UNIVERSIDADE DE SÃO PAULO FACULDADE DE ODONTOLOGIA DE BAURU

FELICIA MIRANDA

Qualitative longitudinal assessment of normal occlusion maturation: 40 years of follow-up

Avaliação longitudinal qualitativa da maturação da oclusão normal: 40 anos de acompanhamento

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Dissertação constituída por artigo apresentada a Faculdade de Odontologia de Bauru da Universidade de São Paulo para obtenção do título de Mestre em Ciências no Programa de Ciências Odontológicas Aplicadas, na área de concentração Ortodontia.

Orientador: Prof^a. Dr^a. Daniela Gamba Garib Carreira

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ABSTRACT

Qualitative longitudinal assessment of normal occlusion maturation: 40 years of follow-up

Introduction: The aim of this study was to evaluate the qualitative occlusal changes in individuals with normal occlusion after a 47 years period follow-up. Material and Methods: An initial sample of 82 White-Brazilian subjects with normal occlusion and dental models performed at 13 years of age was recalled at 60 years of age. Twentyseven individuals were reevaluated at T2. The exclusion criteria were history of orthodontic treatment and complete or extensive tooth loss. The final sample comprised 20 dental models at 13.2 years of age (T1) and 60.9 years of age (T2). Objective Grading System (OGS) and the Six Keys to Normal Occlusion were evaluated in T1 and T2. Subjects also answered a questionnaire on esthetical and occlusion self-perception at T2. Inter-phase comparisons were performed using paired t tests and McNemar test (p<0.05). Descriptive statistics (frequencies) were used for reporting the questionnaire answers. Results: The OGS analysis showed an improvement in the marginal ridge leveling and buccolingual tooth inclination. There was a significant impairment of the anteroposterior occlusal relationship from T1 to T2 with some subjects demonstrating a slight Class III relationship at T2. The six keys to normal occlusal analysis showed a deterioration of the second molars buccolingual inclination, an increase of mandibular incisor crowding and an improvement of second molar mesiodistal angulation. All patients were satisfied with their smiles, with a median grade of satisfaction of 8. Sixty percent of patients had no complaints about their smiles and occlusion. Crowding was the main change noticed from adolescence to sixties and cause a disturbance in 35% of the sample. **Conclusion**: The aging process impairs some occlusal features of individuals with normal occlusion. However, most of individuals with normal occlusion were satisfied with their esthetics and occlusal comfort at the sixth decade of life.

Key words: Dental Occlusion. Aging. Dental Models.

RESUMO

Objetivo: O objetivo deste estudo foi avaliar as alterações oclusais qualitativas em indivíduos com oclusão normal, após um período de 47 anos. Material e Métodos: Uma amostra inicial de 82 brasileiros leucodermas com oclusão normal e modelos dentários realizados aos 13 anos foi recrutada novamente aos 60 anos de idade. 27 indivíduos foram reavaliados em T2. Os critérios de exclusão eram histórico de tratamento ortodôntico e perdas dentárias (extensas ou total). A amostra final foi composta de 20 modelos dentários aos 13,3 anos de idade (T1) e aos 60,9 anos de idade (T2). O Objective Gradind System (OGS) e As seis chaves da oclusão normal de Andrews foram avaliados em T1 e T2. Os indivíduos da amostra responderam a um questionário sobre a própria percepção em relação a estética e oclusão no T2. A comparação interfases foi realizada pelo teste t pareado e pelo teste de McNemar (p<0.05). Estatística descritiva (frequências) foi usada para reportar as respostas dos questionários. Resultados: A análise OGS mostrou uma melhora no nivelamento das cristas marginais e na inclinação vestíbulo-lingual dentária. Houve uma piora significante na relação oclusal anteroposterior de T1 para T2, com alguns indivíduos demonstrando uma suave relação de Classe III no T2. A análise seis chaves da oclusão normal mostrou uma deterioração na inclinação vestíbulo-lingual dos segundos molares, um aumento no apinhamento dos incisivos inferiores e uma melhora na angulação dos segundos molares superiores. Todos os pacientes estavam satisfeitos com os seus sorrisos, sendo 8 a nota mediana de satisfação. Sessenta por cento dos indivíduos não tinham queixas em relação aos sorrisos e oclusão. O apinhamento foi a principal alteração notada da adolescência até os 60 anos e causou incômodo em 35% da amostra. Conclusão: O processo de maturação prejudica algumas características oclusais em indivíduos com oclusão normal. No entanto, a maioria dos indivíduos com oclusão normal estavam satisfeitos com a estética e conforto na sexta década de vida.

Palavras-chave: Oclusão Dentária. Envelhecimento. Modelos Dentários.

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LIST OF ABBREVIATIONS AND ACRONYMS

- T1 Timing 1
- T2 Timing 2
- OGS Objective Grading System
- SKNO Six Keys to Normal Occlusion
- ABO American Board of Orthodontics
- ICC Intraclass correlation coefficients
- SD Standard deviation
- Mx.1 Maxillary Central Incisors
- Mx.2 Maxillary Lateral Incisors
- Mx.3 Maxillary Canines
- Mx.4 Maxillary First Premolars
- Mx.5 Maxillary Second Premolars
- Mx.6 Maxillary First Molars
- Mx.7 Maxillary Second Molars
- Md.1 Mandibular Central Incisors
- Md.2 Mandibular Lateral Incisors
- Md.3 Mandibular Canines
- Md.4 Mandibular First Premolars
- Md.5 Mandibular Second Premolars
- Md.6 Mandibular First Molars
- Md.7 Mandibular Second Molars

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1 INTRODUCTION

1 INTRODUCTION

The knowledge of normal occlusion plays an important role in orthodontics. Since the diagnosis, treatment and finishing, the occlusion evaluation is essential to establish the ultimate success. The changes that occur during maturation in the occlusion of an individual, have an equally important role, since this knowledge allows the professional predict what will happen in the long term.

The craniofacial growth is a continuous process (BEHRENTS, 1984; BISHARA; TREDER; JAKOBSEN, 1994). The changes produced by aging continues throughout the adulthood, although in a small magnitude compared to the adolescence (BISHARA; TREDER; JAKOBSEN, 1994). Over the years, efforts have been made in literature to identify changes in normal occlusion or treated occlusion with aging (SADOWSKY; SAKOLS, 1982; HENRIKSON; PERSSON; THILANDER, 2001; SINCLAIR; LITTLE, 1983, 1985; BISHARA; TREDER; JAKOBSEN, 1994; HARRIS, 1997; CARTER; MCNAMARA, 1998; TIBANA; PALAGI; MIGUEL, 2004; TSIOPAS et al., 2013; BONDEVIK, 2015). Longitudinal assessments were performed, both cephalometric (SINCLAIR; LITTLE, 1985; BISHARA; TREDER; JAKOBSEN, 1994; WEST; MCNAMARA, 1999) and by models (SINCLAIR; LITTLE, 1983; BISHARA; TREDER; JAKOBSEN, 1994; CARTER; MCNAMARA, 1998; TIBANA; PALAGI; MIGUEL, 2004; BONDEVIK, 2015) in individuals with normal occlusion. In general, the quantitative parameters most evaluated were the irregularity index, dental arch widths and lengths, overbite, overjet, mesiodistal crown diameters of single and groups of permanent teeth, curve of Spee, maxillary and mandibular anterior and total crowding or spacing, anterior tooth rotations, palatal height and cephalometric dentofacial parameters (SINCLAIR; LITTLE, 1983; BISHARA et al., 1989; BISHARA; TREDER; JAKOBSEN, 1994; BISHARA et al., 1997; HARRIS, 1997; CARTER; MCNAMARA, 1998; TIBANA; PALAGI; MIGUEL, 2004; THILANDER, 2009; TSIOPAS et al., 2013).

The results of long-term longitudinal studies have tended to show continuing differences, and was previously conduct until the third, fourth and fifth decade of life (BISHARA et al., 1989; BISHARA; TREDER; JAKOBSEN, 1994; BISHARA et al., 1996; BISHARA et al., 1997, 1998; HENRIKSON; PERSSON; THILANDER, 2001; TIBANA; PALAGI; MIGUEL, 2004; THILANDER, 2009). It was reported a noticeable

decrease of the intercanine width (BISHARA et al., 1996; BISHARA et al., 1997; TIBANA; PALAGI; MIGUEL, 2004). The arch length and perimeter decreased from the adolescence to the fourth decade of life (BISHARA et al., 1989; BISHARA et al., 1996; BISHARA; JAKOBSEN, 1998; TIBANA; PALAGI; MIGUEL, 2004; THILANDER, 2009). The decreases varied from 1.0 mm to 5.7 mm for the arch length (BISHARA et al., 1996; BISHARA et al., 1998). A high variety of changes was observed for overbite and overjet (SINCLAIR; LITTLE, 1983; BISHARA; TREDER; JAKOBSEN, 1994; BISHARA et al., 1996; TIBANA; PALAGI; MIGUEL, 2004). In general, mandibular arch anterior crowding had a greater increase than the maxillary arch (SINCLAIR; LITTLE, 1983; BISHARA et al., 1989; BISHARA et al., 1996). Normal occlusion long-term studies are important to provide a reference for natural changes and comparative studies with treated individuals. A recent review about long-term stability of the orthodontic treatment related that despite of a large number of articles published, few studies included an untreated control group (BONDEMARK et al., 2007). Studying a orthodontically treated sample, with 20 years of follow up, an increase in overbite and overjet were the mostly changed parameter, followed by the increase of the anterior crowding (SADOWSKY; SAKOLS, 1982).

Although efforts were performed to quantitatively evaluate the longitudinal alterations in the normal occlusion, no previous study qualified the changes that aging may determine. A possible alternative to analyze the maturational changes, could be through a qualitative assessment, using occlusion evaluation indexes and the models superimposition.

In 1998, the American Board of Orthodontics (ABO) described the Objective Grading System (OGS). It was developed as a tool by which the orthodontists would be able to analyze the completion of orthodontic treatment cases (CASKO et al., 1998). The OGS is assessed by means of scores given to eight criteria. The alignment, marginal ridges, buccolingual inclination, occlusal relationship, occlusal contacts, overjet, interproximal contacts are the seven first criteria and are measured at the dental casts. The root angulation are the last criteria and it is measured at the panoramic radiograph (CASKO et al., 1998).

At the classic study of Lawrence Andrews, in 1972, six differential qualities between a sample of 120 non-orthodontic patients dental casts were determined. Those characteristics were named as the "The six keys to normal occlusion" (SKNO). The author proposed that these qualities provide a guideline to measure the static relationship of successful orthodontic treatment (ANDREWS, 1972). These being: molar relationship, crown angulation, crown inclination, rotations, spaces and occlusal plane.

There are no studies in the literature using the OGS and the SKNO to longitudinally compare the changes that have occurred in the occlusion during its maturation. Using these tools to evaluate cases that were subjectively considered "normal occlusion" can be valuable, mainly because it allows a more objective analysis of the occlusal characteristics.

Does the time impair the quality of the occlusion? Is the normal occlusion stable from the adolescence to late adulthood? These questions need to be elucidate for a better understanding of the aging process of normal occlusion. Therefore, this study aims to qualitative assess the changes of normal occlusion from 13 to 60 years of age.

2 ARTICLE

2 ARTICLE

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

AGING OF THE NORMAL OCCLUSION

ABSTRACT

Introduction: The aim of this study was to evaluate the qualitative occlusal changes in individuals with normal occlusion after a 47 years period follow-up. Material and Methods: The sample was selected from dental models of 82 White-Brazilian subjects with normal occlusion. The final sample comprised 20 dental models at 13.2 years (T1) and 60.9 years (T2). Objective Grading System (OGS) and the Six Keys to Normal Occlusion (SKNO) were evaluated. Subjects answered a questionnaire on esthetical and occlusion self-perception at T2. Inter-phase comparisons were performed using paired t tests and McNemar test (p<0.05). Results: OGS analysis showed an improvement in the marginal ridge leveling and buccolingual inclination. There was a significant impairment of the anteroposterior occlusal relationship from T1 to T2. The SKNO analysis showed a deterioration of the second molars buccolingual inclination, an increase of mandibular incisor crowding and an improvement of second molar angulation. All patients were satisfied with their smiles, and sixty percent of patients had no complaints. Crowding cause a disturbance in 35% of the sample. Conclusion: The aging process impairs some occlusal features of individuals with normal occlusion. However, most individuals were satisfied with their esthetics and occlusal comfort at the sixth decade of life.

INTRODUCTION

The increasing number of adult patients seeking for orthodontic treatment and the growth of older individuals in the population stimulates the evaluation of occlusal aging. Maturation changes were previously studied in nontreated population with normal occlusion. In a longitudinal study of the maturation of normal occlusion from 9 to 20 years of age, Sinclair and Little¹ found a decrease in arch length and intercanine width, while the overjet, overbite and incisor irregularity increased from the early permanent dentition to 20 years of age. Evaluating the long-term stability in dental arch form in normal occlusion subjects from 13 years to 31 years of age, Henrikson et al² found a tendency for a more rounded shape for the mandibule arch with age. In this study, a reduction of the maxillary and mandibular intercanine width and arch depth and an increase of the mandibular incisor crowding was also reported.² From 21 years and 28 years, a decrease of the arch perimeter and an increase in the incisor crowding and overbite was observed in Brazilian individuals with normal occlusion.³ A cross sectional study evaluated the occlusal changes from 5 to 31 years in Sweden normal occlusal individuals.⁴ In both arches, the intercanine width continuously decreased from 16 to 31 years.⁴ A follow up of Finnish normal occlusal subjects from 7 to 32 years showed a decrease of the intercanine distance, maxillary intermolar width, overjet and overbite after 15 years of age.⁵ From 25 to 46 years of age, a decrease of the maxillary and mandibular intercanine widths, a decrease of the maxillary arch lengths and an increase of the mandibular incisor crowding was reported. Bishara et al, also reported a continuous decrease of the maxillary and mandibular intercanine distances from 13 years to 45 years in 1997.⁶

Although efforts were performed to quantitatively evaluate the longitudinal alterations in the normal occlusion, no previous study qualified the changes that aging may determine. The American Board of Orthodontics (ABO) has developed the Objective Grading System (OGS) for analyzing the quality of orthodontic treated occlusion.⁷ The OGS is assessed by scores given to eight criteria. The alignment, marginal ridges, buccolingual inclination, occlusal relationship, occlusal contacts, overjet, interproximal contacts are evaluated using dental models.⁷ The classical study by Andrews identified six frequent features in 120 individuals with normal occlusion which may be used as a guideline for assessing the quality of treated and nontreated occlusion.⁸

Does the time impair the quality of the occlusion? Is the normal occlusion stable from the adolescence to late adulthood? These questions need to be elucidate for a better understanding of the aging process of normal occlusion. Therefore, this study aims to qualitative assess the changes of normal occlusion from 13 to 60 years of age.

MATERIAL AND METHODS

This observational and longitudinal study was approved by the ethical committee in research of Bauru Dental School, University of Sao Paulo (process number 43931915.4.0000.5417). Written patients consents were obtained. The sample size calculation was based on a preliminary statistics including the first 5 patients of the sample. For a standard deviation of 13.07 points for the OGS and a

minimal difference of 10 points to be detected, a sample of 15 patients was required to provide statistical power of 80% with an α of 0.05.

A sample of dental models from eighty-two Brazilian-white subjects with a normal occlusion, obtained between 1967 and 1970, was selected from the files of the Department of Orthodontics of Bauru Dental School, University of São Paulo (T1). The inclusion criteria of normal occlusion were: (1) complete permanent dentition, (2) normal molar and canine relationships, (3) absence of crossbites, (4) normal overjet and overbite, (5) well-balanced faces and (6) a maximum 2 mm of incisor crowding with no previous history of orthodontic treatment. All subjects were target to a recall during 2015 and 2016 (T2).

The exclusion criteria applied at T2 were: (1) history of orthodontic treatment and (2) complete or extensive tooth loss (2 teeth or more in a hemiarch). From the initial sample, thirty-eight subjects were reached. Twenty-seven patients were enrolled and seven were excluded because did not meet the eligibility criteria (Fig 1). At T1 the mean age was 13 years and 2 months, and at T2 the mean age was 60 years and 9 months. The mean follow-up period was 47.5 years.

Dental models were obtained at T2. Both T1 and T2 dental models were scanned using the 3Shape R700 3D© scanner (3Shape A/S, Copenhagen, Denmark) (Fig. 2).

Dental model evaluation was performed using the OGS at both time points.⁷ Seven out of the eight criteria were used, excluding only the angulation criteria due to the absence of panoramic radiographs. A metal gauge commercialized by the American Board of Orthodontics was used.⁷ Measurements were performed by 1 investigator to ensure consistency. The investigator was initially calibrated for the OGS. For each parameter that deviated from normal, 1 or 2 points were subtracted. A score of 0 indicated ideal alignment and occlusion. The magnitude of the score for each patient indicated the relative deviation from the ideal. The critical score for ABO clinical examination is 30.⁷

Additionally, scores were given to the presence of all the Six Keys to Normal Occlusion proposed by Andrews.⁸ The score 0 was given when the Key was present, and 1 when it was absent or altered.

All patients answered a written questionnaire with seven questions on their selfappraisal of occlusion function and esthetics (Fig. 3).

Statistical analyses

One operator (F.M.) performed all the measurements and repeated the measures in 50% of the sample at least 3 weeks later. Intraexaminer reproducibility was evaluated using intraclass correlation coefficients (ICC) and Bland Altman method for the OGS analysis. Normal distribution was verified by the Kolmogorov-Smirnov test for the OGS. Therefore, the inter-phase changes analysis were performed using paired t test.

Intraexaminer reproducibility for the Six Keys to Normal Occlusion was evaluated using the Kappa coefficient. Interphase changes for SKNO was evaluated using the McNemar test.

A statistical significance level of 5 % was regarded for all tests.

RESULTS

Objective grading system

The intraclass correlation coefficient varied from 0.71 to 0.98 showing good to excellent reproducibility of the OGS measurements (Table I).

The scores for the variables marginal ridges and buccolingual inclination showed a decrease from T1 to T2 representing a quality improvement in these variables (Table II). On the other hand, the score for the occlusal relationship increased from T1 to T2 showing a deterioration of this feature over the time (Table II). No significant interphase changes were found for the variables alignment, overjet, interproximal contacts and occlusal contacts (Table II).

Six Keys to Normal Occlusion

Intra-examiner reproducibility showed substantial to almost perfect agreement with Kappa values varying from 0.64 to 1.00 (Table III).

The inter-phase change of key 1 (interarch relationship) was not significant (Table IV). Regarding the key 2 (clinical crown angulation), only the maxillary second molars showed a interphase change demonstrating an improvement at T2 (Table IV). The key 3 (clinical crown inclination) showed an interphase impairment for maxillary and mandibular second molars which showed a frequent buccal inclination at T2 (Table IV).

The frequency of rotations (Key 4) increased only for mandibular central incisors (Table IV). No interphase changes were found for interproximal contacts and curve of Spee (Table IV).

Tooth loss

Fourteen out of 20 individuals showed at least one permanent tooth loss in T2. The mean number of tooth loss at 60 years of age was 2.1 teeth. In general, posterior teeth were most frequently absent than the anterior teeth (Fig.4). Tooth loss was more frequent in the mandibular arch compared to the maxillary arch (Fig. 4). Additionally, for a total of 42 missing teeth, only 11 were rehabilitated with implants/prosthesis.

Written questionnaires

When asked about the satisfaction with their smiles, all patients answered that were satisfied. The median grade chosen to evaluated the smiles were 8, and the grades varied from 6 to 7 for 35% of the patients, 9 to 8 for 30%, and 35% patients give a 10 to their smiles.

Also, when asked about the major complaint about their smiles, 60% of the patients answered that they do not have complaints. The most frequent complaints were: teeth color (5 individuals), dental or rehabilitation problems (3 individuals), alignment (2 individuals), tooth wear (2 individuals), missing teeth (1 individual) and interdental spaces (1 individual).

The major occlusal changes noticed by the individuals from adolescence to sixties were crowding (5 individuals), dental wear (4 individuals), tooth discoloration (4 individuals), chewing impairment (3 individuals), tooth loss (3 individuals), interdental spaces (2 individuals) and third molar eruption (1 individual). Eight out of 20 patients reported they had crowded teeth with a median of discomfort of 0.5 in a scale of 0 (worst) to 10 (better). The desire to undergo orthodontic treatment was null in this sample.

DISCUSSION

Two qualitative methods were used in this study. The OGS assign scores for quality of eight parameters of the occlusion. The greater the score, the worse is the quality of the occlusion. The critical score used by the American Board of Orthodontics is 30 for treated cases. The ICC showed an excellent intra-examiner reproducibility for OGS analysis. The examiner was initially calibrated and the measures were performed following the instructions released by the ABO.⁷ Also, a metal gauge commercialized by the ABO was used for all the measurements. Previous studies also showed an excellent repeatability of the OGS analysis.^{9,10} The Six Keys To Normal Occlusion was additionally used in this study in order to provide a better appraisal of individual tooth variation.⁸ The Kappa coefficient showed substantial to almost perfect repeatability for the SKNO analysis. Kattner and Schnelder, also used SKNO for evaluating the quality of orthodontic treatment with different brackets prescriptions (standard edgewise and the Roth appliances) and found no significant differences for the inter-examiner repeatability.¹¹ The sample of this study was initially selected on the late 60th before the publication of the study by Andrews and therefore, in some cases some normal deviations were expected in T1 (Table IV).

OGS showed significant changes for 3 out of 7 parameters. The marginal ridges scores improved with aging (Table II). This improvement could be justified by the occlusal tooth wear which is a physiological consequence of aging.¹²⁻¹⁴ A previous study compared the patterns of tooth wear of patients with Class II malocclusion and normal occlusion.¹⁵ Normal occlusion subjects had greater tooth wear in the anterior region (palatal surface of maxillary incisors and incisal surface of maxillary canines) compared to malocclusion groups. A strong correlation was found between age and tooth wear in Indigenous people of Amazon.¹⁶ These results were attributed to traditional dietary habits maintained in Indigenous populations.¹⁶ However, in urban population tooth wear might not be considered a good estimator for age, mostly because the urban diet consist of more softer, commercially prepared and packaged food.¹⁶

Buccolingual inclination of posterior teeth showed a score decrease from T1 to T2 (Table II). This change should not be understood as an improvement in the buccolingual inclination of molars and premolars. Instead, this change was related to the decreased number of posterior teeth that was analyzed at T2 due to tooth loss (Fig. 4) and consist a limitation of this study.

As an unexpected result, aging maturation impaired the sagittal occlusal relationship according to OGS (Table II). Two individuals out of 20 (2 males) showed a development of a slight Class III relationship and a decrease in overbite and overjet at T2 (Figs. 5 and 6), although a Class I facial pattern was observed. No previous study

evaluated qualitative changes of interach sagittal relationship with aging. Possible explanations for the deterioration of the anteroposterior occlusion are the late mandibular growth and a greater physiologic mesial migration in the mandibular arch. Another gross observation is that individuals with Class III relationship and an edge-to-edge incisor relationship at T2 showed a pronounced occlusal tooth wear. The assumption of a possible association between tooth wear and the changes in the occlusal relationship should be further studied (Figs. 5 and 6).

The SKNO analysis showed significant changes from 13 to 60 years for the maxillary second molar angulation, maxillary and mandibular second molars inclination and the mandibular central incisors rotation (Table IV). The maxillary second molar angulation improved with aging. Eight out of 20 individuals with an initial distoangulation of the maxillary second molar showed a normal positive angulation at T2. Andrews sample of normal occlusion also had individuals with maxillary second molar distoangulation.¹⁷ The self-correction of maxillary second molar distoangulation with time suggest that the correction of this feature in orthodontic patients during the early permanent dentition might constitute an overtreatment and should be avoided in order to decrease treatment length. These results point that maxillary second molar distoangulation is temporary and adjust with time, at least in individuals with normal occlusion. Before eruption, the second molar crown is usually distally angulated, and after eruption, the apex spontaneously move toward distal.^{18,19} This tendency of second molar uprighting seems to continues after 13 years of age in normal occlusion individuals.

On the other hand, the crown buccolingual inclination of maxillary and mandibular second molars deteriorate with the maturation process (Table IV). Second molar crowns were buccally tipped and displaced at T2 (Fig. 7). No previous report on this regard was found. A speculation is that the impairment of second molar torque can be related to third molar development and eruption. Another possible explanation is the decrease of the buccinator muscle tonicity with age that should be further investigated.

The frequency of incisor rotation increased from T1 to T2 (Table IV). The late anterior crowding at the lower arch is one of the most reported change of the maturational process.^{1-3,20,21} We assume that SKNO is more sensible for detecting slight dental crowding compared to OGS. Forty percent of the sample developed a mandibular incisor crowding from T1 to T2 (Table IV). Mandibular irregularity appears

to increase throughout life regardless of the orthodontic treatment provided.^{1,21} Sinclair and Little found that incisor irregularity increased twice as fast in orthodontic treated subjects when compared to the untreated normal occlusion sample.¹ Little reported that the degree of crowding that develops after retention is variable and unpredictable.²² As a clinical consideration, a 3x3 bar retainer might be indicated even in nontreated individuals with normal occlusion in order to prevent the late mandibular incisor crowding.

The limitation of this study was the high prevalence of tooth loss in the sample (70%). Permanent tooth loss were more prevalent in the posterior region and in the mandibular arch (Fig. 4). Previous studies also found a similar tooth loss rate (1.4 missing teeth on average) in a normal occlusion sample of 18 individuals at 65 years of age.^{23,24} The generation of our sample usually shows a high rates of dental caries and tooth extraction because they do not experienced water fluoridation, fluoride dentifrices, changes in perception of oral healthy and oral hygiene, and a regular use of dental services and technologies.²⁵⁻²⁷

Finally, a secondary analysis was performed in order to evaluate the individual's perceptions of their own occlusion and dental esthetics. Dental crowding was the most prevalent change noticed causing dissatisfaction in 35% of the sample. Most individuals were highly satisfied with their smiles, in accordance with previous studies in normal occlusion subjects.^{23,24} Although patients reported changes as tooth loss, dental prosthesis and others dental changes as tooth wear and enamel staining, the self-perception of esthetic and function was not substantially affected. According to Stenvik et al, individuals with normal occlusion evaluated at 65 years of age reported favorable experiences related to their teeth and occlusion when compared with individuals with malocclusion.²⁴ Corroborating with our results, individuals with normal occlusion at 65 years of age were found highly satisfied with their occlusion and without any desire to undergo orthodontic treatment after a long period of follow-up.²³

Although some changes were found in the quality of the occlusion, the general quality remained stable throughout the years with a high level of individual satisfaction at 60 years of age. A 3x3 bar retainer can be indicated in normal occlusion in order to prevent the late mandibular incisor crowding in individuals with a high oral hygiene level. Future studies should analyze the skeletal and facial changes with aging in individuals with normal occlusion. The association between tooth wear and incisor crowding in normal occlusion individuals should also be evaluated.

CONCLUSIONS

The null hypothesis was rejected. Aging slightly impairs the quality of the normal occlusion. The occlusal relationship, second molars inclination and mandibular central incisors rotation deteriorate. On the other hand, the leveling of marginal ridges and the maxillary second molar angulation improved. Most of the individuals with normal occlusion demonstrated satisfaction with their smile esthetics and occlusal comfort at the sixth decade of life.

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FIGURE CAPTIONS

Fig 1. Enrollment process.

Fig 2. Female subject of the normal occlusion sample. **A.** Dental models at 13.1 years of age. **B.** Dental models at 61.5 years of age.

Fig 3. Written questionnaire answered by the sample individuals at T2.

Fig 4. Tooth loss observed in sample individuals. Teeth was named accordingly with the FDI World Dental Federation notation.

Fig 5. Male subject of the sample at 13.2 **(A)** and 61.7 years of age **(B)**. Note the severe pattern of occlusal tooth wear and the edge-to-edge incisor relationship at T2 **(B)**.

Fig 6. Male subject of the sample at 13.9 **(A)** and 61.6 years of age **(B)**. Note the slight molar Class III relationship and a the edge-to-edge incisor relationship at T2 **(B)**.

Fig 7. Second molar buccal displacement from T1 to T2. **A** - Sample male individual at 14 and 63.4 years of age. **B** - Sample male individual at 13.9 and 61.6 years of age.



Fig. 1



Fig. 2



Fig. 3



Fig. 4







Fig.6



Fig.7

	1st measurement	2nd measurement	Difference Mean	ICC	Lower limit of agreement (95% CI)	Upper limit of agreement (95% CI).
	Mean (SD)	Mean (SD)				
Alignment	10.06 (2.70)	10.35 (2.72)	0.29 (1.02)	0.92	-1.75	2.25
Marginal ridges	3.40 (1.39)	2.95 (1.88)	-0.45 (1.19)	0.71	-1.88	2.78
Buccolingual inclination	7.30 (3.50)	7.65 (3.13)	0.35 (1.23)	0.92	-2.75	2.05
Overjet	3.65 (4.08)	3.40 (3.90)	-0.25 (0.79)	0.97	-1.29	1.79
Occlusal contacts	3.95 (2.80)	3.70 (2.60)	-0.25 (1.55)	0.83	-2.79	3.29
Occlusal relationship	3.50 (3.63)	3.40 (3.60)	-0.10 (0.79)	0.97	-1.44	1.64
Interproximal contacts	3.40 (4.76)	3.15 (4.33)	-0.25 (0.85)	0.98	-1.42	1.92
OGS Total	35.80 (7.26)	34.60 (6.69)	-1.20 (2.75)	0.90	-4.18	6.58

Table I. OGS error study (Intraclass correlation coefficients and Bland Altman limits

of agreement)

SD – Standard deviation.

	T1 Mean (SD)	T2 Mean (SD)	Difference Mean (SD)	p
Alignment	8.90 (2.98)	10.40 (3.47)	1.50 (3.61)	0.096
Marginal ridges	3.89 (0.87)	2.21 (1.58)	-1.68 (1.73)	<0.001*
Buccolingual inclination	8.44 (3.38)	5.00 (2.95)	-3.44 (3.74)	0.001*
Overjet	4.15 (3.64)	6.31 (6.36)	2.15 (6.29)	0.152
Occlusal contacts	3.33 (3.08)	4.16 (3.12)	0.83 (4.55)	0.448
Occlusal relationship	2.72 (2.73)	6.33 (4.58)	3.61 (3.97)	0.001*
Interproximal contacts	4.15 (4.86)	1.85 (2.79)	-2.30 (5.38)	0.071
TOTAL	35.95 (7.14)	34.30 (12.40)	-1.65 (13.40)	0.718

Table II. OGS inter-phase comparisons

* Statistically significant at P<0.05

SD – Standard deviation.

	Comparison	Agreement (%)	Карра
Key 1	Interarch Relationship	90	0.90
	Mx.1	100	1.00
	Mx.2	100	1.00
	Mx.3	90	0.74
	Mx.4	95	0.83
	Mx.5	100	1.00
	Mx.6	95	0.64
16.00	Mx.7	88.89	0.68
Key 2	Md.1	95	0.90
	Md.2 100		1.00
	Md.3 95		0.86
	Md.4	95	0.86
	Md.5	90	0.69
	Md.6	90	0.69
	Md.7	94.74	0.83
	Mx.1	100	1.00
	Mx 2	100	1.00
	Mx 3	95	0.83
	Mx 4	100	1 00
	Mx 5	100	1.00
	Mx 6	90	0.69
	Mx 7	88.89	0.75
Key 3	Md 1	100	1.00
	Md 2	100	1.00
	Md 3	100	1.00
	Md 4	100	1.00
	Md 5	100	1.00
	Md.6	95	0.64
	Md.0	89.47	0.73
	Mx 1	95	0.83
	Mx 2	90	0.79
	Mx 3	100	1.00
	Mx 4	95	0.83
	Mx 5	95	0.00
	Mx.6	95	0.00
	Mx 7	94 44	0.82
Key 4	Md 1	90	0.02
	Md 2	90	0.80
	Md 3	95	0.00
	Md.0	90	0.00
	Md.4	90	0.70
	Md.6	100	1.00
	Md.0	94 74	0.83
	Maxillary right posterior	100	1 00
	Maxillary anterior	95	0 00
	Maxillary left posterior	100	1 00
Key 5	Mandibular right posterior	100	1.00
	Mandibular anterior	95	0.80
	Mandibular right posterior	100	1 00
	Right	Q5	0.83
Key 6	l eft	95	0.00
1	Lon		0.00

Table III. Six Keys to Normal Occlusal error study

		T1	T2	
		Presence (%)	Presence (%)	р
Key 1	Interarch Relationship	52.63	31.57	0.220
	Mx.1	95.00	75.00	0.220
	Mx.2	85.00	90.00	1.000
	Mx.3	55.00	80.00	0.130
	Mx.4	65.00	85.00	0.288
	Mx.5	60.00	80.00	0.288
	Mx.6	94.44	83.33	0.617
14.00	Mx.7	12.50	50.00	0.041*
Key 2	Md.1	40.00	35.00	1.000
	Md.2	45.00	20.00	0.130
	Md.3	55.00	70.00	0.449
	Md.4	63.15	73.68	0.751
	Md.5	60.00	80.00	0.288
	Md.6	78.94	84.21	1.000
	Md 7	76 47	94 11	0.248
	Mx 1	95.00	95.00	0.479
	Mx 2	100.00	95.00	1 000
	Mx 3	90.00	90.00	-
	Mx 4	100.00	80.00	0 133
	Mx 5	100.00	80.00	0 133
	Mx 6	66.66	61 11	1 000
	Mx 7	87.50	31.25	0.007*
Key 3	Md 1	100.00	75.00	0.073
	Md 2	100.00	100.00	-
	Md 3	100.00	100.00	-
	Md 4	100.00	89.47	0 479
	Md 5	95.00	95.00	0.479
	Md.6	100.00	73.68	0.073
	Md.7	94.11	58.82	0.041*
	Mx.1	95.00	90.00	1.000
	Mx.2	50.00	70.00	0.220
	Mx.3	75.00	70.00	1.000
	Mx.4	30.00	40.00	0.683
	Mx.5	60.00	40.00	0.288
	Mx.6	83.33	72.22	0.479
	Mx.7	93.75	62.50	0.073
Key 4	Md.1	60.00	20.00	0.026*
	Md.2	60.00	35.00	0.073
	Md.3	70.00	60.00	0.723
	Md.4	52.63	63.15	0.723
	Md.5	50.00	55.00	1.000
	Md.6	100.00	94.44	1.000
	Md.7	88.23	82.35	1.000
	Maxillary right posterior	95.00	100.00	1.000
Key 5	Maxillary anterior	55.00	75.00	0.288
	Maxillary left posterior	90.00	95.00	1.000
	Mandibular right posterior	94,11	100.00	1.000
	Mandibular anterior	70,00	80.00	0.617
	Mandibular right posterior	100.00	100.00	-
	Curve of Spee - Right	68.75	100.00	0.073
Key 6	Curve of Spee - Left	63 15	84 21	0.288
		00.10	01.21	0.200

Table IV. Inter-phase comparisons for the Six Keys to Normal Occlusion.

* Statistically significant at P<0.05. McNemar test.

3 DISCUSSION
3 DISCUSSION

As discussed above long-term normal occlusion studies were performed and quantitatively demonstrate the changes produced by the aging maturation in the occlusion (SINCLAIR; LITTLE, 1983; BISHARA et al., 1989; BISHARA; TREDER; JAKOBSEN, 1994; BISHARA et al., 1997; HENRIKSON; PERSSON; THILANDER, 2001; TIBANA; PALAGI; MIGUEL, 2004; THILANDER, 2009; HEIKINHEIMO et al., 2012). However, in some cases, the differences observed by these studies, were considered not clinically significant (SINCLAIR; LITTLE, 1983). The review of the literature pointed to high efforts to describe and explain the quantitatively changes observed in the occlusion maturation. Although, these results were sharply observed, it preclude a visualization of the maturational changes in the quality of the occlusion.

The recruitment process from the T2 group was challenging. Previous studies reported the difficulties related to collecting longitudinal data (BISHARA; TREDER; JAKOBSEN, 1994; BISHARA et al., 1996; HARRIS, 1997; TIBANA; PALAGI; MIGUEL, 2004; BERG; STENVIK; ESPELAND, 2008). This study comprised an extensive follow-up period and confirmed the enrollment limitations. Forty-seven years later from the initial contact all patients were browsed and when located were contacted by telephone, letters, e-mail, facebook, and others communication medias. From the 82 individuals in the initial sample, 24.3% was enrolled after a four-decade period (Fig. 1)

Two qualitative methods were used in this study. The OGS assign scores for quality of eight parameters of the occlusion. The greater the score, the worse is the quality of the occlusion. This scoring system has been developed to assess the adequacy of finished orthodontic results (CASKO et al., 1998). In order to prove the accuracy and reliability of the assessment of OGS through digital models, a study conducted in 2005 (COSTALOS et al., 2005), confirmed the accuracy in the evaluation on five of seven OGS criteria. However, the assessment of alignment and buccolingual inclination did not show satisfactory results for evaluation by digital models (COSTALOS et al., 2005). In addition, other studies have also shown that some criteria evaluation by means of digital models may not provide reliable results (OKUNAMI et al., 2007; HILDEBRAND et al., 2008). With that in mind, the OGS evaluation was made manually in the dental models. The examiner was initially calibrated and the measures were performed following the instructions released by the ABO (CASKO et al., 1998).

Also, a metal gauge commercialized by the ABO was used for all the measurements. The ICC varied from 0.71 to 0.98 showing an excellent intra-examiner reproducibility for OGS analysis. Previous studies also showed an excellent repeatability of the OGS analysis (PINSKAYA et al., 2004; SONG et al., 2013).

Andrews, in 1972 (ANDREWS, 1972), recognize six conditions consistently present in a sample of 120 non-orthodontic patients. These conditions were called "The Six Keys To Normal Occlusion" and was considered a consistent guideline to measure the static relationship of successful orthodontic treatment (ANDREWS, 1972). And, therefore, can be an excellent method to analyze the quality of the occlusion. The SKNO was additionally used in this study in order to provide a better appraisal of individual tooth variation (ANDREWS, 1972). The sample of this study was selected on the late 60th. At that time, the sample was selected as "normal occlusion" which represented patients with a normal canine and molar relationship, well balanced faces, absence of crowding and crossbite and normal overjet and overbite. Considering that it is a sample reached before the parameters proposed by Andrews (ANDREWS, 1972), in some cases some normal deviations were expected in T1 (Table IV). The Kappa coefficient varied from 0.64 to 1.00 showing substantial to almost perfect repeatability for the SKNO analysis. All evaluation was made following the subjective parameters as proposed by Andrews (ANDREWS, 1989). Kattner and Schnelder, also used SKNO for evaluating the quality of orthodontic treatment with different brackets prescriptions and found no significant differences for the inter-examiner repeatability (KATTNER; SCHNELDER, 1993).

OGS showed significant changes for 3 out of 7 parameters. The marginal ridges scores improved with aging (Table II), and the physiologic occlusal tooth wear is the most logical explanation (HUGOSON et al., 1988; KIM; KHO; LEE, 2000; YUN et al., 2007). Accordingly with the OGS the inclination of posterior teeth seems to improve with aging (Table II). However, this founds are not in concordance with the SKNO analysis (Table IV), where a deterioration of the inclination for the maxillary and mandibular second molars was found. Finally for the OGS analysis, the aging maturation impaired the sagittal occlusal relationship, and the late mandibular growth and a greater physiologic mesial migration in the mandibular arch were the most plausible hypothesis discussed. The SKNO analysis showed an improvement in the maxillary second molar angulation with aging. Only 12.5% of the sample presented a normal crown angulation for maxillary second molars at the early stage. With aging,

this percentage improved to 50% (Table IV). The improvement in crown angulation is in concordance with previous noticed normal eruption patterns (VAN DER LINDEN, 1978; VAN DER LINDEN, 1982). The crown buccolingual inclination showed a deterioration during the phases for maxillary and mandibular second molars (Table IV). Second molar crowns were buccally tipped and displaced at T2 (Fig. 7), further studies should investigated the causes for this deterioration. The late anterior crowding at the lower arch is the most found change in the maturational studies (SINCLAIR; LITTLE, 1983; BISHARA; TREDER; JAKOBSEN, 1994; CARTER; MCNAMARA, 1998; HENRIKSON; PERSSON; THILANDER, 2001; TIBANA; PALAGI; MIGUEL, 2004). In this study, the mandibular central incisors had an increase of 40% in prevalence of rotations (Table IV). We assume that SKNO is more sensible for detecting slight dental crowding compared to OGS, once that OGS did not show significant differences for the alignment. Considering the results found for the aging of normal occlusion a preventive procedure could be the indication of bonded lingual retainers. This procedure can become even more fundamental when observing the grade of disturbance caused by the late crowding, and should be carefully considered.

A limitation of this study was related to dental conditions at T2 when considerable tooth losses were observed (Fig. 4).The tooth loss among all twenty volunteers elucidated that, in mean, 7.14% teeth were lost from T1 to T2. Unfortunately, this was an uncontrollable and limited variable of this study. A previous study also found a similar tooth loss rate (1.4 missing teeth on average) in a normal occlusion sample of 18 individuals at 65 years of age (STENVIK; ESPELAND; BERG, 2011). Our rate of tooth loss was greater compared to previous studies probably due to the longer follow-up period and older age for the final evaluation (mean of 60 years of age at T2).

Evaluating the sample answers from the written questionnaires, we observed a highly satisfaction with theirs occlusion and smiles, elucidated by the high median grade of satisfaction. This found are in accordance with previous studies in normal occlusion subjects (BERG; STENVIK; ESPELAND, 2008; STENVIK; ESPELAND; BERG, 2011). According to Stenvik et al, individuals with normal occlusion evaluated at 65 years of age reported favorable experiences related to their teeth and occlusion when compared with individuals with malocclusion (STENVIK; ESPELAND; BERG, 2011). It implicates that, although tooth loss and several changes occurred in the

quality of the occlusion these factors seems not affect the esthetic and functional perception for the patient.

Other limitation of this study was the absence of cephalometric measures which could evaluated the craniofacial changes promoted by aging, however this changes are well established in literature (BEHRENTS, 1984; SINCLAIR; LITTLE, 1985; BISHARA; TREDER; JAKOBSEN, 1994). Further studies should investigate the individual tooth crown angulation and crown inclination changes during the aging process in normal occlusion. Additionally, a comparison of the aging changes of the normal occlusion and orthodontic treated occlusions would enrich the founds for long term studies.

Final Considerations

Although some changes were found in the quality of the occlusion, the general quality remained stable throughout the years with a high level of individual satisfaction at 60 years of age. As a clinical application, bonded lingual retainers should also be indicated for adolescent patients without need of orthodontic treatment.

CONCLUSIONS

4 CONCLUSIONS

The null hypothesis was rejected. Aging slightly impairs the quality of the normal occlusion:

- The occlusal relationship, second molars inclination and mandibular central incisors rotation deteriorate.
- The leveling of marginal ridges and the maxillary second molar angulation improved.
- Most of the individuals with normal occlusion demonstrated satisfaction with their smile esthetics and occlusal comfort at the sixth decade of life.

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APPENDIX

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

DECLARATION OF EXCLUSIVE USE OF THE ARTICLE IN DISSERTATION/THESIS We hereby declare that we are aware of the article "AGING OF THE NORMAL OCCLUSION" will be included in the Dissertation of the student Felicia Miranda and may not be used in other works of Graduate Programs at the Bauru School of Dentistry, University of São Paulo. Bauru, 30 de Novembro 2016. Felicia Miranda ronda Author Signature Daniela Garib Author Signature Guilherme Janson -Signature Author mila da Silveira Mararo Camila Massaro Author Signature José Fernando Castanha Henriques Author atur a Marcos Roberto de Freitas Author gnature



ANNEX A – Ethics Committee approval, protocol number 1.051.388 (front)



DADOS DO PROJETO DE PESQUISA

Titulo da Pesquisa: Availação da maturação da oclusão normal e da oclusão tratada após 40 anos de acompanhamento

Pesquisador: Felicia Miranda Area Temàtica: Versão: 1 CAAE: 43931915.4.0000.5417 Instituição Proponente: Universidade de Sao Paulo Patrooinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 1.051.388 Data da Relatoria: 29/04/2015

Aprecentação do Projeto:

O Projeto de pesquisa "Avaliação da maturação da oclusão normal e da oclusão tratada após 40 anos de acompanhamento" de autoria de Felicia Miranda e Camila da Silveira Massaro com orientação da Profa. Dra. Daniela Gamba Garib Carreira e do Professor Colaborador: Prof. Dr. Guilherme Janson O objetivo deste estudo será comparar as alterações maturacionais da oclusão normal e tratada, no periodo de 40 anos, por meio de mensurações dimensionais e referenciais gualitativos.

A amostra será selecionada a partir de um grupo de 82 pacientes brasileiros, de origem mediterránea, que apresentavam oclusão normal, cujos modelos iniciais foram coletados na década de 70. As documentações ortodónticas presentes no Arquivo da Disciplina de Ortodontia da Facuidade de Odontologia de Bauru / USP serão analisados visando a obtenção de uma amostra composta de indivíduos de ambos os sexos. Para a coleta

dessa amostra, foi utilizado como critério de inclusão no grupo: a presença de um modelo de gesso inicial, dentadura permanente completa (todos os dentes em oclusão com exceção aos terceiros molares), presença de todos os dentes permanentes, presença de uma relação molar e relação canino de Classe I, ausência e/ou apinhamento suave, trespasse vertical e horizontal positivos (dentro dos parâmetros normais), e não tratados ortodonticamente. Durante os anos de

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Pégia 01 de Dé

ANNEX A – Ethics Committee approval, protocol number 1.051.388 (VERSO)



Photo Chile 04

ANNEX A – Ethics Committee approval, protocol number 1.051.388 (front)



ANNEX A – Ethics Committee approval, protocol number 1.051.388 (VERSO)



ANNEX B – Informed consent.



Universidade de São Paulo Faculdade de Odontologia de Bauru Departamento de Odontopediatria, Ortodontia e Saúde Coletiva Disciplina de Ortodontia

Termo de Consentimento Livre e Esclarecido

Você está sendo convidado a participar como voluntário da pesquisa:

"Avaliação da maturação da oclusão normal e da oclusão tratada após 40 anos de acompanhamento",

cujos objetivos e justificativas são comparar as alterações maturacionais da oclusão normal natural e oclusão tratada com aparelho ortodôntico em um período de 40 anos por meio de modelos dentários e fotografias.

Para tanto, será necessário realizar um procedimento de moldagem, o qual resultará na obtenção de modelos de estudos que serão utilizados para avaliar aspectos do amadurecimento da oclusão Além disso, serão realizadas fotografias intrabucais (frente e lateral do sorriso) e extrabucais (frente e lateral da face),para complementar a avaliação acima descrita e será solicitado que você responda um breve questionário em relação à satisfição com seu sorriso de maneira geral. Todos os voluntários serão submetidos aos mesmos procedimentos, independente do grupo ao qual pertencerá (com ou sem tratamento ortodôntico prévio). Os modelos e fotografias obtidos serão comparados com sua documentação ortodôntica da década de 70 arquivada no Departamento da Disciplina de Ortodontia da Faculdade de Odontologia de Bauru, USP.

Sobre os procedimentos, o questionário é de resolução simples e terá uma duração aproximada de cinco minutos. Fotografias e moldagens são procedimentos rápidos efazem parte da rotina odontológica. O procedimento de moldagem apresenta como risco o desconforto, que pode ocorrer devido a sensação de ânsia. Você receberá orientações específicas para não sentir ânsia durante a moldagem e se mesmo assim acontecer, as profissionais saberão como aliviar seu desconforto imediatamente, inclusive interrompendo o procedimento se necessário. Em relação as fotografias, as mesmas serão utilizadas neste trabalho respeitando a sua privacidade. É importante que você saiba que sua privacidade será respeitada, ou seja, seu nome ou qualquer outro dado que possa, de qualquer forma, identificá-lo, será mantido em sigilo.

A consulta será realizada por duas cirurgiãs-dentistas com formação em Ortodontia que irão orientálo (a) sobre cuidados gerais com a saúde bucal, com o benefício de orientá-los quanto a necessidade de qualquer tipo de tratamento odontológico que se faça necessário e, estarão à disposição para eventuais questionamentos. Não será oferecida remuneração, auxílio para alimentação ou transporte até o local no dia do atendimento. É garantido a indenização em casos de danos que ocorram decorrentes dos procedimentos empregados nesta pesquisa. Você poderá deixar de participar da pesquisa a qualquer momento sem sofrer prejuízos, retirando, então, seu consentimento, sem precisar justificar

As pesquisadoras envolvidas com o referido projeto são Folicia Miranda e Camila da Silveira Massaro e com elas você poderá manter contato viae-mail: felicia.miranda@usp.br (Dr* Felicia) / camilamassaro@usp.br (Dr* Camila) ou telefone: (14) 98173 1239 (Dr* Felicia) / (14) 99715 6465 (Dr* Camila).

É assegurado o esclarecimento de dúvidas durante toda pesquisa, bem como será garantido o livre acesso a todas as informações e esclarecimentos adicionais sobre o estudo.

FUBRICA (Desquise Página 1 de 2

Por estarmos de acordo com o presente termo o firmanos em duas vias igualmente válidas (una via para o participante da pesquisa e outra para o pesquisador) que serão nubricadas em todas as suas páginas e assinadas ao seu término, conforme o disposto pela Resolução CNS nº 466 de 2012, items IV.3.f e IV.5.4. RUBRICA (pacciente): RUBRICA (pesquisadoras):

ANNEX B – Informed consent.

presente

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exigências

Por fim, como pesquisador(a) responsável pela pesquisa, DECLARO o cumprimento do disposto na Resolução CNS nº 466 de 2012, contidos nos itens IV.3 e IV.5.a e, na integra com a resolução CNS nº 466 de dezembro de 2012.

Por estarmos de acordo com o presente termo o firmamos em duas vias igualmente válidas (uma via para o participante da pesquisa e outra para o pesquisador) que serão rubricadas em todas as suas páginas e assinadas ao seu término, conforme o disposto pela Resolução CNS nº 466 de 2012, itens IV.3 f e IV.5.d.

Bauru, ____ de ______.

legais.

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Sr

(a)

Assinatura do Sujeito da Pesquisa

Felicia Miranda Pesquitadora responsável (felicia miranda@usp.br/(14)98173 1239) Camila da Silveira Massaro Pesquisadora responsável (camilamassaro@usp.br / (14) 99715 6465)

O Comitê de Ética em Pesquisa – CEP, organizado e criado pela FOB-USP, em 29/06/98 (Portaria GD/0698/FOB), previsto no item VII da Resolução nº 466/12 do Conselho Nacional de Saúde do Ministério da Saúde (publicada no DOU de 13/06/2013), é um Colegiado interdisciplinar e independente, de relevância pública, de caráter consultivo, deliberativo e educativo, criado para defender os interesses dos participantes da pesquisa em sua integridade e dignidade e para contribuir no desenvolvimento da pesquisa dentro de padrões éticos.

Qualquer denúncia e/ou reclamação sobre sua participação na pesquisa poderá ser reportada a este CEP:

Horário e local de funcionamento:

Comité de Ética em Pesquisa Faculdade de Odontologia de Bauru-USP - Prédio da Pós-Graduação (bloco E - pavimento superior), de segunda à sexta-feira, no boeirio das 13h30 às 17 horas, em dias úteis. Alameda Dr. Octávio Pinheiro Brisolla, 9-75 Vila Universitária – Bauru – SP – CEP 17012-901 Telefone/FAX(14)3235-8356 e-mail: central de presente de la constante de la

RUBRICA (paciente):

RUBRICA (pesquisadoras):

Página 2 de 2