

UNIVERSIDADE DE SÃO PAULO  
FACULDADE DE ODONTOLOGIA DE BAURU

HENRIQUE CAMPOS ETO

**Aging and erosive tooth wear in subjects with normal occlusion:  
a 47-year follow-up**

**Envelhecimento e desgaste erosivo dentário em indivíduos com  
oclusão normal: 47 anos de acompanhamento**

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Orientadora: Prof<sup>a</sup>. Dr<sup>a</sup>. Daniela Gamba Garib Carreira

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## FOLHA DE APROVAÇÃO





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Dedico este trabalho aos meus pais, minha mãe Ana como exemplo de dedicação e bondade ao próximo e meu pai Luiz Henrique, pelo profissionalismo e integridade. Minha eterna admiração e agradecimento.

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*“Como é importante sonhar juntos! (...) Sozinho, corres o risco de ter miragens, vendo aquilo que não existe, é junto que se constroem os sonhos”.*

***Papa Francisco***

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## ABSTRACT

### **Aging and erosive tooth wear in subjects with normal occlusion: a 47-year follow-up**

**Introduction:** The aim of this study was to assess the erosive tooth wear (ETW) occurred along five decades, from adolescence to 60 years of age, in subjects with normal occlusion; and to evaluate the predictive potential of ETW index in adolescence or early adulthood as a discriminator factor of ETW degree in the mature adulthood.

**Methods:** The sample consisted of digital dental models of 23 subjects with natural normal occlusion (10 female, 13 male) and no need of orthodontic treatment. Dental models were taken longitudinally at 13 (T1), 17 (T2) and 60 years of age (T3). Evaluation of ETW was performed using a modified BEWE index (The Basic erosive wear examination). Interphase changes were evaluated using Friedman test and Dunn's Method. Logistic regression was used to assess the influence of sex, dental arch, tooth and dental surfaces on the degree of ETW. Linear regression was used to evaluate if ETW degree in T1 and T2 could discriminate the degree of ETW in T3. The significance level adopted was 5%.

**Results:** Erosive tooth wear showed a significant increase with aging. The median ETW index at T1, T2 and T3 was 2, 4 and 7, respectively. Erosive tooth wear was greater in male, in the incisors and canines and in the occlusal and lingual surfaces. No differences were found between the maxillary and mandibular teeth. The ETW index at 17 years of age (T2) was an adequate predictive factor of tooth wear at 60 years of age. The critical limit for BEWE score at T2 was 4.

**Conclusions:** Erosive tooth wear significantly increased during aging in subjects with normal occlusion. The greater the degree of tooth wear at early adulthood, the greater the degree of tooth wear at mature adulthood. Preventive care should be recommended during early adulthood for patients with a critical BEWE greater than 4.

**Keywords:** Tooth wear, aging, dental models, diagnosis, Longitudinal Studies

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## RESUMO

### **Envelhecimento e desgaste erosivo dentário em indivíduos com oclusão normal: 47 anos de acompanhamento**

**Introdução:** O objetivo deste estudo foi avaliar o desgaste dentário erosivo (ETW) ocorrido ao longo de cinco décadas, da adolescência aos 60 anos de idade, em indivíduos com oclusão normal; e avaliar o potencial preditivo do índice ETW na adolescência ou início da idade adulta como fator discriminador do grau ETW na vida adulta madura. **Materiais e métodos:** A amostra foi composta por modelos odontológicos digitais de 23 indivíduos com oclusão normal natural (10 mulheres, 13 homens) e sem necessidade de tratamento ortodôntico. Os modelos dentários foram obtidos longitudinalmente aos 13 (T1), 17 (T2) e 60 anos de idade (T3). A avaliação de ETW foi realizada usando um índice BEWE modificado (The Basic erosive wear examination). As mudanças na interfase foram avaliadas usando os testes de Friedman e o método de Dunn. A regressão logística foi usada para avaliar a influência do sexo, arcada dentária, dente e superfícies dentais no grau de ETW. A regressão linear foi usada para avaliar se o grau de ETW em T1 e T2 poderia discriminar o grau de ETW em T3. O nível de significância adotado foi de 5%. **Resultados:** O desgaste dentário erosivo aumentou significativamente com o envelhecimento. A mediana do índice de ETW em T1, T2 e T3 foi de 2, 4 e 7, respectivamente. O desgaste dentário erosivo foi maior no sexo masculino, nos incisivos e caninos e nas faces oclusal e lingual. Não foram encontradas diferenças entre os dentes superiores e inferiores. O índice ETW aos 17 anos (T2) foi um fator preditivo adequado de desgaste dentário aos 60 anos. O limite crítico para pontuação BEWE em T2 foi 4. **Conclusões:** O desgaste dentário erosivo aumentou significativamente durante o envelhecimento em indivíduos com oclusão normal. Quanto maior o grau de desgaste dentário no início da idade adulta, maior será o grau de desgaste dentário na idade adulta madura. Cuidados preventivos devem ser recomendados durante o início da idade adulta para pacientes com BEWE crítico maior que 4.

**Palavras-chave:** Desgaste dentário, envelhecimento, modelos dentários, diagnóstico, estudos longitudinais.

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## LIST OF ABBREVIATIONS AND ACRONYMS

ETW	Erosive tooth wear
T1	Timing 1
T2	Timing 2
T3	Timing 3
BEWE	Basic erosive wear examination
CPI	Community periodontal index



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# **1 INTRODUCTION**

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## 1 INTRODUCTION

Erosive tooth wear (ETW) is a global problem demonstrating an increasing prevalence over time. (HOLBROOK; ARNADOTTIR; HLOETHVERSSON; ARNARSDOTTIR *et al.*, 2014; VERED; LUSSI; ZINI; GLEITMAN *et al.*, 2014) Several studies have evaluated, (ARNADOTTIR; HOLBROOK; EGGERTSSON; GUDMUNDSDOTTIR *et al.*, 2010; DUGMORE; ROCK, 2003; GANSS; KLIMEK; GIESE, 2001; HOLBROOK; ARNADOTTIR; HLOETHVERSSON; ARNARSDOTTIR *et al.*, 2014; VAN'T SPIJKER; RODRIGUEZ; KREULEN; BRONKHORST *et al.*, 2009; VERED; LUSSI; ZINI; GLEITMAN *et al.*, 2014) but there has never been a longitudinal assessment and analysis over four decades of tooth wear. Understand the characteristics and evolution during aging has become an important tool for the correct diagnosis, for differ between physiological and pathological and serving as parameters to decide for the best treatment or for monitoring its evolution. Researchers do not know yet if the wear pattern changes with time and the influence of natural aging on occlusion. Etiological factors are multifactorial. Throughout life, teeth are exposed to a broad spectrum of physical and chemical injuries, which contributes to a wide range of tooth wear. (GANSS, 2006; LUSSI; SCHLUETER; RAKHMATULLINA; GANSS, 2011) Chemical factors can be extrinsic or intrinsic as the use of types of food acids an reflux and regurgitation, respectively. (MOAZZEZ; ANGGIANSAH; BARTLETT, 2005) Parafunctional habits as bruxism and regular mastication are mechanical or physical factors. (GRIPPO, 1991; SHAH; RAZAVI; BARTLETT, 2009; THORDARSON; ZACHRISSON; MJOR, 1991)

The origin of ETW is attributed to abrasion, erosion and attrition mechanisms. The occurrence of two or more different processes at different times or simultaneously increases the complexity of tooth wear. (BRKIC; MILICEVIC; PETROVECKI, 2006; D'INCAU; COUTURE; MAUREILLE, 2012; KREULEN; VAN 'T SPIJKER; RODRIGUEZ; BRONKHORST *et al.*, 2010; SMITH; BARTLETT; ROBB, 1997) Interactions in chemical/biological, behavioral, socioeconomic and educational factors were previously reported for tooth wear development. (BARTLETT; FARES; SHIRODARIA; CHIU *et al.*, 2011; BASSED, 2012; GRIMOUD; ROBERTS; BOIMOND; SEVIN *et al.*, 2012; KULLMAN, 1995; LUSSI, 2006) Other local factors, such as

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multiple tooth loss, parafunctional habits, changes in mandibular movement patterns can also influence the process. (BERNHARDT; GESCH; SPLIETH; SCHWAHN *et al.*, 2004; D'INCAU; COUTURE; MAUREILLE, 2012; DONACHIE; WALLS, 1995; KULLMAN, 1995) It is not yet clear whether there is a natural cumulative process that progresses throughout life or the wear of the activity rate changes depending on the impact of risk factors. (BARTLETT, 2016) There is even some evidence that the erosive wear in the deciduous dentition works as a predictor of the same process in the permanent dentition. (GANSS; YOUNG; LUSSI, 2011) Little is known about signs and symptoms, and difficult to correlate the progression and prevention of activity. (BARTLETT, 2016)

It is believed that throughout life, dental arches change due to maturation and growth, resulting from a compensatory mechanism, to maintain the structural balance of the face and dentition. (BISHARA; TREDER; JAKOBSEN, 1994; TIBANA; PALAGI; MIGUEL, 2004) Previous studies show continuity even after modifications of the occlusal maturity reached after the eruption of the second molar, (MASSARO; MIRANDA; JANSON; DE ALMEIDA *et al.*, 2018; MIRANDA; MASSARO; JANSON; DE FREITAS *et al.*, 2019) which extends into the sixth decade of life. (TSIOPAS; NILNER; BONDEMARK; BJERKLIN, 2013) Therefore, the study of these changes is very important to the prediction of long-term changes. Documented changes in normal occlusion during aging consist of increased clinical crown and increased anterior crowding, among other changes. However, tooth wear during aging in normal occlusion has not been documented yet in the literature.

With the advent of the technology, the digital models, research and clinical practice were very benefited. The proven accuracy and reproducibility of the measurements taken from images obtained with specific software mark their importance in the quantitative nature of research, (LEIFERT; LEIFERT; EFSTRATIADIS; CANGIALOSI, 2009; THIRUVENKATACHARI; AL-ABDALLAH; AKRAM; SANDLER *et al.*, 2009) such as decreasing the variability intra and interexaminers, (DALSTRA; MELSEN, 2009) increasing the reliability of the results obtained by the reduction of subjectivity. (DOWLING; BURNS; MACAULEY; GARVEY *et al.*, 2013) Thus, it is possible to overlap models, increasing the visualization of changes in growth, development and aging with or without orthodontic treatment.

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(DALSTRA; MELSEN, 2009; MILLER; KUO; CHOI, 2003; THIRUVENKATACHARI; AL-ABDALLAH; AKRAM; SANDLER *et al.*, 2009)

The quantification of tooth wear is challenging. (BARTLETT; GANSS; LUSI, 2008; GANSS; YOUNG; LUSI, 2011; MILOSEVIC, 2011; YOUNG; AMAECHI; DUGMORE; HOLBROOK *et al.*, 2008) There are several indexes used to score tooth wear. BEWE index or the Basic Erosive Wear Examination was idealized by Bartlett and represent a simple and accurate tool for assessing tooth wear, guiding treatment decisions. (BARTLETT; GANSS; LUSI, 2008) In a clinical point of view, the index should be repeated once a year in patients presenting risk factors. For Bartlett (2008) is very difficult to discern and separate the three mechanisms that compose the wear, using currently the term “dental erosive wear” as a standard term of reference. (BARTLETT; GANSS; LUSI, 2008) Later in Workshop Organized by the ORCA and the Cariology Research Group of the IADR in 2019 some terms were recommended for use. In this event, the term erosive tooth wear (ETW) was defined and standardized. The BEWE index (The Basic Erosive Wear Examination), introduced by Bartlett in 2008, aims to be simple, straightforward, repeatable and transferable to the daily life and help in the aid of the best treatment decisions. (BARTLETT; GANSS; LUSI, 2008) The results of BEWE would lead to conduct including the identification and elimination of etiologic factors, prevention, and monitoring, as well as the symptoms and appropriate intervention. Normally the index can be repeated once a year, at least in cases of people with risk factors, which is indicated to repeat every 6 months.

In order to prevent, it is advised a dietary control, use of fluoride, toothpaste base calcium and desensitizing. (BARTLETT, 2016) In the case of patients with reflux, without symptoms, the classification of the etiology is difficult to identify. Special attention should be given in history and wear once diagnosed, should be referred to as a medical evaluation. (BARTLETT, 2016) In patients with bruxism, early diagnosis is very important and can prevent wear reaches deeper layers of the teeth. (BARTLETT, 2016)

Most previous studies on erosive tooth wear consisted of transverse and longitudinal short-term studies. No studies described the pattern of tooth wear over 4 decades. Nor samples were characterized by a natural normal occlusion, and most studies using untreated samples for malocclusions. Thus, there is a literary gap in

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understanding the erosive wear of longitudinal changes during aging of normal occlusion to define the prognostic and therapeutic approach. Besides, it is necessary to contribute to the definition of pathological and physiological occlusion in aged, aiming preventive and curative therapeutic goals. It is also necessary to set early predictors of pathological wear at advanced ages in an attempt to establish preventive measures for high-risk individuals wear accentuated along the years.

Most previous studies on erosive tooth wear were transverse and longitudinal short-term studies. No studies described the pattern of tooth wear over four decades of life. The identification of early predictors of erosive tooth wear at mature chronological is essential to establish preventive measures for high-risk individuals since the early permanent dentition. Then, this study followed subjects with normal occlusion for 47 years, in order to exclude possible occlusal interferences and factors related to malocclusion in order to better understand what happened with tooth wear with aging. There are several works that explain the terms physiological and pathological dental wear, but without long-term monitoring and without differentiating their characteristics and consequences. Understand the aging of occlusion through tooth wear seems to be well supported and with gap in contemporary literature. For the absence of a study in the literature reporting this monitoring of tooth wear in aging, this study aims to assess the level of tooth wear and its evolution over 47 years using the BEWE index. In this context the BEWE was divided into classification according to gravity trying to make a parallel with pathogenicity. Using the score results, this study analyzed the tooth wear in tooth region, surface, sex and dental arch. Therefore, this study aimed to assess the erosive tooth wear (ETW) occurred along five decades, from adolescence to 60 years of age, in subjects with normal occlusion; and to evaluate the predictive potential of ETW index in adolescence or early adulthood as a discriminator factor of ETW degree in the mature adulthood. We hypothesized that mature adults with severe tooth wear have earlier indicators of tooth wear when ETW indexes are applied.

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## **2 ARTICLE**

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## **2 ARTICLE**

The article presented in this Dissertation was formatted according to the Journal Dental Research instructions and guidelines for article submission.

## AGING AND EROSIVE TOOTH WEAR IN SUBJECTS WITH NORMAL OCCLUSION: A 47-YEAR FOLLOW-UP

### ABSTRACT

**Introduction:** The aim of this study was to assess the erosive tooth wear (ETW) occurred along five decades, from adolescence to 60 years of age, in subjects with normal occlusion; and to evaluate the predictive potential of ETW index in adolescence or early adulthood as a discriminator factor of ETW degree in the mature adulthood.

**Methods:** The sample consisted of digital dental models of 23 subjects with natural normal occlusion (10 female, 13 male) and no need of orthodontic treatment. Dental models were taken longitudinally at 13 (T1), 17 (T2) and 60 years of age (T3). Evaluation of ETW was performed using a modified BEWE index (The Basic erosive wear examination). Interphase changes were evaluated using Friedman test and Dunn's Method. Logistic regression was used to assess the influence of sex, dental arch, tooth and dental surfaces on the degree of ETW. Linear regression was used to evaluate if ETW degree in T1 and T2 could discriminate the degree of ETW in T3. The significance level adopted was 5%. **Results:** Erosive tooth wear showed a significant increase with aging. The median ETW index at T1, T2 and T3 was 2, 4 and 7, respectively. Erosive tooth wear was greater in male, in the incisors and canines and in the occlusal and lingual surfaces. No differences were found between the maxillary and mandibular teeth. The ETW index at 17 years of age (T2) was an adequate predictive factor of tooth wear at 60 years of age. The critical limit for BEWE score at T2 was 4. **Conclusions:** Erosive tooth wear significantly increased during aging in subjects with normal occlusion. The greater the degree of tooth wear at early adulthood, the greater the degree of tooth wear at mature adulthood. Preventive care should be recommended during early adulthood for patients with a critical BEWE greater than 4.

**KEYWORDS:** Tooth wear, aging, dental models, diagnosis, Longitudinal Studies

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## INTRODUCTION

Erosive tooth wear (ETW) is a global problem demonstrating an increasing prevalence over time (Holbrook et al. 2014; Vered et al. 2014). ETW is considered a physiological or pathological process during aging. Occlusal/incisal of all teeth and lingual aspects of incisors are the most affected areas (Ganss et al. 2011; Lussi 2006). Etiological factors are multifactorial. Throughout life, teeth are exposed to a broad spectrum of physical and chemical injuries, which contributes to a wide range of tooth wear (Ganss 2006; Lussi et al. 2011). Chemical factors can be extrinsic or intrinsic as the use of types of food acids and reflux and regurgitation, respectively (Moazzez et al. 2005). Parafunctional habits as bruxism and regular mastication are mechanical or physical factors (Shah et al. 2009; Thordarson et al. 1991).

The origin of ETW is attributed to abrasion, erosion and attrition mechanisms. The occurrence of two or more different processes at different times or simultaneously increases the complexity of tooth wear (d'Incau et al. 2012; Kreulen et al. 2010; Smith et al. 1997). Interactions in chemical/biological, behavioral, socioeconomic and educational factors were previously reported for tooth wear development (Bartlett et al. 2011; Grimoud et al. 2012; Lussi 2006). Other local factors, such as multiple tooth loss, parafunctional habits, changes in mandibular movement patterns can also influence the process (Bernhardt et al. 2004; d'Incau et al. 2012; Donachie and Walls 1995). It is not yet clear whether there is a natural cumulative process that progresses throughout life or the wear of the activity rate changes depending on the impact of risk factors (Bartlett 2016). There is even some evidence that the erosive wear in the deciduous dentition works as a predictor of the same process in the permanent dentition (Ganss et al. 2011). Little is known about signs and symptoms, and difficult to correlate the progression and prevention of activity (Bartlett 2016). The quantification of tooth wear is challenging (Bartlett et al. 2008; Ganss et al. 2011; Milosevic 2011; Young et al. 2008). There are several indexes used to score tooth wear. BEWE index or the Basic Erosive Wear Examination was idealized by Bartlett and represent a simple and accurate tool for assessing tooth wear, guiding treatment decisions (Bartlett et al. 2008). In a clinical point of view, the index should be repeated once a year in patients presenting risk factors.

Most previous studies on erosive tooth wear were transverse and longitudinal short-term studies. No studies described the pattern of tooth wear over four decades of life. The identification of early predictors of erosive tooth wear at mature chronological is essential to establish preventive measures for high-risk individuals since the early permanent dentition. Therefore, this study aimed to assess the erosive tooth wear (ETW) occurred along five decades, from adolescence to 60 years of age, in subjects with normal occlusion; and to evaluate the predictive potential of ETW index in adolescence or early adulthood as a discriminator factor of ETW degree in the mature adulthood. We hypothesized that mature adults with severe tooth wear have earlier indicators of tooth wear in adolescence or early adulthood when ETW indexes are applied.

## MATERIAL AND METHODS

This observational and longitudinal study was approved by the Ethics Committee on Human Research of Bauru Dental School, University of São Paulo, Brazil (protocol number: 22082019.4.0000.5417) and written consents were obtained from all subjects.

The sample of this study was selected among a sample of 82 white Brazilians (39 male, 43 female) with normal occlusion obtained from 1967 to 1974 at Bauru Dental

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School, University of Sao Paulo, Brazil. Dental models were obtained at 13 (T1) and 17 years of age (T2) at that time. All subjects had a clinically acceptable occlusion in the complete permanent dentition, dental and skeletal Class I relationships, no crossbites, normal overjet and overbite, and a maximum 2 mm of incisor crowding with no previous orthodontic treatment. All subjects were recalled from 2015 to 2016 and dental models were obtained at 60 years of age (T3). Thirty-eight patients were reached, and 29 subjects were enrolled (Figure 1). At T3, subjects with history of orthodontic treatment between T1 to T3 or absence of two or more teeth in each hemiarch were excluded. The final sample comprised 23 subjects (10 female, 13 male).

All dental models were digitized using a R700 3-dimensional scanner (3Shape, Copenhagen, Denmark). Using the software OrthoAnalyzer 3-dimensional software (3Shape, Copenhagen, Denmark), digital dental models were analyzed for erosive tooth wear using the modified BEWE index (Bartlett et al. 2008). As demonstrated in figure 2, BEWE scores vary from no surface loss (score 0), initial loss of enamel surface texture (score 1), distinct defect with dentine loss in less than 50% of the surface area (score 2) or dentine hard tissue loss with more than 50% of the surface area (score 3). All teeth were scored, except the second and third molars, implants and restored surfaces. The analyzed surfaces were the incisal/occlusal, buccal and lingual. The final score for each subject was calculated by recording the most severely affected surface in a sextant and adding the value of each sextant. Teeth were grouped by regions: incisors (central and lateral incisors), canines, premolars (first and second premolars) and molars (first molars). The assessment was conducted by two trained examiners (H.C.E., F.M.) in two time points. The training before the study commencement was conducted by a repeated examination of 19 photographs twice with a 30-day interval.

### **Statistical analyses**

For the error study, 20% of the sample was randomly re-measured by both raters after a 21-day interval. Intra and interexaminer reproducibility were evaluated using kappa coefficient (Landis and Koch 1977).

Normal distribution was evaluated using the Shapiro Wilk test. For tooth wear score, normal distribution was not found. Nonparametric statistics were selected. Tooth wear scores were described using median and interquartile range (IQR). The difference between the three time points was analyzed using Friedman test and Dunn's Method for multiple comparisons (Dunn 1961).

An ordinal logistic regression analysis was performed at T3 considering tooth wear as a dependent variable and sex, dental arch, teeth and surfaces as independent variables. A linear regression analysis was performed considering tooth wear at T3 as a dependent variable and tooth wear at T1 and T2 as independent variables. The critical BEWE index at T2 was calculated considering the minimum value of 95% confidence interval of subjects with a BEWE index greater than the median value at T3. The level of significance was set at 5%.

All the analyses were performed using SigmaPlot 12.0 (Systat Software Inc., San Jose, CA), Statistica 10.0 (StatSoft Inc., Tulsa, OK.) and Jamovi 1.2 (Computer Software Inc., Sydney, Australia).

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## RESULTS

Intra and interexaminer agreements were 0.90 and 0.91, respectively, presenting almost perfect agreement.

The erosive tooth wear increased significantly during aging (Table I). The median BEWE score in T1, T2 and T3 was 2, 4 and 7, respectively (Table I).

The logistic regression demonstrated that sex had an influence on erosive tooth wear in mature adulthood ( $p=0.003$ ). Male had more ETW than females with an odds ratio of 1.54 (Table II). Maxillary and mandibular dental arches were not a significant predictor of the tooth wear ( $P=0.086$ ) (Table II). The tooth region had an influence on erosive tooth wear at T3. Incisors and canines had, respectively, 4.72 and 2.26 increased chance of demonstrate ETW compared to premolars and molars (Table II). Tooth surface was also a discriminant factor for tooth wear at 60 years of age. Both incisal/occlusal aspect and lingual aspect had an increased chance of display ETW compared to the labial/buccal aspect with an odds ratio of 144.83 and 2.19, respectively (Table II).

The degree of tooth wear at 17 years of age was a predictive factor for severe tooth wear at 60 years of age (Table III). Subjects with greater tooth wear at T2 demonstrated more tooth wear at T3. The critical limit for BEWE score at T2 was the index 4 considering the lower limit of the 95% confidence interval of 3.69 (Table IV). Subjects with a BEWE score greater than 4 in the early adulthood had an increased risk of severe ETW in the mature adulthood.

## DISCUSSION

Tooth wear is a common and universal outcome during the aging process. No previous longitudinal study followed subjects with normal occlusion until the seventh decade of life to evaluate erosive tooth wear. A reproducible qualitative index was used in this study to assess ETW (Bartlett et al. 2008). BEWE index is a partial scoring system recording the most severely affected surface in each sextant. Compared to other classical indexes, the BEWE system showed an adequate reliability to score the severity of ETW (Margaritis et al. 2011; Mulic et al. 2010). Additionally, previous studies have shown a good accuracy of the BEWE index (Bartlett et al. 2019; Dixon et al. 2012; Olley et al. 2014). The assessment of BEWE index can be performed by direct oral examination, using dental photographs, conventional or digital dental models (Alaraudanjoki et al. 2017; Marro et al. 2018; Wohlrab et al. 2019). In our study using digital dental model, the inter and intraexaminer reproducibility of BEWE index was high. These results are in accordance with previous studies (Alaraudanjoki et al. 2017; Marro et al. 2018). One limitation of BEWE index is that the wear scored was not necessarily due to exclusive erosion process. The extension of wearing by attrition or abrasion is difficult to determine (Bartlett et al. 2008). In addition, the BEWE index do not differentiate a tooth wear at the level of the enamel or dentine because the surfaces are scored independently of the exposed structure.

A significant increase of BEWE score was observed both from 13 to 17 and from 17 to 61 years of age (Table 1). The total score increases during 47 years of follow up corresponded to five. These results corroborate previous studies showing an increase of the BEWE score with an increasing age (Arnadottir et al. 2010; Ganss et al. 2001; Holbrook et al. 2014; Vered et al. 2014). A previous transversal study assessed the severe tooth wear from 20 to 70 years of age and observed an increase of ETW of 3% to 17% (Van't Spijker et al. 2009). In mature ages, severe tooth wear involving large dentin exposure was demonstrated (Bartlett and O'Toole 2019).

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Men demonstrated a greater level of ETW compared to women (Table II). These results are in accordance to previous transversal and longitudinal studies (Arnadottir et al. 2010; El Aidi et al. 2008; Holbrook et al. 2014; Loureiro et al. 2015; McGuire et al. 2009). The explanation is related to a greater muscular strength and biting forces in men (Abu-Ghazaleh et al. 2013; El Aidi et al. 2008). We could speculate that the sexual difference in tooth wear can also be related to differences in food preferences and behavioral/lifestyle factors. Compared to women, men are more likely to prefer sour foods and beverages with lower pH levels (Dumith et al. 2012; Gambon et al. 2012). Very intense physical activities might cause changes in saliva composition and a decrease in salivary flow (Chicharro et al. 1998; Dumith et al. 2012; Mulic et al. 2012). Conversely, in other studies, sex was not an associated factor for ETW prevalence (Auad et al. 2007; Kumar et al. 2013; Vered et al. 2014; Zhang et al. 2014). Two previous studies also reported a higher prevalence of ETW in women, probably because the sample was younger than the sample of our study including subjects from 6 to 14 years of age (Kunzel et al. 2000; Wang et al. 2010).

Both dental arches were equally affected by tooth wear, corroborating other studies (Liu et al. 2014; Sun et al. 2017). On the other hand, previous studies reported a greater ETW in the maxilla compared to the mandible (Liu et al. 2014; Milosevic and Lo 1996; Schierz et al. 2014). The opposite situation was presented in other studies, where the ETW in the mandible was greater compared to the maxilla (Liu et al. 2014; McGuire et al. 2009). A probable explanation of our results showing similar ETW in the maxillary and mandibular dental arches is the masticatory reciprocity.

The more affected teeth in our study were the incisors and the canines. Molar and premolars showed a similar level of tooth wear (Table II). Previous studies also reported a predominance of tooth wear in the anterior teeth (Auad et al. 2007; Marro et al. 2020; Vered et al. 2014; Wang et al. 2010). In contrast, other studies have found more ETW in the posterior teeth (Ab Halim et al. 2018; Arnadottir et al. 2010; Bartlett et al. 2013). One of the possible explanations for the increased erosive tooth wear in the incisors and canines in our study is the functional occlusion (Schierz et al. 2014). The anterior and lateral excursions of the mandible during function are usually guided by the incisors and canines, respectively. Incisors and canines also have a restricted incisal surface for occlusal force and attrition distribution. Other explanations for the higher degree of tooth wear observed in the incisors and canines is that function and parafunction require more of the anterior than the posterior teeth (Liu et al. 2014).

When tooth surfaces were analyzed, incisal/occlusal aspects were the most affected (Table II). Previous studies demonstrated similar results (El Aidi et al. 2008; Jaeggi and Lussi 2006; McGuire et al. 2009; Sun et al. 2017; Wang et al. 2010). Conversely, the palatal aspect of maxillary anterior teeth together with the occlusal aspect of mandibular first molars were the most affected regions in a previous study (El Aidi et al. 2008). Other studies found the buccal surface as the most affected tooth surface (Ab Halim et al. 2018; Gurgel et al. 2011). The consumption of erosive drinks and foods was also shown to be strongly associated with erosion on the facial and occlusal surfaces, while severe palatal erosion occurred highly associated with chronic vomiting (Lussi et al. 1991). In our sample, the predominance of incisal/occlusal wear might be related to masticatory function and aging (Wang et al. 2010). Parafunctional habits might also have influenced the incisal/occlusal tooth wear (Wang et al. 2010).

Nystrom et al. reported that tooth wear of primary anterior teeth at 5 years of age demonstrated low predictive value for tooth wear at 18 years of age, whereas wear at 14 years of age had a predictive value (Nystrom et al. 1990). In the present study, 13-year-old and 17-year-old tooth wear were used to predict the degree of tooth wear

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at 61 years of age. The outcomes demonstrated that only the BEWE score at 17 years of age was a predictor factor for severe tooth wear at 61 years of age (Table III). The critical limit for BEWE score at T2 was 4. Therefore, subjects with a BEWE score greater than 4 in the early adulthood might have an important risk indicator of severe ETW in mature adulthood. Tooth wear is part of the natural aging process. However, diet habits might accelerate the erosive tooth wear. Preventive care is desirable to avoid pain, esthetic impairment and functional consequences. Identifying risk factors that increases tooth wear is an important task for preventive aging care. In view of this study outcomes, when a young adult in the permanent dentition is identified with a BEWE score greater than 4, an investigation should be performed. A detailed anamnesis evaluating the history of diseases, use of medications, drink and diet habits and presence of parafunctions should be accomplished. Orientation and restoration of the incisal edges is recommended (Loomans et al. 2017).

The limitations of this study were the difficulties related to collecting longitudinal data (Bishara et al. 1996; Elling Berg et al. 2008; Tibana et al. 2004). This study comprised an extensive follow-up period and had some enrollment limitations as shown in Figure 1. Other limitation was related to dental conditions at the mature adulthood (T3) when many tooth losses and prosthesis were observed. The rate of tooth losses corresponded to 3.09 teeth per subject and was greater compared with previous studies (Bishara et al. 1996; Elling Berg et al. 2008). The possible explanations for the high index of tooth losses were the long follow-up period and the absence of water fluoridation in our city until 1975 when the dental development of the sample subjects was completed. Future longitudinal studies should assess the erosive tooth wear associated to functional occlusion, diet and lifestyle.

## **CONCLUSION**

A significant increase in erosive tooth wear occurred with aging. From the second to the seventh decade of life, males, incisors/canines and the incisal/buccal aspects were more affected by erosive tooth wear. No differences were observed between the maxillary and mandibular dental arches. The greater the degree of tooth wear at early adulthood, the greater the degree of tooth wear at mature adulthood. Preventive care should be recommended in early adult subjects with a critical BEWE index greater than 4.

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**FIGURE LEGENDS**

Figure 1. Flow chart

Figure 2. BEWE index. Score 1 (A), Score 2 (B), Score 3 (C), Score 4 (D)

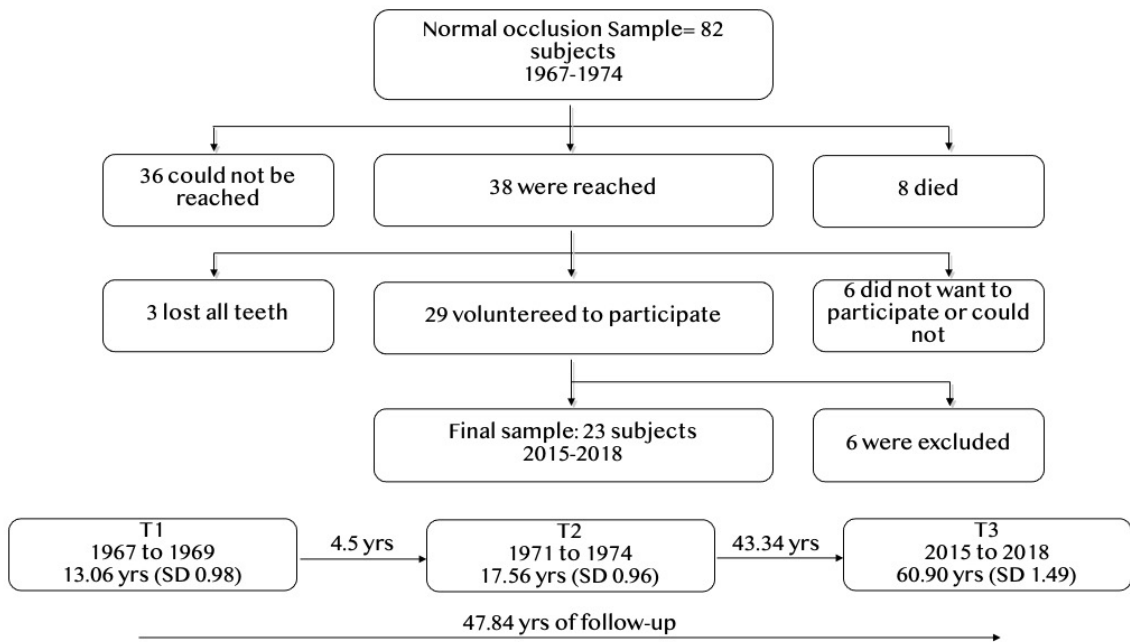


Figure 1.

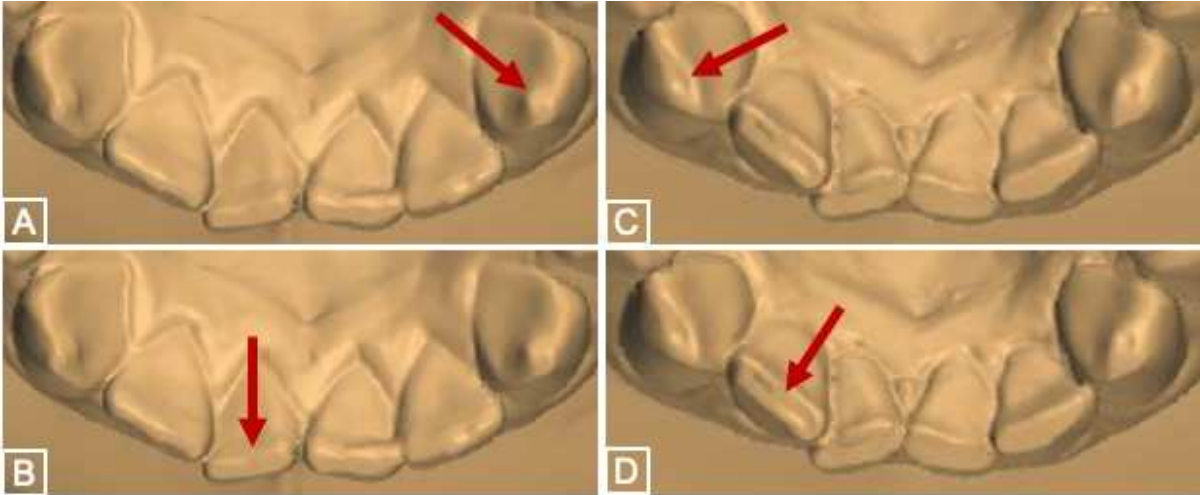


Figure 2.

Table I. Interphase changes for the modified BEWE score (Friedman test and Dunn's method)

	T1 – 13 years			T2 – 17 years			T3 – 61 years			P value
<b>BEWE score</b>	<b>Median</b>	<b>25%</b>	<b>75%</b>	<b>Median</b>	<b>25%</b>	<b>75%</b>	<b>Median</b>	<b>25%</b>	<b>75%</b>	
	2.00 <sup>A</sup>	1.00	2.00	4.00 <sup>B</sup>	3.00	5.00	7.00 <sup>C</sup>	5.00	10.00	<0.001*

Different letters represent statistically significant differences

\*Statistically significant at P<0.05

A, B, C Dunn's Method

Table II. Influence of sex, dental arch, tooth region and dental surface on the erosive tooth wear at T3 (Ordinal logistic regression)

Predictor	Estimate	SE	Z	P value	Odds ratio	95% CI		
						Lower	Upper	
Sex (male versus female)	0.43	0.14	3.02	0.003*	1.54	1.16	2.03	
Dental arch (maxillary versus mandibular)	0.24	0.14	1.72	0.086	1.27	0.97	1.66	
Tooth Region	Incisor- premolar	1.51	0.19	8.13	<0.001*	4.72	3.26	6.90
	Canine- premolar	0.82	0.21	3.80	<0.001*	2.26	1.49	3.45
	Molar-premolar	0.58	0.34	1.71	0.087	1.78	0.90	3.39
Surface	Incisal/occlusal- buccal	4.98	0.24	20.94	<0.001*	144.83	91.91	233.45
	Lingual-buccal	0.78	0.18	4.33	<0.001*	2.19	1.54	3.13

\*Statistically significant at  $P < 0.05$

Table III. Influence of the degree of tooth wear at T1 and T2 in the severity of tooth wear at T3 (Linear regression)

<b>Predictor</b>	<b>Estimate</b>	<b>SE</b>	<b>t</b>	<b>P value</b>
BEWE – T1	0.06	0.09	0.68	0.493
BEWE – T2	1.05	0.05	22.80	<0.001*

\*Statistically significant at  $P < 0.05$

Table IV. Comparisons of erosive tooth wear at early adulthood (T2) between subgroups with a ETW below and above the median at mature adulthood (T3) (t-test)

<b>Groups</b>	<b>N</b>	<b>Mean</b>	<b>Std Dev</b>	<b>P value</b>	<b>95% CI</b>	
					Lower	Upper
Below median	13	3.308	1.182	0.018*	2.59	4.02
Above median	10	4.700	1.418		3.69	5.71

\*Statistically significant at  $P < 0.05$

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## **3 DISCUSSION**

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### 3 DISCUSSION

Population aging is a global trend, and the percentage of older individuals is expected to more than double over the next half century. (UNITED NATIONS; AFFAIRS, 2002) Aging is defined as the cumulative and progressive change that occurs with time, causing deterioration in structural integrity, as well as increase in disease susceptibility and debilitated function. (LÓPEZ-OTÍN; BLASCO; PARTRIDGE; SERRANO *et al.*, 2013) Tooth wear is a common and universal outcome during the aging process. No previous longitudinal study followed subjects with normal occlusion until the seventh decade of life to evaluate erosive tooth wear. A reproducible qualitative index was used in this study to assess ETW. (BARTLETT; GANSS; LUSSE, 2008) BEWE index is a partial scoring system recording the most severely affected surface in each sextant. Compared to other classical indexes, the BEWE system showed an adequate reliability to score the severity of ETW. (MARGARITIS; MAMAI-HOMATA; KOLETSI-KOUNARI; POLYCHRONOPOULOU, 2011; MULIC; TVEIT; WANG; HOVE *et al.*, 2010) The assessment of BEWE index can be performed by direct oral examination, using dental photographs, conventional or digital dental models. (ALARAUDANJOKI; SAARELA; PESONEN; LAITALA *et al.*, 2017; MARRO; DE LAT; MARTENS; JACQUET *et al.*, 2018; WOHLRAB; FLECHTENMACHER; KRISAM; SAURE *et al.*, 2019) In our study using digital dental model, the inter and intraexaminer reproducibility of BEWE index was high. One limitation of BEWE index is that the wear scored was not necessarily due to exclusive erosion process. The extension of wearing by attrition or abrasion is difficult to determine. (BARTLETT; GANSS; LUSSE, 2008) In addition, the BEWE index do not differentiate a tooth wear at the level of the enamel or dentine because the surfaces are scored independently of the exposed structure.

A significant increase of BEWE score was observed both from 13 to 17 and from 17 to 61 years of age (Table 1). The total score increases during 47 years of follow up corresponded to five. These results corroborate previous studies showing an increase of the BEWE score with an increasing age. (ARNADOTTIR; HOLBROOK; EGGERTSSON; GUDMUNSDOTTIR *et al.*, 2010; GANSS; KLIMEK; GIESE, 2001; HOLBROOK; ARNADOTTIR; HLOETHVERSSON; ARNARSDOTTIR *et al.*, 2014;

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VERED; LUSSI; ZINI; GLEITMAN *et al.*, 2014) A previous transversal study assessed the severe tooth wear from 20 to 70 years of age and observed an increase of ETW of 3% to 17%. (VAN'T SPIJKER; RODRIGUEZ; KREULEN; BRONKHORST *et al.*, 2009) In mature ages, severe tooth wear involving large dentin exposure was demonstrated. (BARTLETT; O'TOOLE, 2019)

Men demonstrated a greater level of ETW compared to women (Table II). These results are in accordance to previous transversal and longitudinal studies. (ARNADOTTIR; HOLBROOK; EGGERTSSON; GUDMUNDSDOTTIR *et al.*, 2010; EL AIDI; BRONKHORST; TRUIN, 2008; HOLBROOK; ARNADOTTIR; HLOETHVERSSON; ARNARSDOTTIR *et al.*, 2014; LOUREIRO; FAGER; ALVES; VAZ *et al.*, 2015; MCGUIRE; SZABO; JACKSON; BRADLEY *et al.*, 2009) The explanation is related to a greater muscular strength and biting forces in men. (ABU-GHAZALEH; BURNSIDE; MILOSEVIC, 2013; EL AIDI; BRONKHORST; TRUIN, 2008) We could speculate that the sexual difference in tooth wear can also be related to differences in food preferences and behavioral/lifestyle factors. Compared to women, men are more likely to prefer sour foods and beverages with lower pH levels. (DUMITH; GIGANTE; DOMINGUES; HALLAL *et al.*, 2012; GAMBON; BRAND; VEERMAN, 2012) Very intense physical activities might cause changes in saliva composition and a decrease in salivary flow. (CHICHARRO; LUCIA; PEREZ; VAQUERO *et al.*, 1998; DUMITH; GIGANTE; DOMINGUES; HALLAL *et al.*, 2012; MULIC; TVEIT; SONGE; SIVERTSEN *et al.*, 2012) Conversely, in other studies, sex was not an associated factor for ETW prevalence. (AUAD; WATERHOUSE; NUNN; STEEN *et al.*, 2007; KUMAR; ACHARYA; MISHRA; DEBNATH *et al.*, 2013; VERED; LUSSI; ZINI; GLEITMAN *et al.*, 2014; ZHANG; CHAU; LO; CHU, 2014) Two previous studies also reported a higher prevalence of ETW in women, probably because the sample was younger than the sample of our study including subjects from 6 to 14 years of age. (KUNZEL; CRUZ; FISCHER, 2000; WANG; LIN; CHEN; LIANG, 2010)

Both dental arches were equally affected by tooth wear, corroborating other studies. (LIU; ZHANG; CHEN; YAO, 2014; SUN; WANG; WANG; SHI *et al.*, 2017) On the other hand, previous studies reported a greater ETW in the maxilla compared to the mandible. (LIU; ZHANG; CHEN; YAO, 2014; MILOSEVIC; LO, 1996; SCHIERZ; DOMMEL; HIRSCH; REISSMANN, 2014) The opposite situation was presented in other studies, where the ETW in the mandible was greater compared to the maxilla.

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(LIU; ZHANG; CHEN; YAO, 2014; MCGUIRE; SZABO; JACKSON; BRADLEY *et al.*, 2009) A probable explanation of our results showing similar ETW in the maxillary and mandibular dental arches is the masticatory reciprocity.

The more affected teeth in our study were the incisors and the canines. Molar and premolars showed a similar level of tooth wear (Table II). Previous studies also reported a predominance of tooth wear in the anterior teeth. (AUAD; WATERHOUSE; NUNN; STEEN *et al.*, 2007; MARRO; ARANGUIZ; RAMIREZ; LUSSI, 2020; VERED; LUSSI; ZINI; GLEITMAN *et al.*, 2014; WANG; LIN; CHEN; LIANG, 2010) In contrast, other studies have found more ETW in the posterior teeth. (AB HALIM; ESA; CHEW, 2018; ARNADOTTIR; HOLBROOK; EGGERTSSON; GUDMUNDSDOTTIR *et al.*, 2010; BARTLETT; LUSSI; WEST; BOUCHARD *et al.*, 2013) One of the possible explanations for the increased erosive tooth wear in the incisors and canines in our study is the functional occlusion. (SCHIERZ; DOMMEL; HIRSCH; REISSMANN, 2014) The anterior and lateral excursions of the mandible during function are usually guided by the incisors and canines, respectively. Incisors and canines also have a restricted incisal surface for occlusal force and attrition distribution. Other explanations for the higher degree of tooth wear observed in the incisors and canines is that function and parafunction require more of the anterior than the posterior teeth. (LIU; ZHANG; CHEN; YAO, 2014)

When tooth surfaces were analyzed, incisal/occlusal aspects were the most affected (Table II). Previous studies demonstrated similar results. (EL AIDI; BRONKHORST; TRUIN, 2008; JAEGGI; LUSSI, 2006; MCGUIRE; SZABO; JACKSON; BRADLEY *et al.*, 2009; SUN; WANG; WANG; SHI *et al.*, 2017; WANG; LIN; CHEN; LIANG, 2010) Conversely, the palatal aspect of maxillary anterior teeth together with the occlusal aspect of mandibular first molars were the most affected regions in a previous study. (EL AIDI; BRONKHORST; TRUIN, 2008) Other studies found the buccal surface as the most affected tooth surface. (AB HALIM; ESA; CHEW, 2018; GURGEL; RIOS; BUZALAF; DA SILVA *et al.*, 2011) The consumption of erosive drinks and foods was also shown to be strongly associated with erosion on the facial and occlusal surfaces, while severe palatal erosion occurred highly associated with chronic vomiting. (LUSSI; SCHAFFNER; HOTZ; SUTER, 1991) In our sample, the predominance of incisal/occlusal wear might be related to masticatory function and

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aging. (WANG; LIN; CHEN; LIANG, 2010) Parafunctional habits might also have influenced the incisal/occlusal tooth wear. (WANG; LIN; CHEN; LIANG, 2010)

Nystrom et al. reported that tooth wear of primary anterior teeth at 5 years of age demonstrated low predictive value for tooth wear at 18 years of age, whereas wear at 14 years of age had a predictive value. (NYSTROM; KONONEN; ALALUUSUA; EVALAHTI *et al.*, 1990) In the present study, 13-year-old and 17-year-old tooth wear were used to predict the degree of tooth wear at 61 years of age. The outcomes demonstrated that only the BEWE score at 17 years of age was a predictor factor for severe tooth wear at 61 years of age (Table III). The critical limit for BEWE score at T2 was 4. Therefore, subjects with a BEWE score greater than 4 in the early adulthood might have an important risk indicator of severe ETW in mature adulthood. Tooth wear is part of the natural aging process. However, diet habits might accelerate the erosive tooth wear. Preventive care is desirable to avoid pain, esthetic impairment and functional consequences. Identifying risk factors that increases tooth wear is an important task for preventive aging care. In view of this study outcomes, when a young adult in the permanent dentition is identified with a BEWE score greater than 4, an investigation should be performed. A detailed anamnesis evaluating the history of diseases, use of medications, drink and diet habits and presence of parafunctions should be accomplished. Orientation and restoration of the incisal edges is recommended. (LOOMANS; OPDAM; ATTIN; BARTLETT *et al.*, 2017)

The limitations of this study were the difficulties related to collecting longitudinal data. (BISHARA; TREDER; DAMON; OLSEN, 1996; ELLING BERG; ESPELAND; STENVIK, 2008; TIBANA; MEIRA PALAGI; MIGUEL, 2004) This study comprised an extensive follow-up period and had some enrollment limitations as shown in Figure 1. Other limitation was related to dental conditions at the mature adulthood (T3) when many tooth losses and prosthesis were observed. The rate of tooth losses corresponded to 3.09 teeth per subject and was greater compared with previous studies. (BISHARA; TREDER; DAMON; OLSEN, 1996; ELLING BERG; ESPELAND; STENVIK, 2008) The possible explanations for the high index of tooth losses were the long follow-up period and the absence of water fluoridation in our city until 1975 when the dental development of the sample subjects was completed. Future longitudinal studies should assess the erosive tooth wear associated to functional occlusion, diet and lifestyle.

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## **4 CONCLUSIONS**

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## **4 CONCLUSIONS**

A significant increase in erosive tooth wear occurred with aging. From the second to the seventh decade of life, males, incisors/canines and the incisal/buccal aspects were more affected by erosive tooth wear. No differences were observed between the maxillary and mandibular dental arches. The greater the degree of tooth wear at early adulthood, the greater the degree of tooth wear at mature adulthood. Preventive care should be recommended in early adult subjects with a critical BEWE index greater than 4.

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# APPENDIX

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

We hereby declare that we are aware of the article "AGING AND EROSIVE TOOTH WEAR IN SUBJECTS WITH NORMAL OCCLUSION: A 47-YEAR FOLLOW-UP" will be included in Dissertation of the student Henrique Campos Eto and may not be used in other works of Graduate Programs at the Bauru School of Dentistry, University of São Paulo.

Bauru, January 22<sup>th</sup>, 2021

Henrique Campos Eto  
Author



Signature

Daniela Gamba Garib Carreira  
Author



Signature

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**ANNEX**

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**PARECER CONSUBSTANCIADO DO CEP****DADOS DO PROJETO DE PESQUISA**

**Título da Pesquisa:** Avaliação do desgaste dentário erosivo em pacientes com oclusão normal: 47 anos de acompanhamento

**Pesquisador:** HENRIQUE CAMPOS ETO

**Área Temática:**

**Versão:** 1

**CAAE:** 22082019.4.0000.5417

**Instituição Proponente:** Faculdade de Odontologia de Bauru

**Patrocinador Principal:** Financiamento Próprio

**DADOS DO PARECER**

**Número do Parecer:** 3.649.876

**Apresentação do Projeto:**

Trata-se de pesquisa retrospectiva e com dados atualizados para avaliar os desgastes dentários erosivos decorrentes de fatores etiológicos fisiológicos e patológicos ocorridos ao longo de 47 anos, em 24 pacientes (participantes da pesquisa) com oclusão normal natural que apresentam a documentação. A amostra será composta por pacientes brasileiros leucodermas atendidos na FOB/USP desde 1973 até a presente data, com oclusão normal na dentadura permanente completa e que têm seus modelos de gesso digitalizados e fotografias intraorais tomadas em três diferentes tempos: T1 (iniciais, 13 anos de idade), T2 (17 anos de idade) e T3 (60 anos de idade). Estes modelos pertencem ao arquivo de Ortodontia da FOB/USP. Será utilizada documentação obtida entre os anos de 2015 e 2016 e questionários aplicados atualmente para avaliação dos fatores de risco abordando hábitos comportamentais, dietéticos e possíveis alterações sistêmicas.

As avaliações dos desgastes dentários erosivos serão realizadas por meio dos índices BEWE (The Basic erosive wear examination) e TWI (Tooth wear index). As diferenças interfases serão calculadas pelo teste de Friedman. O nível de significância adotado será de 5%.

**Objetivo da Pesquisa:**

Avaliar os desgastes dentários erosivos decorrentes de fatores etiológicos, fisiológicos e patológicos ocorridos ao longo de 47 anos, em pacientes com oclusão normal natural.

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**Avaliação dos Riscos e Benefícios:****Riscos:**

Os autores informam que "Não há riscos, visto que não haverá contato com o paciente. A presente pesquisa será análise secundária de prontuários e modelos de gesso já coletados previamente". Porém, além de não existir pesquisa sem risco, haverá contato com o participante haja vista que terão que responder um questionário atualizado para avaliação dos fatores de risco abordando hábitos comportamentais, dietéticos e possíveis alterações sistêmicas. Então, os riscos todos devem ser considerados.

**Benefícios:**

Contribuição na definição do conceito de desgaste patológico e fisiológico na oclusão envelhecida, objetivando metas terapêuticas preventivas e curativas. E, ainda, definir fatores preditivos precoces dos desgastes patológicos em idades avançadas para estabelecer condutas preventivas para indivíduos de alto risco de desgastes acentuados ao longo da idade.

**Comentários e Considerações sobre a Pesquisa:**

A pesquisa está bem justificada e a seleção da amostra com acompanhamento de 47 anos é bem interessante. Os participantes da pesquisa têm seus dados coletados desde os 13 anos (década de 70), aos 17 anos e aos 60 anos (tempo corrente). Durante os anos de 2015 e 2016, estes pacientes, participantes da pesquisa, foram recrutados no setor de Ortodontia da FOB/USP para a realização de nova documentação. Não foi esclarecido se tratava-se de pesquisa, com aprovação do CEP, e neste caso, qual o CAAE. Caso dados de pesquisa anterior sejam utilizados, lembramos que há necessidade de autorização dos autores para a utilização desses dados.

Os autores citam no projeto apresentado que será aplicado aos pacientes, participantes da pesquisa, no tempo corrente (T3) alguns questionários para avaliação dos fatores de risco abordando hábitos comportamentais, dietéticos e possíveis alterações sistêmicas. Desta forma, fica clara a possibilidade de contato com estes participantes para que, após a explicação da pesquisa, assinem de forma livre e esclarecida o consentimento em ter seus dados utilizados para a referida pesquisa, bem como do questionário aplicado para a avaliação dos fatores de risco.

**Considerações sobre os Termos de apresentação obrigatória:**

Verificamos que:

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1- O check list não está preenchido (somente assinado).

2- Embora os autores afirmem que não há riscos, sempre existem riscos ao se participar de uma pesquisa, ainda que sejam indiretos. Sendo assim, há necessidade de serem descritos riscos, mesmo porque os participantes responderão questionários no tempo corrente (T3) para avaliação dos fatores de risco abordando hábitos comportamentais, dietéticos e possíveis alterações sistêmicas para avaliação de determinados fatores.

3- Caso sejam utilizados dados coletados em pesquisa anterior, esta deve ser referida, indicando o CAAE e deve haver autorização dos autores para a utilização de dados.

4- Há necessidade de serem previstos gastos com a locomoção dos participantes para virem à FOB responder "no tempo corrente" aos questionários para avaliação dos fatores de risco abordando hábitos comportamentais, dietéticos e possíveis alterações sistêmicas.

5- Há necessidade de apresentação de TCLE visto que, embora seja uma pesquisa retrospectiva, os participantes ainda apresentam vínculo com a FOB, serão utilizados dados atualizados dos participantes coletados no "tempo corrente", citados no projeto e na Plataforma Brasil, tornando-se evidente o necessário contato com estes participantes para o consentimento livre e esclarecido de seus dados e materiais de acervo para a presente pesquisa. Também está citado na Plataforma Brasil, grupos em que serão divididos os participantes da pesquisa neste centro, uma "Nova avaliação, se necessário", evidenciando a possibilidade de contato.

**Recomendações:**

1- Preencher o check list.

2- Considerar os riscos da pesquisa na Plataforma Brasil e no Projeto.

3- Se for o caso, citar o CAAE de pesquisa anterior e anexar consentimento dos autores para o uso de dados.

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4- Apresentar orçamento detalhado dos gastos, considerando a vinda dos participantes da pesquisa para responder questionários e realizar uma "Nova avaliação, se necessário", conforme Plataforma Brasil.

5- Apresentar o TCLE, frente às considerações anteriores.

6- Atualizar o cronograma, face às alterações necessárias.

7- Realçar as correções para posterior análise por este CEP.

**Conclusões ou Pendências e Lista de Inadequações:**

Pendente, aguardando correções e apresentação de TCLE.

**Considerações Finais a critério do CEP:**

O CEP, reunido ordinariamente no dia 09/10/2019, acata por unanimidade, o parecer COM PENDÊNCIA emitido pelo relator. Encaminha ao pesquisador para as modificações necessárias e atualização do cronograma.

De acordo com a Res. CNS 466/12 e com as Normas Operacionais internas deste CEP, as pendências devem ser respondidas exclusivamente pelo pesquisador responsável no prazo de 30 dias, a contar da data de envio do parecer deste CEP. Após esse prazo o protocolo será arquivado. Solicita-se ainda que as respostas sejam enviadas por meio de ofício, de forma ordenada, conforme os itens das considerações deste parecer, destacando a localização das possíveis alterações realizadas nos documentos do protocolo, com realce no texto, inclusive no TCLE, se for o caso.

Diante do exposto, este CEP manifesta-se por aguardar o atendimento às questões acima para emissão de seu parecer final.

**Este parecer foi elaborado baseado nos documentos abaixo relacionados:**

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1433856.pdf	19/09/2019 21:38:14		Aceito

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Outros	Checklist.pdf	19/09/2019 21:36:45	HENRIQUE CAMPOS ETO	Aceito
Declaração de Pesquisadores	Declaracaodopesquisador.pdf	19/09/2019 21:35:20	HENRIQUE CAMPOS ETO	Aceito
Declaração de Instituição e Infraestrutura	Documentos.pdf	19/09/2019 21:33:56	HENRIQUE CAMPOS ETO	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	DispensadoTCLE.pdf	19/09/2019 21:23:51	HENRIQUE CAMPOS ETO	Aceito
Projeto Detalhado / Brochura Investigador	Projeto.pdf	19/09/2019 21:23:24	HENRIQUE CAMPOS ETO	Aceito
Folha de Rosto	Folhaderosto.pdf	19/09/2019 21:20:31	HENRIQUE CAMPOS ETO	Aceito

**Situação do Parecer:**

Pendente

**Necessita Apreciação da CONEP:**

Não

BAURU, 18 de Outubro de 2019

Assinado por:

Ana Lúcia Pompéia Fraga de Almeida  
(Coordenador(a))

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