não ser uma pesquisa que requer participação direta dos indivíduos. Nela se utilizarão dados secundários do arquivo do departamento de Ortodontia, no caso, panorâmicas e modelos de estudo de pacientes previamente tratados, tomadas no inicio e no final do tratamento ortodontico, e já possuem TCLE assinados pelos pacientes autorizando a nos utilizarmos dessa documentação em pesquisas.

Atenciosamente,

Danelin Peña Reyes
Responsável Principal

Al. Dr. Octávio Pinheiro Brisolla, 9-75 – Bauru-SP – CEP 17012-901 – C.P. 73
e-mail: veragato@fob.usp.br – Fone/FAX (0xx14) **3235-8369**
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ANNEX B. Patient´s informed consent exoneration (verso)

UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ODONTOLOGIA DE BAURU
CLÍNICA DE ORTODONTIA

AUTORIZAÇÃO PARA DIAGNÓSTICO E/OU EXECUÇÃO DE TRATAMENTO ORTODÔNTICO

Por este instrumento de autorização por mim assinado, dou pleno consentimento à FACULDADE DE ODONTOLOGIA DE BAURU-USP para, por intermédio de seus professores, assistentes e alunos devidamente autorizados, fazer diagnóstico, planejamento e tratamento em minha pessoa ou meu filho menor de idade _____, de acordo com os conhecimentos enquadrados no campo dessa especialidade.

Concordo também, que todas radiografias, fotografias, modelos, desenhos, históricos de antecedentes familiares, resultados de exames clínico e de laboratório e quaisquer outras informações concernentes ao planejamento de diagnóstico e/ou tratamento, constituem propriedade exclusiva desta FACULDADE, à qual dou plenos direitos de retenção, uso para quaisquer fins de ensino e de divulgação em jornais e/ou revistas científicas do país e do exterior.

Bauru, ____ de _____ de 19 ___.

_____

Assinatura do paciente ou responsável

R.G. Nº: _____

Nome: _____

Endereço: _____

CEP: _____ Telefone: _____