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STREPTOCOCCUS MUTANS AND *LACTOBACILLUS* LEVELS IN ORAL CLEFT PATIENTS

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Abstract. Aim. The aim of the present study was to search the manner in which cariogenic bacteria might coexist with know bacteria that produce volatile sulfur compounds and represent the cause of habitasis. **Materials and methods**. 100 patients aged 11-21y with palatal clefts and malocclusions were divided into two groups: group A was treated with fixed orthodontic appliances, group B was treated with removable appliances. The untreated group C represented the control one. Patients were examined for halitosis and an assessment for cariogenic bacteria from saliva samples was performed. Significance established at $p<0.05$ was used to analyze the data by U-Mann-Whitney test and r-Spearman coefficient. **Results.** The patients presented lower levels of *Streptococcus mutans* than expected. Group B showed an inverse relationship between halitosis and the presence of cariogenic bacteria. Groups A and C had higher levels of *Streptococcus mutans* that did not inhibit the development of microbes that produce volatile sulfur compounds. **Conclusion.** Our study showed that cleft palate patients have a diminished caries risk comparing to non cleft ones. Therefore, these patients have special oral hygiene needs and must focus on brushing either the tongue or an appliance.
Key words: cariogenic bacteria, halitosis, cleft palate, orthodontics

Rezumat. Scop. Scopul studiului a fost de a evidenția măsura în care bacteriile cariogene pot coexista cu bacterii cunoscute ca producătoare de compuşi volatili sulfuraţi şi care reprezintă cauza halitozei. **Material şi metode.** Un număr de 100 pacienți cu vârste între 11-21 ani, prezentând palatoschisis şi malocluzii a fost clasificat în 2 grupuri: grupul A a fost tratat cu aparate ortodontice fixe şi grupul B care a fost tratat cu proteze mobile. Grupul C, netratat, a reprezentat grupul martor. Pacienţii au fost examinaţi pentru halitoză. S-a efectuat o evaluare a eşantioanelor de salivă pentru determinarea bacteriilor cariogene. Semnificația statistică la $p < 0,05$ a fost utilizată pentru analiza datelor prin testul Mann-Whitney şi a coeficientului r-Spearman. **Rezultate.** Pacienții au prezentat niveluri mai mici de *Streptococcus mutans* decât cele aşteptate. Pentru grupul B s-a remarcat o relație inversă între halitoză şi prezența bacteriilor cariogene. Grupurile A şi C au prezentat cantităţi crescute de *Streptococcus mutans,* care nu au inhibat producerea de compuşi volatili sulfuraţi de către microbi. **Concluzii.** Studiul a demonstrat faptul că pacienții care prezintă palatoschisis prezintă un risc mai scăzut pentru carii, în comparație cu pacienții fără palatoschisis. Astfel, aceşti pacienți prezintă nevoi speciale de igienă orală, mai ales periajul limbii sau aplicații locale.
Cuvinte cheie: bacterii cariogene, halitoză, palatoschisis, ortodontic

INTRODUCTION

Severe facial malformations as well as morphological and functional impairment of sucking, swallowing and breathing often result from cleft lip and cleft palate. Multi-disciplinary teams offer the best

hope for securing an intact dentition with these patients (1, 2).

Unfortunately, cleft patients frequently require sucrose-laden prescriptions that make the teeth and gingival susceptible to caries and gingivitis that result from the subsequent *Streptococcus mutans (Ms)* and *Lactobacillus (Lb)* amplification (3).

Also, oral microflora originates from extraoral sources, e.g., sinuses, gastrointestinal tract, ingested food and lungs. Bad breath or malodors often result from volatile sulfur compounds that result from the metabolic degradation of these bacteria. Such bacteria occur on oral surfaces, periodontal pockets and especially on the dorsal wart-like surface of the tongue (4,5, 6, 7).

The aim of the study was to examine the dynamic between *S. mutans* and *Lactobacillus acidophilus* and those that release volatile sulphur compounds.

MATERIALS AND METHODS

200 cleft lip/palate patients aged 11-21y were divided into two equal groups. Group A had cleft patients treated with fixed appliances oral and group B consisted of cleft patients treated with removable appliances. The control group - C - comprised 100 untreated individuals with no cleft. All patients in the study underwent a subjective self-examination for halitosis. Upon awakening, each patient licked the back of their hands, and from a three centimeter distance would smell this deposit and rank the odor on a 4-point scale: 0 - no odor, 1 - almost imperceptible odor, 2 - moderate odor, 3 - especially offensive odor.

Researchers collected scrapings from the distal and anterior parts of patients' tongues and evaluated deposits from the same distance and on the same scale; then they collected saliva samples from each patient by having them chew on paraffin samples. The saliva was used to inoculate a selective medium in test tubes (CRT-bacteria, Vivadent) with $NaHCO_3$ and placed in a thermostat. After 48 hours of incubation cultures of *S. mutans* and *Lactobacillus* were observed and compared to the firm's pattern (fig. 1).

Significance established at $p<0.05$ was used to analyze the data by U-Mann-Whitney test and r-Spearman coefficient.

RESULTS AND DISCUSSION

This study revealed that *S. mutans* and *L. acidophilus* levels were lower in orthodontic cleft palate patients than in untreated ones (fig. 1). The lowest percentage of *S. mutans* and *Lactobacillus* levels, 40% and 46% respectively, were found in cleft palate patients treated by removable appliances (Group B), whereas patients treated with fixed appliances (Group A) had values of 44% and 54% respectively.

The difference in cariogenic bacteria distribution in cleft patients and those with no clefts showed a statistical significance ($p<0.05$) with respect to *S. mutans* levels.

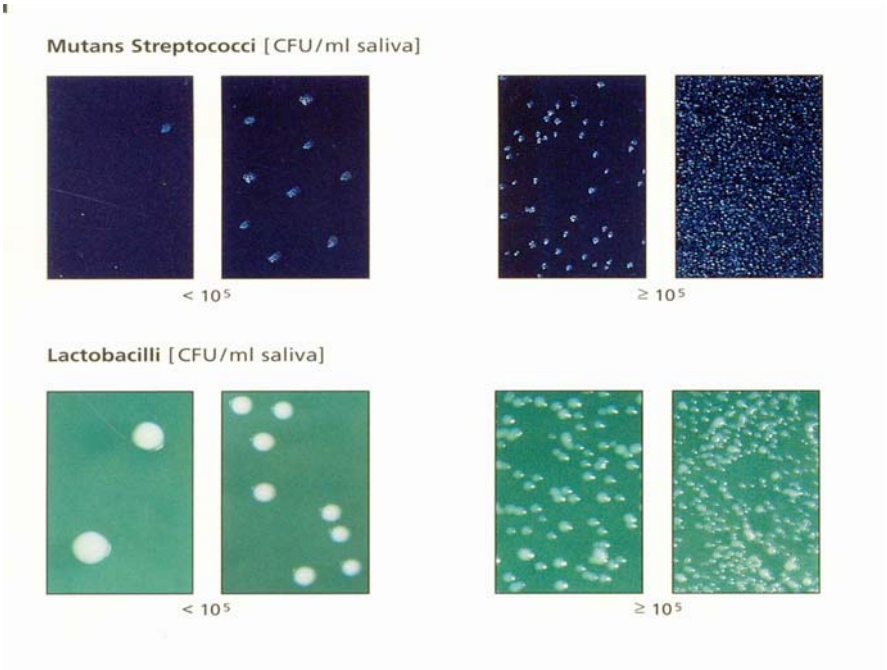


Fig. 1. Template for estimation of intensity of *Sm* and *Lb* culture proliferation; CFU/ml means colony-forming unit (CFU) in 1 ml of saliva

Evaluation of patients of their halitosis did not coincide with clinicians' findings (fig. 2a – b).

Researchers discovered that self-evaluation of halitosis intensity, in general, overestimated except for those with removable appliances. Two percent of these individuals had anterior tongue odors of 3.

An analysis of correlation could not statistically support a consistency ($p>0.05$) of self-estimated halitosis with levels of *S. mutans* and *Lactobacillus* (table 1).

However, an application of r Spearman coefficient did reveal a statistical significance (table 2). An increase of *S. mutans* level in saliva correlated significantly with higher halitosis scores from the tongue's anterior region and with higher self-estimation of halitosis in patients from Groups A and C respectively. Cleft palate patients from Group B, however, showed an increase in halitosis from the tongue's anterior region when cariogenic bacteria diminished.

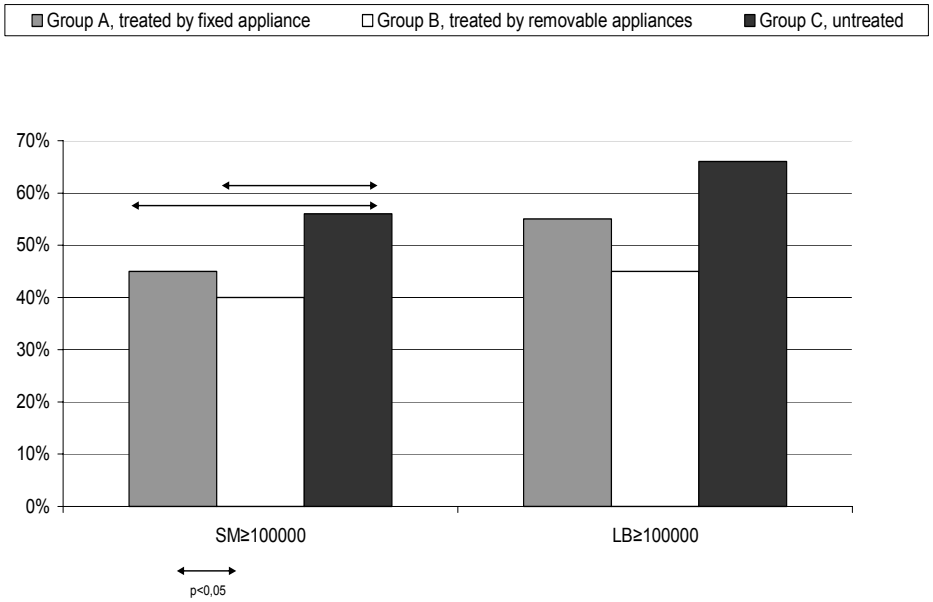


Fig. 2. Percentage distribution of high *Sm* and *Lb* levels in orthodontic patients and in untreated ones

Table 1. Correlation of halitosis self-estimation and *Ms* or *Lb* level, established by U-Mann-Whitney test

Variable	Group	Bacteria level	Sum of ranks	U	Z corrected.	p level	N
Halitosis	**A**	$Sm \geq 10^5$	94,50	49,50	0,00	>0,05	22
		$Sm < 10^5$	115,50				28
		$Lb \geq 10^5$	123,50	41,50	0,69	>0,05	28
		$Lb < 10^5$	86,50				22
	B	$Sm \geq 10^5$	72,00	33,00	0,81	>0,05	15
		$Sm < 10^5$	138,00				35
		$Lb \geq 10^5$	107,00	37,00	1,04	>0,05	22
		$Lb < 10^5$	103,00				28
	C	$Sm \geq 10^5$	109,50	43,50	-0,52	>0,05	28
		$Sm < 10^5$	100,50				22
		$Lb \geq 10^5$	122,50	31,50	-1,28	>0,05	31
		$Lb < 10^5$	87,50				19

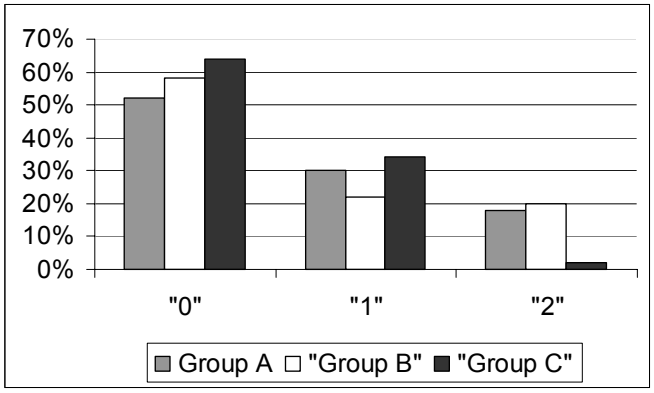
Table 2. Correlation of halitosis and *Sm* or *Lb* level established by r-Spearman coefficient

Group	Variable	Bacteria level	N Valid	R Spearman	t(N-2)	p level
A	Halitosis in tongue frontal part	*Sm*≥10^5	50	**0,32**	2,36	**<0,05**
	Halitosis in tongue distal part	*Sm*≥10^5	50	0,02	0,17	>0,05
	Self-estimation of halitosis	*Sm*≥10^5	50	-0,05	-0,38	>0,05
B	Halitosis in tongue frontal part	*Sm*≥10^5	50	**-0.01**	-0,11	**<0,05**
	Halitosis in tongue distal part	*Sm*≥10^5	50	0,11	0,77	>0,05
	Self-estimation of halitosis	*Sm*≥10^5	50	0,18	1,28	>0,05
C	Halitosis in tongue frontal part	*Sm*≥10^5	50	0,10	0,71	>0,05
	Halitosis in tongue distal part	*Sm*≥10^5	50	0,04	0,30	>0,05
	Self-estimation of halitosis	*Sm*≥10^5	50	**0,34**	2,52	**<0,05**
A	Halitosis in tongue frontal part	*Lb*≥10^5	50	0,22	1,58	>0,05
	Halitosis in tongue distal part	*Lb* ≥10^5	50	0,03	0,27	>0,05
	Self-estimation of halitosis	*Lb* ≥10^5	50	0,02	0,16	>0,05
B	Halitosis in tongue frontal part	*Lb* ≥10^5	50	**-0,34**	2,50	**<0,05**
	Halitosis in tongue distal part	*Lb* ≥10^5	50	0,07	0,51	>0,05
	Self-estimation of halitosis	*Lb* ≥10^5	50	0,20	1,43	>0,05
C	Halitosis in tongue frontal part	*Lb* ≥10^5	50	-0,00	-0,02	>0,05
	Halitosis in tongue distal part	*Lb* ≥10^5	50	0,03	0,02	>0,05
	Self-estimation of halitosis	*Lb* ≥10^5	50	-0,03	-0,02	>0,05

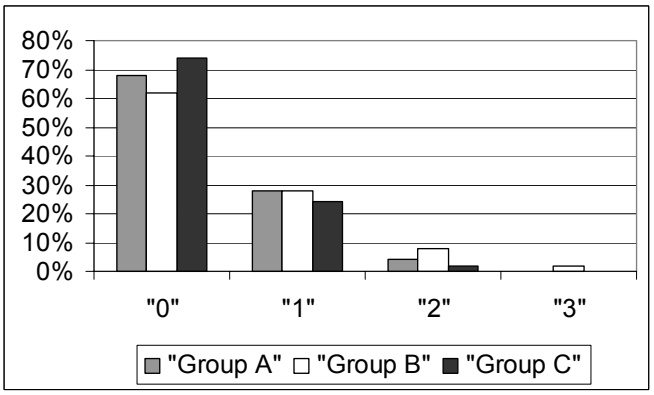
Numerous reports have shown that oral concentration of polysaccharides, either bacterial (dextran) or alimentary (sucrose) favor an increase of *S. mutans* and *Lactobacillus* along with their proteolytic enzymes and pH-lowering potential (8, 9, 10, 11).

Diminished pH encourages salivary protein acid precipitation, which offers an organic stroma for plaque accumulation and subsequent dental caries. Teeth in cleft regions are often crowded and rotated with susceptible-to-caries enamel. As Chang et al and Batoni et al have reported the employment of orthodontic appliances represent an additional factor that promotes the colonization in the oral cavity of *S. mutans* (12, 13). This present research has revealed significantly higher levels of *S. mutans* in the non cleft patients when compared to those with palate impairment. The cleft patients seem to display comparably lower risk of caries, especially with removable appliances.

Human saliva not only eliminates bacteria mechanically, but limits them through defensive factors such as neutralization of pH also (fig. 3) (14, 15).



a)



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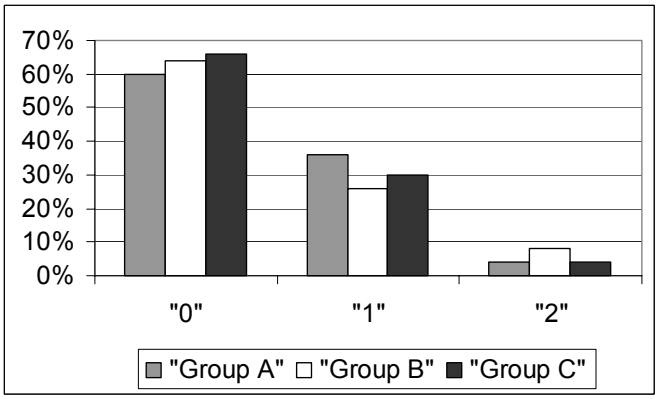

c)

Fig. 3. Percentage distribution of halitosis intensity. A) self-examined, B) evaluated on the basis of scrapings from the tongue's anterior region, C) evaluated on the basis of scrapings from the tongue's distal region. Horizontal axis represents scale-values of malodor

This improves the environment for colonization of tongue niches by nonpathogenic microorganisms. An increase in salivation also prompts a higher number of substrates for volatile sulfur compounds, which encourages halitosis (16, 17, 18). This biological feedback displayed in this current research showed a shift of microbiota towards those responsible for oral malodor in patients with removable appliances. Patients with high halitosis scores by either self-estimation or clinicians' verification resulted from increased saliva secretion stimulated by the acrylic plate of the appliance. The malodor of patients in Group B might also have been triggered by the transitional unblocking of the remaining palatal fissures, which allowed communication between nasal and oral cavities.

Such inverse relationship of halitosis and cariogenic bacterial levels was not observed in patients from Groups A and C. Higher values of oral malodor were statistically significant with an increase amount of *S. mutans*.

Therefore, fixed orthodontic appliances may have the potential that favors halitosis and also threatens the teeth and gingiva.

The morphological and functional changes in cleft patients determine oral bacteria composition, and this depends on the therapy employed. The discomfort induced by orthodontic appliances could provoke orthodontic patients to evaluate their halitosis as greater than untreated patients. Although halitosis concerns many dental patients, the relative young ages of patients in presented study could account for the diminished halitosis scores in this population (19, 20, 21).

The results of this inquiry could not relate the use of orthodontic appliances to increased caries risk in cleft patients, but the subject needs more intense investigation.

CONCLUSIONS

The following conclusions have emerged from this study:

1. cleft palate patients treated by removable appliances run the risk of amplified halitosis but diminished caries;
2. palatal clefts do not increase patients' risk to caries, but these patients have special oral hygiene needs that should focus on tongue cleaning and appliance brushing;
3. the coincidence of halitosis and *S. mutans* in patients treated by fixed appliances reveal that the bacteria responsible for caries do not inhibit those microbes that produce volatile sulfur compounds.

The reparative function of saliva decreases the likelihood of enamel loss or gain, but a failure to follow basic preventive measures will increase the threat of enamel decalcification. Careful oral hygiene monitoring must be applied to orthodontic patients irrespective of the chosen therapy.

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