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D Ziebolz
E Hornecker
RF Mausberg

Microbiological findings at tongue piercing sites – implications to oral health

Authors' affiliations:
Dirk Ziebolz, *Else Hornecker*, *Rainer F. Mausberg*, Department of Operative Dentistry, Preventive Dentistry and Periodontology, University of Goettingen, Goettingen, Germany

Correspondence to:
Dr Dirk Ziebolz
Department of Operative Dentistry, Preventive Dentistry and Periodontology
University of Goettingen
Robert-Koch-Strasse 40
D-37075 Goettingen
Germany
Tel.: +49 (0) 551 39 8368
Fax: +49 (0) 551 39 2037
E-mail: dirk.ziebolz@med.uni-goettingen.de

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Ziebolz D, Hornecker E, Mausberg RF. Microbiological findings at tongue piercing sites – implications to oral health.

Abstract: *Background:* Body piercing enjoys a widespread popularity among juveniles and young people. The tongue is the most commonly pierced oral site. Tongue jewellery, however, can damage the teeth and periodontium and may provide an ideal environment for microorganisms. The aim of this report was to investigate if and in case in which amount periodontopathogenic organisms can be found at tongue piercing sites. *Methods:* Patients with tongue piercings visiting the authors' dental office for a dental check-up volunteered. A questionnaire was used to collect data on the type of material used in the piercing, the time the device was in place, oral and piercing hygiene practices and smoking habits. The dental examination included an oral hygiene index and the periodontal screening index. From the surface of the piercing jewellery adjacent to the tongue perforation, microbiological samples were collected and analysed for the presence of 11 periodontopathogenic bacteria. *Results:* A total of 12 patients with tongue piercing were asked and examined. Their tongue piercings had been in place between 2 and 8 years. The microbiological analysis showed an increased or substantially increased concentration of periodontopathogenic bacteria in all cases. It became obvious that the longer a piercing had been in place, the more pronounced was the shift from bacteria with a moderate periodontopathogenic potential to bacteria with a high periodontopathogenic potential. *Conclusion:* Tongue piercing provides a potential reservoir for periodontopathogenic bacteria.

Key words: microbiological test; oral health hazard; periodontopathogenic bacteria; tongue piercing

Introduction

Body piercing has been practiced for centuries by many ethnic groups for religious and other purposes (1). In western societies, piercing has become increasingly popular in recent years (2–4). Among the most popular places to be pierced are the navel, the nipples and in particular the face. Although the ear continues to be the most common site of piercing, the orofacial area, including the tongue, lips, labiomental groove, cheeks, nose or eyebrows, is becoming increasingly popular (5). As the tongue is the most commonly pierced intraoral site, dental professionals are encountering a growing number of patients with tongue jewellery (5–7). In the majority of cases, piercing of the tongue is performed in the midline (8). Barbell-shaped devices are among the most widely used tongue piercings. Piercings are made of different materials, usually metals such as stainless steel or titanium (1, 5). Recently, synthetic materials such as Teflon and nylon or plastic material have been used as well.

From a medical perspective, the use of body jewellery is not a harmless fashion trend as it can produce undesired local and general effects. With the increasing popularity of oral piercings, dental professionals are being confronted with many oral and dental complications associated with this practice. The literature on medical implications of oral piercings mainly exists of a case report, a limited number of studies with only few patients and a review (9). The most commonly described oral complication is damage to the teeth and periodontium caused by tongue piercing (1, 2, 6, 7, 9–18).

Moreover, the jewellery may provide an ideal environment for microorganisms to proliferate. The tongue is similar to the anaerobic conditions of the subgingival milieu, and may thus harbour increased concentrations of periodontopathogenic microorganisms (19–21). Nevertheless, even periodontally healthy sites harbour these microorganisms to some amount. Thus, anaerobic Gram-negative bacteria can be found on the surfaces of the teeth and the tongue as well as in periodontal pockets (20). Despite the presence of a wide variety of bacterial species in the oral cavity, and especially in the subgingival area, there are only a few species that have important biological properties for the pathogenesis of periodontitis.

The relationship between intraoral piercings and local bacterial contamination is not well documented in the literature. The aim of these case reports was to investigate if and in case in which amount periodontopathogenic organisms can be found at tongue piercing sites. In addition, instructions on how to advise patients with tongue piercing are given.

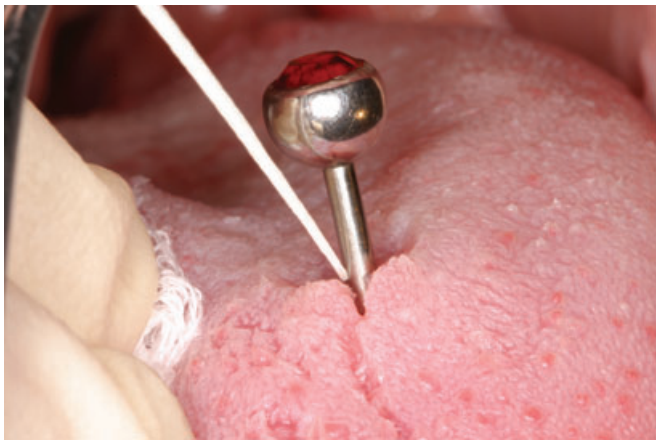

Fig. 1. Sampling procedure at the tongue piercing jewellery.

Population and methodology

Patients with tongue piercing visiting the authors' dental office for a check-up were asked to participate. A total of 12 persons with tongue piercing volunteered, seven males and five females between 20 and 28 years of age (mean age: 24.5 years). After informed consent the participants completed a special questionnaire providing information on the following items: type of material used in the piercing, time the device is in place, individual oral and piercing hygiene practices and smoking habits.

The oral hygiene of the patients was documented (modified Quigley Hein plaque Index – QHI; disclosing agent: Erythrosin) within the usual dental check-up including the periodontal screening index (PSI) (22–24). From the surface of the piercing jewellery adjacent to the tongue perforation microbiological samples were collected using four paper points at each piercing (Fig. 1). The four samples were pooled and analysed for the presence of 11 periodontopathogenic bacteria with the micro-Ident® plus test (Hain Lifescience, D-72147 Nehren, Germany). The DNA of the 11 periodontopathogenic bacteria was detected by PCR-analysis.

Results

Questionnaire

The time the tongue piercings were in place ranged between 2 and 8 years (mean: 4.3 years). All patients had barbell-type tongue jewellery with ball-shaped tips. Most devices were made of stainless (n = 4) steel or titanium (n = 8).

The information of the patients provided on their oral and piercing hygiene practices revealed poor cleaning standards. Six patients stated never cleaning the jewellery and brushing

Table 1. **Gender, oral hygiene (brushing and flossing), piercing hygiene and smoking habits of the 12 participants**

Gender		Oral hygiene brushing		Oral hygiene brushing		Piercing hygiene		Smoker	
Male	Female	1× per day	2× per day	Occ.	No	Yes	No	Yes	No
n = 7	*n* = 5	*n* = 6	*n* = 6	*n* = 4	*n* = 8	*n* = 6	*n* = 6	*n* = 10	*n* = 2

Occ., occasionally.

Table 2. **Age, period since piercing insertion and QHI (mean ± SD) of all participants, females and males**

	All participants (*n* = 12)	Females (*n* = 5)	Males (*n* = 7)
Age (years) (mean ± SD)	24.0 ± 2.8	23.2 ± 3.3	24.6 ± 2.4
Period since piercing insertion (years) (mean ± SD)	4.3 ± 2.7	5.8 ± 3.0	3.1 ± 1.9
QHI (mean ± SD)	2.9 ± 0.7	2.3 ± 0.4	3.4 ± 0.5

their teeth only once a day (Table 1). Nine of the participants stated using manual toothbrushes and three electric toothbrushes. Eight subjects never ever performed dental flossing and four stated using dental floss occasionally. Tongue scrapers were not used. Ten patients were smokers with more than 10 cigarettes per day (Table 1). All participants were in good general health and in good nutritional state. Their medical history was unremarkable. There was no antibiotic medication within at least 4 month prior to the examination.

Oral hygiene findings

The QHI ranged between 1.9 (female; the best oral hygiene value of the 12 patients) and 3.8 (male; the worst oral hygiene value of the 12 patients). In seven cases plaque accumulation and calculus at the piercing object (barbell) could be observed, mainly at the ventral side of the tongue (sublingual). A comparison between females and males is shown in Table 2.

Evaluating the PSI scores, none of the 72 sextants showed healthy conditions (score 0). Score 1 or 2 was found in 23 sextants, score 3 in 46 sextants and score 4 in three sextants. No participant showed score 1 as the worst finding. Score 2 at maximum was recorded for one participant and score 3 for 10 participants. The worst finding of score 4 showed one participant in three sextants (Table 3).

Microbiology

The microbiological analysis showed an increased or substantially increased concentration of periodontopathogenic bacteria at all 12 tongue piercing sites. There were variations in microbial complexes and distribution patterns. The longer a piercing had been in place, the more pronounced was the shift from bacteria with a moderate periodontopathogenic potential (green complex) (Fig. 2) to bacteria with a high periodontopathogenic potential (red complex) (Fig. 3). In three tongue piercings, the value obtained for *Aggregatibacter actinomycetemcomitans*, formerly *Actinobacillus actinomycetemcomitans*, was above the detection threshold. Table 3 shows gender, PSI score, piercing material and bacterial load for each participant.

Discussion

Bacterial infection after tongue piercing was described by Scully and Chen as early as 1994 (6). The piercing procedure exposes the piercee to a high risk of infection because the oral cavity harbours a huge amount of bacteria (25). The high vascularity of the area and the possible transmission of diseases, such as HVB, HVC and HIV are further aspects to be considered (2, 6, 26, 27). To our knowledge, at the time being there are no data available providing a microbiological analysis at the piercing site or remarkable microbiological findings.

Especially poor oral hygiene, i.e. great amounts of dental plaque, is likely to encourage bacterial growth at the site of the piercing. Because of the vast variety of microorganisms in the oral cavity, it is not unlikely that infections and inflammations may occur at the perforation site (1, 3, 13). Therefore, it seems possible that the pierced site provides a permanent route of entry for microorganisms and may cause a localized or even a systemic infection anytime. Dental plaque is the prime aetiological agent for caries and periodontal disease (28). It can be regarded as a specialized example of microbial biofilm that forms on surfaces in many environmental aquatic systems, in this case adhering to the teeth and related structures (29). Dental biofilm harbours a great variety of different microorganisms and today it is well recognized that some of these bacteria, e.g. *A. actinomycetemcomitans*, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Tannerella forsythia* and *Treponema denticola*, are frequently detected in periodontal diseases (19, 20, 30). A periodontal pocket is characterized by anaerobic

Table 3. **Gender, PSI score (max.), piercing material and bacterial load for each participant**

		Pat. no./Gender (F/M)	1/F	2/F	3/M	4/F	5/M	6/M	7/M	8/M	9/M	10/F	11/M	12/F
		PSI score (max.)	3	3	4	3	3	3	3	3	3	3	3	2
		Piercing material	Synthetic	Titanium	Titanium	Titanium	Titanium	Titanium	Titanium	Titanium	Steel	Titanium	Steel	Steel
Aa complex	*Actinobaciilus actinomycetemcomitans*	Aa	–	–	+	–	–	(+)	–	–	–	(+)	–	–
Red complex	*Porphyromonas gingivalis*	Pg	–	–	+	–	–	–	–	–	–	–	–	–
	Tannerella forsythia	TF	–	–	+	(+)	–	–	–	(+)	+	–	–	–
	Treponema denticola	Td	–	–	–	–	–	–	–	–	+	–	–	–
Orange complex	*Prevotella intermedia*	Pi	–	–	+	–	–	(+)	–	(+)	+	–	+	–
	Peptostreptococcus micros	Pm	+	+	+	(+)	+	+	+	+	+	+	–	–
	Fusobacterium nucleatum/ periodonticum	Fn	++	++	+	++	++	++	++	++	+	++	–	+
Orange associated complex	*Campylobacter rectus*	Cr	(+)	–	–	(+)	(+)	(+)	–	+	(+)	(+)	–	–
	Eubacterium nodatum	En		–	–	–	–	–	–	–	–	–	–	–
Green complex	*Eikenella corrodens*	Ec	++	–	–	+	+	+	++	+	–	+	–	–
	Capnocytophaga sp.	Cs	+++	+	–	+++	+	++	+++	+++	–	++	–	–

PSI score 2: calculus in at least one sextant, but no periodontal pocket; PSI score 3: periodontal pocket between 3.5 and 5.5 mm in at least one sextant; PSI score 4: periodontal pocket deeper than 5.5 mm in at least one sextant.

Explanation of pathogen concentrations: –, $<10^4$ (exception Aa: $<10^3$); (+), 10^4 (exception Aa: 10^3); +, $<10^5$ (exception Aa: $<10^4$); ++, $<10^6$ (exception Aa: $<10^5$); +++, $>10^7$ (exception Aa: $>10^6$).

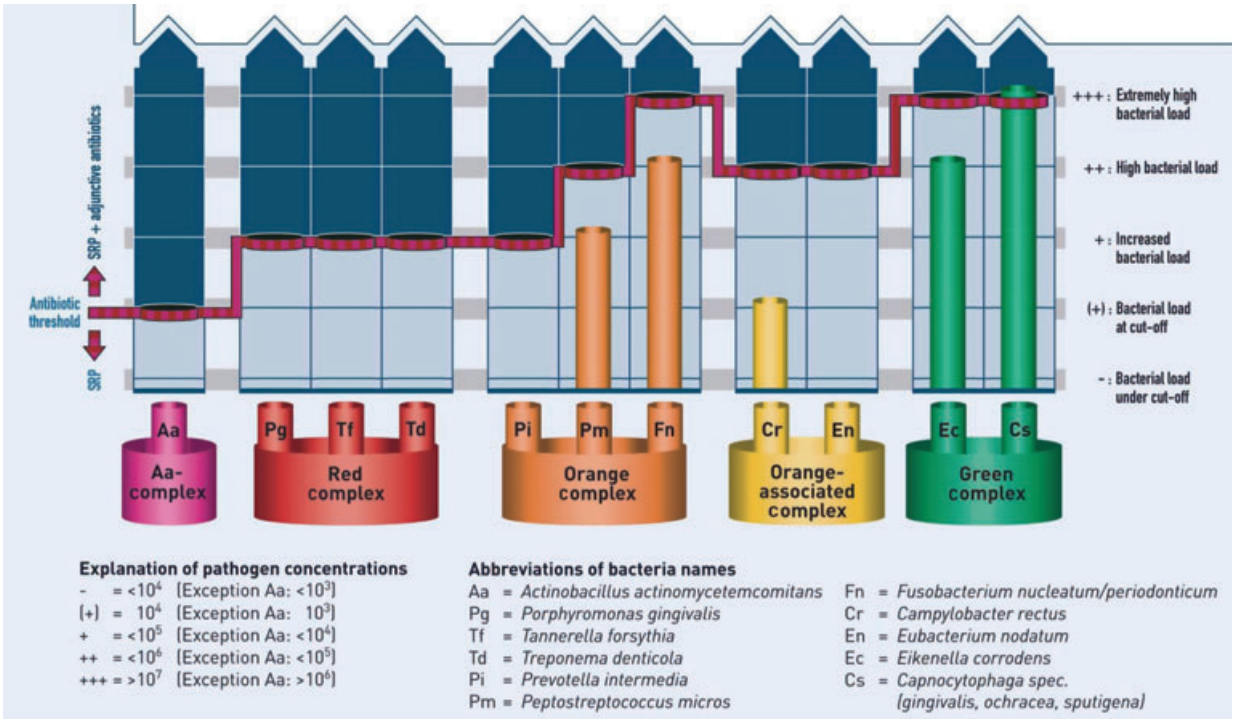

Fig. 2. Microbiological result of the tongue piercing of a 20-year-old female patient. The jewellery had been in place for 2 years and was regularly cleaned, oral hygiene: QHI = 2.5, non-smoker.

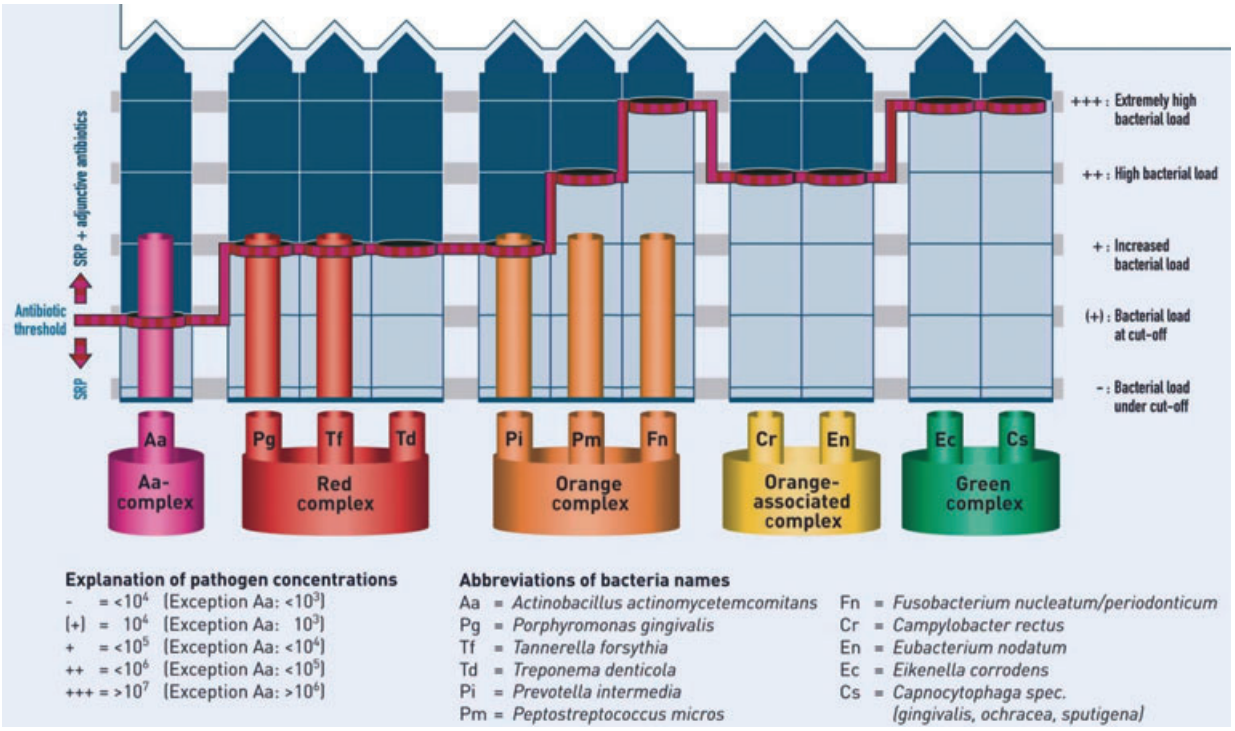

Fig. 3. Microbiological result of the tongue piercing of a 26-year-old male patient. The jewellery had been in place for 6 years and had never been cleaned, oral hygiene: QHI = 3.8, heavy smoker.

conditions and thus provides an environment which is more suited to anaerobic and facultative anaerobic bacteria than to aerobic species. Wearing a tongue piercing over an extended period of time is likely to produce similar conditions, especially in a patient who neglects oral hygiene measures. The test used in this study detects 11 different periodontopathogenic bacteria. The test results were analysed on the basis of the findings reported by Socransky *et al.* (1998) who described different complexes of bacteria in subgingival plaque (20). The red complex consists of bacteria with high periodontopathogenic potential. It shows the strongest relationship with the clinical parameters considered most meaningful in periodontal diagnosis, i.e. bleeding on probing and pocket depth. Bacteria of the orange complex were found to be associated with infections in non-periodontal sites. The green complex includes bacteria with a moderate periodontopathogenic potential. While species within complexes were closely associated, the complexes themselves seem to have specific relationships with one another. Moreover, certain complexes and members of certain complexes were strongly related to clinical parameters of inflammation and periodontal destruction (20).

The microbiological analysis of the tongue piercing sites shows that the jewellery can provide a reservoir for periodontopathogenic bacteria. We noticed that the longer a piercing had been in place and the worse the oral and piercing hygiene was, the more pronounced was the shift from bacteria with a moderate periodontopathogenic potential (green complex) to bacteria with a very high periodontopathogenic potential (red complex). Heavy smoking seemed to have an additional effect (31). Whether the material of the piercing may play an additional role in plaque accumulation is questionable. At the time being, there is no reference available regarding the surface plaque retention of different materials used as tongue jewellery.

The results emphasize the necessity of informing patients with oral piercings about their increased risk of bacterial infection. From a dental perspective, prospective or current piercees should be advised against wearing oral jewellery because of the complications and risks associated with this fashion trend. Apart from this, dentists and/or dental hygienists should advise piercees how to protect oral structures by maintaining good oral hygiene and by cleaning and disinfecting their jewellery with appropriate materials. Additionally, using a tongue scraper should be strongly recommended. A disinfection solution could also be used. Chen and Scully (1992) reported that chlorhexidine digluconate (CHX) was useful as an adjunct in the treatment of acute infection after the placement of jewellery in the tongue (26). Chlorhexidine digluconate is effective against both Gram-positive and Gram-negative bacteria and has considerably higher substantivity than other antibacterial agents (32–35). According to the beneficial effects, CHX should be strongly recommended as an effective disinfectant for patients with tongue piercing: to clean their jewellery, piercees should remove the device regularly and place it in a CHX solution.

Conclusion

Wearing tongue jewellery over an extended period of time may result in the colonization of periodontopathogenic bacteria at the piercing site in the absence of appropriate oral hygiene practices.

Prospective and current pierces should be informed about possible side-effects and oral health hazards, and about the necessity of cleaning their piercing jewellery regularly with a CHX solution or another appropriate disinfectant.

Acknowledgement

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