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Periodontal health and lateral lower lip piercings: a split-mouth cross-sectional study

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Abstract

Aim: To assess periodontal health of individuals with a lateral lower lip piercing and describe associated periodontal, dental and mucosal complications.

Material and Methods: A split-mouth study was performed in a sample of 50 patients with a lateral lower lip piercing who attended the Periodontal Pathology and Surgery Unit of the Dental School of the University of Barcelona. The patients underwent periodontal, dental and mucosal examination on both the piercing and the control sides. **Results:** Piercing users were predominantly women (78%), with a mean age of 21.3 years (SD = 4.4). The amounts of keratinized and attached gingiva were significantly lower on the piercing side, and the prevalence of gingival recession was higher (p = 0.012). The canine and first bicuspid teeth were the most affected. Tooth fractures and cracks were more frequent on the piercing side (20%) when compared with the

control (4%). Mucosal alterations were found in seven patients. **Conclusions:** The use of lateral lower lip piercings enhances gingival recession and reduces the amounts of keratinized and attached gingiva. These ornaments are also associated with tooth fractures and cracks.

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Key words: body piercing; epithelial attachment; gingival; gingival recession; tooth injuries

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Piercings are ornamental elements that pierce different parts of the body. Currently, they are widely used among teenagers and young adults in the western world, and this trend is clearly increasing. According to Boardman & Smith (1997), around 51% of the population

Conflict of interest and source of funding statement

The authors declare that they do not have any conflict of interest.

This study was performed by the "Dental and Maxillofacial Pathology and Therapeutic" research group of the UB-IDIBELL Institute with the economic support of an educational–clinical agreement in Oral Surgery between the University of Barcelona, General Health Consortium and the Catalan Health Service of the Catalan Autonomous Government. have some type of piercing. Nevertheless, the prevalence in oral and perioral regions is estimated to be between 3.4% and 20.3% (Venta et al. 2005).

Such ornaments are made of different materials and designs depending on the individual's preference and location. They are usually worn for aesthetic reasons, although they are sometimes used as an identifying feature of certain social groups or as a sign of marginality (Peticolas et al. 2000).

Diverse complications may arise as a result of oral and perioral piercings depending on the site. Gingival recession and dental fractures of adjacent teeth, as well as immediate complications such as swelling, infection and bleeding after placement, are often described in the dental literature (Maheu-Robert et al. 2007).

In recent years, a number of papers dealing with periodontal or dental complications on the use of oral piercings have been published. However, most reports are non-controlled, usually case series with small groups. In addition, papers often pool the results of several locations and types of piercing. Selecting a single location and analysing the type of piercing could help to better identify the effect of piercings on periodontal health. In addition, a controlled split-mouth design would substantially reduce variability and increase the precision of the estimation of the effect of lower lip piercings on periodontal health.

The main objectives of our study were to assess the effect of unilateral lower lip piercings on the amounts of keratinized gingiva, attached gingiva and probing depth and evaluate the presence of gingival recession comparing the piercing side with the contralateral side of the same patient. Secondly, we aimed to describe the dental and mucosal complications following piercing placement.

Material and Methods

A cross-sectional study was performed on 50 patients with a lateral lower lip piercing who attended the School of Dentistry of the University of Barcelona from July 2007 to February 2008 for dental treatment. These were referred to the Periodontal Pathology and Surgery Unit to be included in this study (to evaluate periodontal complications associated with the piercings). Sample size was determined using the statistical program G*Power 3.0.10 (Faul et al. 2007). The mean difference in attached gingiva was estimated at 1 mm, the SD was estimated at 2 mm and power was set at 90% and $\alpha = 0.05$. The required sample size for a paired t-test was 36 patients. Fifty were selected to compensate for possible drop-outs.

Exclusion criteria were oral piercings in other locations (tongue, upper lip and midline lower lip), pregnancy and lactation, periodontitis (periodontal probing depth higher than 3 mm in areas that were not in direct contact with the piercing), drugs that induce gingival hyperplasia, local or systemic disease affecting the periodontal tissues, dental restorations in evaluated teeth and absence of teeth in the anterior area of the mandible.

Patients gave their informed consent to participate in the study.

The study design was adapted to the STROBE guidelines (Vandenbroucke et al. 2007, von Elm et al. 2007).

Data were gathered by means of an anamnesis and clinical examination. The periodontal, dental and mucosal examinations were performed on both the piercing and the contralateral sides in all patients. All data were collected by the same examiner (M. A. V. P.).

Anamnesis

The variables recorded were age, gender, piercing side, piercing material (plastic, gold, titanium, other metals), piercing type (labret, ring, barbell) and date of insertion. Other variables such as smoking (number of cigarettes per day), toothbrush technique (horizontal, vertical, combined, rotational, electric brush), previous orthodontic treatment and practice of a contact sport were also recorded.

Periodontal examination

Probing depth and the amount of keratinized gingiva were measured at the buccal aspect of the lateral incisors, canines and first bicuspids on both sides. These measurements were made with a Michigan calibrated periodontal probe at three different points (distobuccal, buccal and mesiobuccal) on each of the evaluated teeth. The amount of keratinized gingiva was measured from the mucogingival line to the free gingival margin. Attached gingiva was also measured by subtracting the probing depth from the width of keratinized gingiva. If a probing depth >3 mmwas found at any point, all teeth were explored to discard periodontitis. Miller's classification was used to determine the presence and degree of gingival recession.

The side of the piercing was not concealed to the examiner due to practical reasons. To assess intra-examiner reliability, five patients were randomly re-evaluated at least 15 days after the first examination and the results were compared using the intra-class correlation coefficient for scale variables (width of keratinized gingiva and probing depth).

Dental examination

Upper and lower incisor, canines and first bicuspids, on both the control and the piercing sides, were screened for cracks or fractures by direct visual inspection without magnification and using transillumination with a handpiece light. Dental fractures were classified as affecting only the enamel or the enamel and dentin.

Mucosal examination

Oral soft tissues were explored on both sides for signs of infection (purulent drainage), swelling (increased volume of the pierced area), hyperplastic tissue (non-painful soft tissue overgrowth), keloid scarring (fibrous scar tissue) or any other anomaly possibly related to the piercing.

Statistical analysis

Microsoft Access for Windows was used for data collection. A descriptive and bivariate analysis was performed with the Statistical Package for the Social Sciences for Windows (SPSS v14.0; SPSS Inc. Chicago, IL, USA). Withinsubject variables were assessed using one-way analysis of variance (ANOVA) for repeated measures, paired *t*-tests and McNemar tests. Between-subject variables were assessed with Spearman's ρ or *t*-tests. The significance level was set at p < 0.05. The association of recessions or fractures with piercing type or material was explored using Fisher's exact tests.

Keratinized gingiva, attached gingiva and probing depth and associations with type of piercing, piercing material, intra-oral stud material, smoking, previous orthodontic treatment and toothbrush technique were assessed using ANOVA for repeated measures. The association of piercing with gingival recession or dental injuries was evaluated using the McNemar test. The correlation of wearing time and age with keratinized gingiva, attached gingiva and probing depth was analysed using Pearson's correlation coefficient.

Results

A total of 76 wearers of lateral lower lip piercings were identified in the Periodontal Pathology and Surgery Unit at the Dental School of the University of Barcelona between July 2007 and February 2008. After their evaluation, only 50 were selected for the inclusion in the study. Nine patients were excluded for having more than one piercing, 10 did not attend the visit for their evaluation, four were diagnosed with periodontitis and three had dental restorations in the evaluated teeth.

The sample consisted of 39 women (78%) and 11 men (22%), with a mean age of 21.3 years (SD = 4.4). The average time of wearing the piercing was 35.4 months (SD = 19.5).

Regarding the piercings' characteristics, 76% were labret-type and the rest were rings. The material most commonly referred was titanium (58%), although 20% of the sample was unaware of its composition. Other materials placed were gold, plastic and other metals, such as surgical steel. The intra-oral stud used in the labret piercing was made of metal in 88% of the sample and of silicone in the rest.

The amounts of keratinized and attached gingiva were significantly narrower on the

piercing side. The buccal sites of the three evaluated teeth and the mesiobuccal and distobuccal sites of the canine had significantly less keratinized gingiva on the piercing side (ANOVA for repeated measures: p < 0.05). For attached gingiva, these differences were only found in the buccal site of the first bicuspid and distobuccal and buccal sites of the canine (Table 1).

There was no association between the amounts of keratinized or attached gingiva and age or gender (p < 0.05). The wearing time had a statistically significant correlation, with a higher difference in attached gingiva between piercing and control sides in buccal measurements of the canine (Spearman's $\rho = 0.288$, p = 0.043).

Maximal probing depth was significantly higher on the piercing side (ANOVA for repeated measures: F = 4.11; df = 1; p = 0.048), although this difference was small (95% CI of the mean was 2.10–2.57 mm on the piercing side and 1.97–2.46 mm on the control side).

Gingival recession was present in 22% of the piercing side while on the control side this complication was less common (4%). Out of 11 patients with gingival recession in only one side, 10 had this recession in the piercing side (there was a clear asymmetry in the distribution). The difference between piercing and control sides was statistically significant (McNemar test: p = 0.012) (Table 3). All gingival recessions were classified as Miller's class I (Fig. 1).

Previous orthodontic treatment, tooth brushing technique and smoking were not associated with differences in probing depth, attached or keratinized gingiva, higher prevalence of gingival recession or with decreased values in keratinized and attached gingiva (ANOVA for repeated measures, p > 0.05).

On the piercing side, the sites with the least attached gingiva and the least keratinized gingiva had significantly lower values than the control side (ANOva for repeated measures: F = 22.99; df = 1; 1.61×10^{-5} for attached gingiva and F = 23.53; df = 1; p = 1.33×10^{-5} for keratinized gingiva). Piercing and intra-oral stud materials (plastic, gold, titanium, other metals) were not associated with reduced values of keratinized and attached gingiva (ANOVA for repeated measures: p >0.05). There was no association between piercing type and intra-oral stud material and the presence of either gingival recession or dental fractures on the piercing side (Fisher's exact test: p > 0.05 for piercing type and stud material). When patients with labret and ring piercings were compared, estimated marginal means of the control side were very similar, but the lack of keratinized and attached gingiva was more marked in patients using a ringtype piercing, although the difference was not statistically significant (ANOVA for repeated measures: F = 3.73; df = 1; p = 0.059 for keratinized gingiva and F = 0.92; df = 1; p = 0.342 for attached gingiva).

Only seven patients (14%) had some type of mucosal complications. In three cases (6%), hyperplastic tissues were observed around the piercing. In the remaining, swelling of the pierced area was present in two cases (4%), and keloid scarring around the piercing was perceived in two other cases (4%). Twenty percentage of teeth had small fractures or cracked enamel on the piercing side compared with 4% on the control side. In all cases they were asymptomatic (Table 2) (Fig. 2). In our sample, out of 10 patients with only one side affected, nine had these fractures or cracks on the piercing side (there was a clear asymmetry in the distribution). The difference between piercing and control sides was statistically significant (McNemar test, p = 0.021).

Discussion

Since the first study describing piercing complications published in 1997, several authors have reported dental fractures and gingival recessions related to oral and perioral piercings (Boardman & Smith 1997). Most are case reports or case series referring to piercings placed in the tongue or in the midline of the lower lip (Table 3). These study designs are not the most adequate to establish relationships between wearing a piercing and periodontal alterations (Er et al. 2000, Dibart et al. 2002, O'Dwyer & Holmes 2002, Sardella et al. 2002, Rawal et al. 2004).

Only two reports have been published on lip piercings with a control group. They evaluated exclusively lower lip piercings placed in the midline, and compared patients with non-pierced controls (Leichter & Monteith 2006,



Fig. 1. Differences in the amount of keratinized gingiva between the left side (pierced) and the right side (non-pierced).

Table 1. Highlighted cells show statistically significant differences of keratinized and attached gingiva between the piercing side and the control side

		Keratir	nized gingiva			Attac	hed gingiva	
	pierced	control	t	significance	pierced	control	t	significance
Distobuccal of first bicuspid	4.22	4.38	- 1.344	0.185	2.58	2.86	- 1.920	0.061
Buccal of first bicuspid	2.14	2.50	- 3.674	0.001	1.10	1.52	- 3.556	0.001
Mesiobuccal of first bicuspid	4.52	4.64	-1.231	0.224	2.60	2.82	- 1.157	0.253
Distobuccal of canine	4.70	5.20	-3.352	0.002	2.92	3.50	-3.057	0.004
Buccal of canine	2.50	3.34	- 5.521	0.000	1.48	2.28	-4.950	0.000
Mesiobuccal of canine	5.64	6.04	-3.500	0.001	3.82	4.10	-1.632	0.051
Distobuccal of lateral incisor	6.08	6.28	-1.385	0.172	4.12	4.40	-1.385	0.109
Buccal of lateral incisor	4.36	4.60	-2.064	0.044	3.36	3.58	-1.753	0.086
Mesiobuccal of lateral incisor	6.24	6.26	-0.227	0.821	4.50	4.38	-0.948	0.348

Measurements are expressed in millimetres.

Table 2. Comparisons of dental trauma and gingival recession

	Gingival rece control	ssion in the	Total
	no	yes	no
Gingival recession in the piercing	g side		
No [Number (%)]	38 (76%)	1 (2%)	39 (78%)
Yes [Number (%)]	10 (20%)	1 (2%)	11 (22%)
Total yes [Number (%)]	48 (96%)	2 (4%)	50 (100%)
	Dental trauma i side	n the control	Total
	no	yes	no
Dental trauma in the piercing sid	le		
No [Number (%)]	39 (78%)	1 (2%)	40 (80%)
Yes [Number (%)]	9 (18%)	1 (2%)	10 (20%)
Total yes [Number (%)]	48 (96%)	2 (4%)	50 (100%)

Highlighted cells show patients with gingival recession or trauma only in one side. The most affected side in this case was the piercing side.



Fig. 2. Comparisons, in the same patient, of both mandible canines. Right canine (a) without associated piercing. Local tooth abrasion in the left canine (b) is observed. Note that the buccal gingiva of the left canine shows a light pink colour, which might indicate a possible traumatic lesion with no relation to plaque.

Kapferer et al. 2007). Our results show that lateral lower lip piercings could also cause or enhance gingival recession and a reduction in the width of keratinized and attached gingiva in teeth that are not as prone to gingival recession as the lower incisors.

An important advantage of using a split-mouth design in the present study is to reduce variability, thus increasing statistical power and reducing the sample size needed. Therefore, this splitmouth design controls the influence of variables such as periodontal biotype. genetic factors, smoking, muscular pattern, para-functional habits, previous orthodontic treatment, pre-existing periodontal complications or plaque and gingival scores. However, it can be speculated that patients might have some difficulty in performing the oral hygiene measures on the piercing side, thus influencing the periodontal parameters. This parameter was not assessed in our study.

Several studies describe complications related to oral piercings. Levin & Zadik (2007) showed that swelling and bleeding were the most common complications, with a prevalence of 51.9% and 45.7%, respectively. They also reported 13.9% of tooth fractures and a 26.6% gingival recession in piercing wearers. Gingival recession was more frequent in mandible incisors.

Similar studies have been performed by Kieser et al. (2005) and De Moor et al. (2005). These authors reported immediate complications in 34.9% and 26% of their samples, respectively. The more frequent complications were swelling, infection, pain and bleeding. In our sample, these complications were not recorded, because an extended time had elapsed from piercing insertion to examination (mean of 35 months). In these observational studies, and in others described in the literature, gingival recession, dental trauma and other complications related to piercing were also evaluated. The results were all descriptive and non-comparative. Other important complications related to piercings have also been described such as Ludwig's angina, bacterial endocarditis or cerebral abscess formation (Martinello & Cooney 2003, Lick et al. 2005, Kloppenburg & Maessen 2007).

Concerning non-immediate mucosal alterations, the incidence found in our study (14%) was slightly greater than that reported by Lopez-Jornet & Cama-cho-Alonso (2006) (9.2%).

Table 3. Observationa	ıl studies with oral and perioral pie	ercings			
Authors	Patients and methods	Type of piercing	Self-reported complications	Periodontal health	Other anomalies
Levin & Zadik (2007)	Observational study 389 volunteers	20.3% with oral piercing The most frequent was tongue piercing	Swelling (51.9%) Bleeding (45.7%)	26.6% with gingival recession (mandible incisors)	13.9% tooth fractures
De Moor et al. (2005)	Observational study 50 patients with piercings	47 tongue piercings eight lip piercings	26% (infection, swelling, persisting pain, bleeding, disturbed wound healing)	Lip piercings were associated to gingival recession	Lingual piercings were associated with tooth damage
Kieser et al. (2005)	Observational study 43 patients with piercings	76.7% tongue piercing 34.9% lip piercing	34.9% (infection, swelling, pain and lymphadenopathy)	80% of patients with lip piercing had gingival recession in the buccal aspect 30% of patients with lingual piercing had gingival recession in the lingual aspect	Not evaluated
Lopez-Jornet et al. (2006)	A case series review 59 volunteers with 70 piercings	17 tongue piercings 13 lip piercings 18 nose piercings seven eyebrow piercings 15 ear piercings	Pain (60%) inflammatory reactions (34.3%) Bleeding (24%)	Gingival swelling (26.8%)	Dental fractures or fissures/ cracks (20%)
Lopez-Jornet & Camacho-Alonso (2006)	Cross-sectional study 98 intra-oral piercings	45 (45.9%) tongue piercings 52 (53.1%) lip piercings one (1%) cheek piercing	Pain (37.8%) Swelling (46.9%) Bleeding (8.2%)	Gingival recession in 23 cases (23.5%), more frequent in buccal region (91.3%)	Tooth damage in 13.3% of cases Mucosal complications in 9.18%
Leichter & Monteith (2006)	Cross-sectional study 98 pierced volunteers 54 non-pierced voluntaries	Lip piercings in the midline	Not evaluated	Gingival recession in 68.13% of the test group Likelihood of recession 7.5 times greater in a pierced individual	Not evaluated
Kapferer et al. (2007)	Cross-sectional study 50 pierced volunteers 50 non-pierced volunteers	Lip piercings in the midline	86% reported early post- piercing complications (non- specified)	Gingival recession in 68% of the test group Gingival recession in 4% of the control group	4% of test subjects had localized periodontitis

In an observational study by Kapferer et al. (2007), the prevalence of gingival recession and associated risk factors was addressed. These authors found that the time elapsed between piercing placement and the clinical examination, as well as the position with respect to the cementoenamel junction were associated with gingival recession.

The above study showed a higher amount of keratinized gingiva in the piercing group, although they concluded that lower measurements of attached gingiva were associated with a greater prevalence of gingival recession. This fact could be related to the periodontal measurements. In our study, we included only the buccal aspects of three teeth in each side, whereas Kapferer et al. (2007) measured both buccal and lingual aspects of the mandible incisors and canines, and obviously, lip piercings do not seem to affect the lingual gingiva. Another important aspect is that due to either genetic or hygienic factors, the height of keratinized gingiva varies considerably between different subjects. The fact that they obtained a higher incidence of gingival recession in cases with lower measurements of adhered gingiva supports our results. In the present study, there was no inter-individual variability because keratinized gingiva and attached gingiva were compared between the two sides.

Leichter & Monteith (2006) studied the different positions of the piercing stud, and in contrast to Kapferer et al. (2007), they stated that this does not seem to influence the occurrence of gingival recession. Nevertheless, they concluded that the simple use of piercing is associated with gingival recession and has a greater severity compared with gingival recession in non-pierced individuals.

It can be concluded that lateral lower lip piercings are associated with a decrease in the amounts of keratinized and attached gingiva and a higher incidence of gingival recession. In addition, they cause fractures and cracks in teeth in direct contact with the piercing. Oral health professionals should be aware of the immediate and long-term complications that can arise from these kinds of ornaments, in order to properly inform and advise their patients.

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Clinical Relevance

Scientific rationale for study: In recent years, there has been an increase in the number of people with a lip piercing attending dental clinics.

Principal findings: Among wearers of lateral lower lip piercings, the

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. STROBE Statement— Checklist of items that should be included in reports of *cross-sectional studies*.

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Practical implications: Dentists should inform and advise their patients about these consequences of lower lip piercings, even in the lateral aspect of the lower lip, and eventually recommend their removal. This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.