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Association between periodontal condition and use of tongue piercing: a case–control study

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Abstract

Objective: This cross-sectional study aimed to evaluate the periodontal status and risk factors for gingival recession in individuals with tongue piercings.

Methods: Sixty cases (individuals with tongue piercings) and 120 controls (non-users) in Brazil, between 13 and 28 years of age, from both genders and a mix of races were selected. The clinical evaluation of patient oral health records included periodontal parameters and the presence of tooth fracture. Cases and controls were compared with demographic, behavioural and clinical variables of interest. Risk variables for the occurrence of gingival recession were identified in multivariate regression models, with linear and logistic regressions.

Results: The case group presented a higher prevalence and severity of gingival recession when compared with the control group. Individuals with tongue piercings presented an 11 times greater chance for the occurrence of gingival recession in the anterior lingual mandibular region as compared with controls (OR = 11.0, 95% CI 5.02–24.09). The presence of gingival recession in the anterior lingual mandibular region was associated with the use of piercings, age, male gender and bleeding on probing.

Conclusions: The use of tongue piercings was strongly associated with the occurrence of gingival recession in the anterior lingual mandibular region.

Key words: body piercing; gingival recession; periodontal conditions; risk factors; tooth fracture

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Modifications of the body, including tattooing and body piercing, have been performed by various population groups over centuries, in different geographic regions, producing distinct cultural and social meanings. (Panconesi 2007). In recent decades, the practice of body piercing has become extremely popular, not only increasing the number of users but also the social classes involved (Wohlrab et al. 2007). The increasing demand from adolescents and young adults for oral piercings in recent years has generated concern within the medical and dental societies regarding the risks posed to users. According to age, population group and region of the perforation, the prevalence of use tends to vary from 3% to 20% (Bone et al. 2008, Garcia-Pola et al. 2008, Firoozmand et al. 2009), but may reach as high as 50% (Antoszewski et al. 2009).

The most common locations for the insertion of oral piercings are the tongue and lips. The mere presence or improper placement of the piercing can cause a series of complications to the user related to the site of the object, which may be manifested in early or late complications (Meltzer 2005). Immediate complications include the involvement of blood vessels, swelling, pain, speech difficulties as well as chewing and swallowing difficulties. Tongue piercings may also cause the obstruction of the upper airways and the disruption of innervation and risks of infection and bacterial endocarditis (De Moor et al. 2000, Ebrahim & Naidoo 2008). Chronic complications include dental wear or fractures (Boardman & Smith 1997, De Moor et al. 2000), impaired oral functions, swallowing all or part of the piercing (Er et al. 2000, Ebrahim & Naidoo 2008, Van Borsel & Cornelis 2009) and localized gingival recession (Campbell et al. 2002, Chambrone & Chambrone 2003, Slutzkey & Levin 2008). Tongue piercings have been directly related to dental and gingival

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injuries in the anterior lingual mandibular region, whereas buccal gingival recession has been observed in cases where the lip stud is located in such a manner as to traumatize the gingiva (Boardman & Smith 1997, Campbell et al. 2002). Gingival recession is of particular interest because it can increase susceptibility to hypersensitive dentine and root caries, especially as regards negative aesthetic effects (Kassab & Cohen 2003, Slutzkey & Levin 2008).

Despite the knowledge of the deleterious effects of the use of oral piercings, findings from different studies have shown conflicting data regarding the adverse effects on periodontal tissues, especially regarding gingival recession. It is important to address that most studies on oral piercings are case reports or case series (Chambrone & Chambrone 2003, Shacham et al. 2003, Brennan et al. 2006, Leichter & Monteith 2006, Antoszewski et al. 2009, Kapferer et al. 2008) and, consequently, their conclusions are limited. Additionally, few studies have investigated the influence of factors or risk variables on the occurrence of adverse effects on periodontal tissues in individuals with oral piercings (Kapferer et al. 2007).

Therefore, it is imperative for dental health professionals to understand the factors incurred upon using oral piercings. Thus, the purpose of this study was to evaluate and investigate, through a case–control study, the periodontal status among users of tongue piercings, particularly the presence of gingival recession and the identification of potential risk variables that could be related to the frequency and severity of recessions.

Methods

Sampling Strategy

This case–control study included a convenience sample of 60 individuals who use tongue piercings (case group) and 120 individuals who do not use tongue piercings (control group). This sampling technique was adopted due to accessibility and for a simpler recruitment of individuals. The total sample size was determined to be appropriate for both univariate and multivariate analysis. The identification and selection of participants involved school groups and university centres in the period from January 2008 to March 2009, in Belo Horizonte, Brazil. After acceptance on the part of the schools, the identification of the individual case was performed by including only individuals with tongue piercings. For each case, two controls were selected on a consecutive basis from the same school, according to criteria regarding age, gender, smoking and previous orthodontic treatment, in an attempt to homogenize the groups.

All subjects were examined in a location reserved for this purpose. Data were collected through a questionnaire addressing aspects of clinical relevance and behaviour related to the use of the tongue piercings and their characteristics as well as the clinical assessment of periodontal status and the presence of tooth fracture in all teeth. Exclusion criteria included individuals with systemic diseases that could possibly compromise the immune system, who had taken antibiotics 3 months before this study (to avoid any influence on periodontal status and the occurrence of acute complications related to tongue piercings) and who had used medications that could affect the gingival tissues.

The final sample consisted of 60 users (cases) and 120 non-users (controls) of tongue piercings, between 13 and 28 years of age. It is also important to note that the entire sample was from a living geographic area of low socioeconomic status.

Ethical considerations

This study followed the ethical principles of the Helsinki Declaration. It was approved by the Ethics in Research Committee (COEP) from the Federal University of Minas Gerais (UFMG) – ETIC 233-08. The subjects or their legal guardians were informed about the purpose of the study, and all signed a written informed consent form. Additionally, patients were warned about their oral health status and, when necessary, referred for treatment at Dentistry School clinics within the Federal University of Minas Gerais.

Questionnaire

The individuals answered a questionnaire with the demographic and behavioural characteristics of body piercings, such as smoking (yes/no at the time of examination), time of piercing use, functional habits (rattling the piercing against the teeth), material (metal, silicone, plastic) and complications after placement. Also included were questions about previous orthodontic treatment, last dentist appointment, frequency of tooth brushing and flossing, use of medications and systemic diseases. If, during the clinical examination, a fractured tooth was found, the individual was asked under what circumstances it had occurred.

Clinical examinations

The periodontal examination was performed at six sites around each present tooth, i.e. mesial, mesiobuccal, mesiolingual, distal, distobuccal and distolingual (not including third molars), using a millimetre periodontal probe (model UNC-15 North Carolina), mirror and gauze. The examinations were performed in a regular chair with good lighting conditions, using artificial light when necessary.

The presence of signs of inflammation and tissue destruction of tooth supports was assessed and the following elements were recorded: probing depth (PD), clinical attachment level (CAL), plaque index (Löe & Silness 1963), bleeding on probing (BOP) (Ainamo & Bay 1975), gingival recession and the presence of tooth fracture. The PD was measured by the distance from the gingival margin to the probed apex. The CAL was considered to be the distance from the cemento-enamel junction to the probed apex, while the BOP was recorded as the presence of bleeding 30–60 s after periodontal probing. The parameters BOP, PD and CAL were recorded at mesial, distal, buccal and lingual/palatine sites. The recession was evaluated in an apico-coronal order and the distance from the gingival margin to the cemento-enamel junction on the buccal and lingual/palatine surfaces was recorded. Dental fractures were recorded per element involved when occurring after the insertion of the piercing.

All examinations were performed by two trained and calibrated examiners (I. L. O. P. and F. O. C.). The inter- and intra-investigator agreement was performed by means of a re-examination of 10 individuals for all clinical parameters evaluated within a maximum interval of 7 days. The results showed a κ index above 0.82 and an intra-class correlation coefficient of 0.90 for all variables and for both examiners.

The criterion used for the diagnosis of localized periodontitis was defined as

the presence of one or more teeth with one or more sites with a PD > 4 mm and CAL ⩾ 3 mm in the same site (American Academy of Periodontology, 2000).

Statistical analysis

All gathered data were stored in a database. Analyses were performed using a statistical software (SPSS – Statistical Package for Social Sciences, version 16.0 for Windows – SPSS Inc., Chicago, IL, USA), and were considered significant for a probability significance of $< 5\%$ ($p < 0.05$).

The normality of data was tested using the Kolmogorov–Smirnov test with Lilliefors correction. A descriptive analysis of the data was performed and the sample was divided into cases (users of tongue piercings) and controls (non-users of tongue piercings). Cases and controls were then compared in relation to demographic, behavioural, dental and periodontal variables of interest by means of the Mann–Whitney and χ^2 tests, when appropriate.

Subsequently, the gingival recession in the anterior lingual mandibular region was assessed as the primary outcome and the sample was divided according to the presence/absence and the severity (1–2, 3 and ⩾4 mm) of the recession. The presence and severity of recession were assessed in relation to demographic, behavioural and periodontal variables of interest through univariate analysis using the Mann–Whitney and χ^2 tests, when appropriate.

Variables of predisposing risk factors for the presence and severity of recession were determined in multivariate models using logistic and linear regressions. All multivariate models were evaluated in post hoc compatible tests to verify suitability.

Results

The characterization of the case and control groups in relation to the demographic and behavioural variables of interest is presented in Table 1. The average age of the case group was 18.9 years (± 3.98), whereas for the control group, it was 17.7 years (± 3.88). There were no significant differences between groups in relation to gender and ethnicity (white/non-white), smoking habits and flossing. There was a higher frequency of visits to the dentist of ≤ 6 months for the case group ($p = 0.014$).

Table 1. Distribution of subjects according to the demographic and behavioural variables of interest

Variable	Case group ($n = 60$)	Control group ($n = 120$)	p
Age (years)	18.9 ± 3.9	17.78 ± 3.8	0.052*
Gender			
Male	27 (45.0%)	43 (35.8%)	0.234†
Female	33 (55.5%)	77 (64.2%)	
Ethnicity			
Whites	38 (63.3%)	68 (56.7%)	0.391†
Non-Whites	22 (36.7%)	52 (43.3%)	
Smokers			
Yes	47 (78.3%)	94 (78.3%)	1.000†
No	13 (21.7%)	26 (21.7%)	
Last visit to the dentist			
⩽ 6 months	27 (45.0%)	30 (25.5%)	**0.014**†
> 6 ⩽ 12 months	13 (21.7%)	26 (21.7%)	
> 12 months	20 (33.3%)	64 (53.3%)	
Frequency of tooth brushing			
1 once a day	0 (0.0%)	0 (0.0%)	**0.030**†
2 times a day	16 (26.7%)	52 (43.3%)	
⩾3 times a day	44 (73.3%)	68 (56.7%)	
Flossing			
No	21 (35.0%)	41 (34.2%)	0.912†
Yes	39 (65.0%)	79 (65.8%)	

Significant values are presented in bold.
*Mann–Whitney test.
†χ^2 test.

In contrast, the control group reported more frequent daily brushing (greater than or equal to three times) ($p = 0.030$).

Table 2 summarizes the main variables of interest in relation to individuals with tongue piercings. Most of the cases presented a mean time of use of 2 years (25.0 ± 2.84 months). The habit of rattling the piercing was reported by 75% of the users, while the occurrence of tooth fracture after insertion of the piercing occurred in 20% of the users.

The dental and periodontal variables of interest among cases and controls are described in Table 3. It could be observed that the overall mean values of BOP, PD and CAL, as well as those values within the anterior region, were higher in controls and differed significantly from cases ($p < 0.050$). The mean global gingival recession proved to be higher in cases than in controls ($p < 0.001$); this difference was not significant for the anterior lingual maxillary region (teeth13–23) ($p = 0.280$). However, the average gingival recession in the anterior lingual mandibular region (teeth 33–43) was significantly higher in cases (0.194 ± 0.288 mm) than in controls (0.011 ± 0.036 mm) ($p < 0.001$). Prior orthodontic therapy was more frequent in cases, which differed significantly from the controls. Fracture of the anterior teeth was significantly more frequent in cases (26.7%) than in controls (11.7%, $p = 0.011$), as was the average number of fractured teeth ($p = 0.046$).

Table 2. Distribution of piercing users (cases) according to the variables of interest

Variable	Case group ($n = 60$)
Body piercing material	
Metal	43 (71.7%)
Metal and silicone	8 (13.3%)
Metal and plastic	9 (15.0%)
Time of piercing use	25.0 ± 2.8 (1–96)
1 to 24 months	26 (43.3%)
25 to 48 months	26 (43.3%)
> 48 months	8 (13.4%)
Complications after piercing	
No	38 (63.3%)
Yes	22 (36.7%)
Swelling	11 (50.0%)*
Infection	4 (18.2%)*
Keloid	1 (4.5%)*
Rejection	2 (9.0%)*
Inflammation	4 (18.2%)*
Inflammation present around the piercing	
No	58 (96.7)
Yes	2 (3.3%)
Habit of biting the piercing	
No	30 (50.0%)
Yes	30 (50.0%)
Habit of rattling the piercing	
No	15 (25.0%)
Yes	45 (75.0%)
Dental fracture after the piercing	
No	48 (80.0%)
Yes	12 (20.0%)

*Percentage of the total number of patients with complications.

Table 3. Distribution of subjects according to the dental and periodontal variables of interest

Variable	Case group ($n = 60$)	Control group ($n = 120$)	p
BOP (% of sites)			
Global	22.33 ± 23.23	26.96 ± 23.34	0.179*
Anterior lingual maxillary region	10.56 ± 24.15	20.22 ± 30.60	**0.012***
Anterior lingual mandibular region	23.06 ± 35.53	36.18 ± 38.90	**0.010***
PD (mm)			
Global	1.10 ± 0.310	1.48 ± 0.508	**<0.000***
Anterior lingual maxillary region	1.01 ± 0.314	1.34 ± 0.543	**<0.000***
Anterior lingual mandibular region	1.12 ± 0.576	1.28 ± 0.537	**0.003***
CAL (mm)			
Global mean	1.17 ± 0291	1.46 ± 0.512	**0.020***
Anterior lingual maxillary region	1.05 ± 0368	1.32 ± 0.598	**<0.000***
Anterior lingual mandibular region	1.67 ± 0988	1.28 ± 0.580	**0.008***
Gingival recession (mm)			
Global	0.097 ± 0102	0.029 ± 0.065	**<0.000***
Anterior lingual maxillary region	0.018 ± 0072	0.003 ± 0.021	0.280*
Anterior lingual mandibular region	0.194 ± 0288	0.011 ± 0.036	**<0.000***
Previous orthodontic treatment			
Yes	20 (33.3%)	20 (16.7%)	
No	40 (66.7%)	100 (83.3%)	**0.011**†
Time of treatment (months)	40.80 ± 23.50	37.20 ± 23.41	**0.009***
Anterior tooth fracture			
Yes	16 (26.7%)	14 (11.7%)	
No	44 (73.3%)	106 (88.3%)	**0.011**†
Number of fractured teeth	0.30 ± 0.530	0.14 ± 0.416	**0.046***

*Mann–Whitney.
†χ^2 significant values are presented in bold.
BOP, bleeding on probing; PD, probing depth; CAL, clinical attachment level; mean value ± SD unless otherwise specified.

Table 4. Presence and severity of gingival recession in cases (piercing users) and controls (non-users)

Gingival recession	Case group ($n = 60$)	Control group ($n = 120$)	p*
Global†			
Presence	48 (80.0%)	41 (34.2%)	**<0.000**
Recession 1–2 mm	21 (35.0%)	29 (24.2%)	**<0.000**
Recession 3 mm	14 (23.3%)	10 (8.3%)	
Recession ⩾4 mm	13 (21.7%)	2 (1.7%)	
Anterior lingual maxillary region			
Presence‡	4 (6.7%)	3 (2.5%)	0.173
Recession 1–2 mm	2 (3.3%)	3 (2.5%)	0.243
Recession 3 mm	1 (1.7%)	0 (0.0%)	
Recession ⩾4 mm	1 (1.7%)	0 (0.0%)	
Anterior lingual mandibular region			
Presence§	33 (55.0%)	12 (10.0%)	**<0.000**
Recession 1–2 mm	14 (23.3%)	12 (10.0%)	**<0.000**
Recession 3 mm	8 (13.3%)	0 (0.0%)	
Recession ⩾4 mm	11 (18.3%)	0 (0.0%)	

Significant values are presented in bold.
*χ^2 test.
†OR = 7.71 (3.69–16.10).
‡OR = 2.79 (0.60–12.87).
§OR = 11.00 (5.02–24.09).

It is also important to report that cases did not significantly differ from controls in relation to the occurrence ($p = 0.173$) and number of posterior fractured teeth ($p = 0.170$), lingual frenulun insert (above/below the mucogingival junction) ($p = 0.853$) and the global ($p = 0.435$) and anterior ($p = 0.738$) plaque index. The prevalence of periodontitis was 11.7% and 4.2% for cases and controls ($p = 0.057$), respectively. The prevalence of localized periodontitis (anterior lingual maxillary and mandibular regions) was 6.7% and 1.7% for cases and controls ($p = 0.078$), respectively.

The presence and severity of gingival recession are characterized in Table 4. When considered in an overall diagnosis, the frequency of recession in the case group (80%) was significantly different from that observed in the control group (34.2%) (OR = 7.71, $p < 0.001$). When the gingival recession was analysed in a localized manner, no significant differences could be observed in occurrence ($p = 0.173$) and severity ($p = 0.243$) in the anterior lingual maxillary region. However, within the anterior lingual mandibular region, a higher occurrence of recession could be observed in cases (55.0%) than in controls (10.0%). Individuals with tongue piercings presented an 11 times greater chance for the occurrence of recession in the anterior lingual mandibular region when compared with the controls (OR = 11.0, 95% CI 5.02–24.09, $p < 0.001$). It is worth noting that the severity of the recession in the region (value calculated using an ordinal scale of 1–2, 3 and ⩾4 mm) was also significantly higher in cases than in controls ($p < 0.001$).

The multivariate logistic regression for the occurrence of gingival recession in the anterior lingual mandibular region is shown in Table 5. The final logistic model included the use of tongue piercings ($p < 0.001$), age ($p < 0.000$), male gender ($p < 0.006$) and the presence of BOP in the anterior region ($p = 0.037$) associated with periodontal recession. Individuals with tongue piercings showed an 18 times greater chance for the occurrence of gingival recession (adjusted OR = 18.06, 95% CI 6.66–48.95, $p < 0.001$). The accuracy of this model, determined by the area under the ROC curve of the model, was 87.88%.

Table 6 presents a multivariate linear regression of the severity of the recession, measured as a continuous variable to the anterior lingual mandibular region. This model reports that 34% of the severity of the recession that occurred in this region can be explained by the use of tongue piercings, age, BOP and periodontal disease located in the anterior region (adjusted $R^2 = 0.3428$, $p < 0.006$).

Discussion

Some studies have shown different types of adverse effects and complica-

Table 5. Multivariate logistic regression: occurrence of gingival recession in the anterior lingual mandibular region

Variable	Coefficient	OR	95% CI	*p*
Initial model				
Constant	− 8.136	–	–	**<0.000**
Piercing	3.071	21.56	7.19–64.68	**<0.000**
Age	0.199	1.22	1.06–1.39	**0.004**
Gender	1.476	4.38	1.59–11.99	**0.004**
Ethnicity	− 0.047	0.95	0.36–2.53	0.925
Frenulun insertion in keratinized gingiva	1.072	2.92	0.53–1621	0.220
Smoking	0.587	1.80	0.61–5.28	0.284
Alcohol	0.853	2.34	0.82–6.69	0.110
Previous orthodontic treatment	0.610	1.84	0.65–5.23	0.252
Plaque index in the anterior region	− 0.004	0.99	0.98–1.01	0.667
Anterior BOP	0.017	1.01	1.00–1.04	0.115
Localized periodontitis in the anterior region	2.051	7.77	0.34–182.80	0.203
Final model*				
Constant	− 7.630	–	–	**<0.000**
Piercing	2.893	18.06	6.66–48.95	**<0.000**
Age	0.217	1.24	1.10–1.40	**<0.000**
Gender	1.249	3.48	1.44–8.47	**0.006**
Anterior BOP	0.018	1.02	1.00–1.03	**0.037**

Significant values are presented in bold.
*$R^2 = 0.3597$; area under the ROC curve for model = 0.8788.
BOP, bleeding on probing.

Table 6. Multivariate linear regression: severity of gingival recession in the anterior lingual mandibular region

Variable	Coefficient	95% CI	*p*
Initial model			
Constant	− 0.209	− 0.346– − 0.072	**0.003**
Piercing	0.201	0.148–0.255	**<0.000**
Age	0.005	− 0.001–0.012	0.094
Gender	0.031	− 0.019–0.081	0.219
Ethnicity	− 0.001	− 0.049–0.047	0.970
Frenulun insertion in keratinized gingiva	0.037	− 0.045–0.119	0.373
Smoking	0.034	− 0.029–0.097	0.285
Alcohol	0.063	0.008–0.116	**0.023**
Previous orthodontic treatment	0.011	− 0.049–0.070	0.726
Plaque index in the anterior region	− 0.000	− 0.000–0.001	0.900
Anterior BOP	0.001	0.001–0.003	**<0.000**
Localized periodontitis in the anterior region	0.176	0.046–0.307	**0.009**
Final model*			
Constant	− 0.152	–	**0.006**
Piercing	0.184	0.134–0.233	**<0.000**
Age	0.006	0.000–0.012	**0.049**
Anterior BOP	0.002	0.001–0.003	**<0.001**
Localizated periodontitis in the anterior region	0.157	0.028–0.286	**0.017**

Significant values are presented in bold.
*$R^2 = 0.3574$; R^2 adjusted = 0.3428.
BOP, bleeding on probing.

tions in users of oral piercings. However, it is important to note that most studies presented limited conclusions, as they consisted mainly of reports and case series (Chambrone & Chambrone 2003, Shacham et al. 2003, Brennan et al. 2006, Antoszewski et al. 2009, Kapferer et al. 2008). The present study adopted a case–control design (1:2) in which sample groups were homogeneous in relation to demographic and behavioural variables, such as age, gender and smoking, which proved to be similar in both groups, thus minimizing potential confounding factors. In addition, the present study provided a sample of 60 individuals with tongue piercings, as compared with most previous studies that were conducted using smaller samples and/or users of lip piercings or mixed (Campbell et al. 2002, Kieser et al. 2005, López-Jornet et al. 2006).

In the present study, 36.7% of the subjects reported either immediate complications or the occurrence of swelling and infection/inflammation. These findings are similar to those of López-Jornet et al. (2006), who reported that 34.3% of those subjects presented initial local inflammation, and of Kieser et al. (2005), who reported that 34.9% of the complications occurred within the first weeks. However, discrepant findings were reported in the literature, with complication rates varying from 14% to 86% (Mayers et al. 2002, Levin et al. 2005, Vilchez-Perez et al. 2009, Kapferer et al. 2007).

Prior studies (Campbell et al. 2002, Kieser et al. 2005, Levin et al. 2005, Leichter & Monteith 2006, Kapferer et al. 2007) have shown that the occurrence of gingival recession is one of the main effects of the use of oral piercings, whose prevalence can vary from 19.2% to 68.13%. In the present study, the focus of analysis and the primary outcome used in the comparison between cases and controls was the occurrence and severity of gingival recession.

In accordance with previous findings (Leichter & Monteith 2006, Kapferer et al. 2007), the present study showed that the anterior lingual recession was strongly associated with the use of tongue piercings. However, previous studies did not examine the occurrence of recession in the upper and lower arches separately. Our results showed that this insight is necessary, as no association was found between gingival recession in the anterior lingual maxillary region and the use of tongue piercings. This fact can most likely be explained by the direct traumatic effect that tongue piercings can exert on the region closest to its location (anterior lingual mandibular region). Similar to our findings, Campbell et al. (2002) reported that the distribution of lingual recession per tooth showed that the lower central incisors were the most frequently affected teeth (88% of teeth), while the upper front teeth remained undamaged.

Our study demonstrated the occurrence of gingival recession in 80% ($n = 48$) of the case group and 34.2% of the control group ($n = 41$). It is noteworthy that in 55% of the cases ($n = 33$), this gingival recession

occurred in the anterior lingual mandibular region. Leichter & Monteith (2006) reported a recession prevalence of 68.1% among 91 individuals with lip piercings. Campbell et al. (2002) observed that 19.2% of 52 tongue piercing users presented one or more sites with lingual gingival recession. Additionally, the authors reported that the prevalence of lingual recession per individual increased with the time of the use and the length of piercing. A recent split-mouth study of lip piercings (Vilchez-Perez et al. 2009) showed that gingival recession was present in 22% of the regions adjacent to the piercing and present in 4% on the control side. A reduction in the thickness of attached gingiva in the region, adjacent to the piercing was also reported.

Our study did not relate a higher frequency and severity of recessions associated with the time of piercing use. However, these results should be interpreted with caution, as it is important to note that 43.3% of the sample consisted of individuals using piercings over a maximum period of 2 years. These results are in direct contrast with the findings from Campbell et al. (2002), who reported an absence of recession in the group of individuals who had used a tongue piercing for 0–2 years, as compared with an average of 1.6 mm ($\pm$ 0.7) in the group who had used a tongue piercing for 2–4 years. Concerning the severity of the recession, the present study showed that, among individuals in the case group, 23.3% presented from 1 to 2 mm of gingival recession in the anterior lingual mandibular region with an average recession of 0.194 mm ($\pm$ 0.288). This could be observed at a high frequency but with a low severity of recessions.

Regarding localized periodontitis, related to the use of piercings, limited data can be found in the literature, mainly in case reports (Kretchmer & Moriarty 2001, Berenguer et al. 2006, Kapferer et al. 2008). In accordance with findings from Kapferer et al. (2007), the present study found no significant differences in the occurrence of periodontitis between the case and the control groups. It could be argued that the prevalence of periodontitis reported in the present study (12%) is, to a certain extent, high for this study sample. However, it is important to address that the cut-off point adopted for the definition of localized periodontitis was intentionally less strict, as this study focused on a group of young individuals. In addition, almost 80% of these young subjects reported smoking habits, a known risk factor for periodontitis.

This study found a prevalence of 20% of self-reported fractured teeth in the case group after the insertion of the piercing, most of which were anterior teeth. However, these findings should be interpreted with caution due to the possible memory bias present in this information. Coincidental findings were reported by Campbell et al. (2002), who showed a prevalence of 19.2% of dental fractures, with this frequency increasing according to the time of use. Findings of a higher incidence of tooth fracture and tooth wear have been reported by some studies (De Moor et al. 2000, Brennan et al. 2006). These authors reported that the habit of rattling the piercing against the teeth can lead to excess stress on the enamel and dentin, thus characterizing the syndrome of cracked teeth. Kapferer et al. (2007) reported that of 100 individuals (cases and controls) assessed, 9% showed an abnormal wear of the teeth. Eight percent (8%) of the group presented a crack in a tooth, whereas 28% presented fractures in one or more lower teeth. These values showed no statistical difference in the control group (6% with cracks and 24% with fractures).

These reported differences can be attributed, once again, to the different methodologies used. The large number of posterior teeth affected can be explained by the fact that these individuals had the habit of biting the piercing or rattling it against their teeth. (Maibaum & Margherita 1997, Cobb et al. 1998, Fehrenbach 1998, De Moor et al. 2000, Ram & Peretz 2000). Additionally, some authors have reported that piercings placed in patients with functional habits, such as bruxism, significantly increase the chance of tooth fracture (Botchway & Kuc 1998).

Factors such as smoking (Susin et al. 2004), previous orthodontic treatment (Manschot 1991) and insertion of the lingual frenulun (Bowers 1963) have been reported in the literature as predisposing factors to the occurrence of gingival recession (Kapferer et al. 2007). Vilchez-Perez et al. (2009) report that previous orthodontic treatment, tooth brushing technique and smoking were not associated with differences in PD, attached or keratinized gingiva as well as a higher prevalence of gingival recession among users of oral piercings. The multivariate models of logistic and linear regression in the present study reported that ethnicity, insertion of the lingual frenulun, smoking, alcohol, previous orthodontic treatment and plaque index were not related to the analysis of the primary outcome (gingival recession in the anterior lingual mandibular region). Similar findings were reported by Leichter & Monteith (2006) in a logistic regression analysis, showing that age, gender, smoking and the form of the piercing did not significantly influence the development of recessions.

The use of piercing, age, male gender and anterior BOP proved to be variables significantly associated with the occurrence of gingival recession in the anterior lingual mandibular region. The above-mentioned variables, in addition to localized periodontitis in the anterior region, were also associated with the severity of recessions in the anterior lingual mandibular region. Specifically in relation to age, some studies also report that the prevalence, extent and severity of recession were associated with age (Löe et al. 1992, Susin et al. 2004). However, Campbell et al. (2002) found no association between recession and age.

In conclusion, the occurrence and severity of gingival recession in the anterior lingual mandibular region were strongly associated with the use of tongue piercings. Therefore, dental professionals should alert subjects with tongue piercings of the oral risks associated with this habit.

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Clinical Relevance

Scientific rationale for the study: The mere presence or improper placement of a piercing can cause a series of complications to the user related to the site of the object. Localized gingival recession is multifactorial and has been associated with oral piercings.

Principal findings: The use of tongue piercings was strongly associated with the occurrence of recession in the anterior lingual mandibular region.

Practical implications: dental professionals should alert subjects with tongue piercings of the oral risks associated with this habit.