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ORIGINAL ARTICLE

Use of Oral Rinse with Enzymatic System in Patients Totally Dependent in the Intensive Care Unit*

Uso de Solução Bucal com Sistema Enzimático em Pacientes Totalmente Dependentes de Cuidados em Unidade de Terapia Intensiva

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SUMMARY

BACKGROUND AND OBJECTIVES: Patients admitted to an intensive care unit (ICU), in most cases do not have a proper oral hygiene. This deficient condition of oral hygiene in critical patients often triggers periodontitis, gingivitis and other systemic and oral complications. This research aimed to evaluate the efficiency of the antimicrobial action of a solution with bioactive enzymatic system for oral hygiene, in totally care-dependent patients admitted to ICU.

METHODS: A prospective, double blind pilot study was conducted with 20 patients admitted to an ICU, divided into 2 groups with the same technique of oral hygiene, protocols but using different solutions: the study group (n = 10) using an oral solution with enzymatic system and the control group (n = 10) using an oral solution based on cetylpyridinium.

RESULTS: Results of microbiological cultures collected in the study group and control group, before and after the use of enzymatic solution, showed no significant difference between groups (p = 0.41). In clinical evaluation of the Simplified Oral Hygiene Index (SOHI) statistical significance was found by the Fisher Exact test (p = 0.01) when comparing the study group and control group. The value of statistical significance was set at 5%, or $p < 0.05$.

CONCLUSIONS: The use of oral rinse with the lactoperoxidase enzyme was effective in the clinical evaluation of the oral hygiene of patients totally care-dependent in the hospital. This study stresses the importance of developing more research on the oral care of these patients.

Key Words: hospital infection control program, ICU, oral manifestations

RESUMO

JUSTIFICATIVA E OBJETIVOS: Os pacientes internados em unidades de terapia intensiva (UTI), na maioria das vezes, não possuem higienização oral adequada. Esta condição de deficiência de higiene oral em pacientes graves desencadeia freqüentemente periodontites, gengivites e outras complicações sistêmicas e orais. O objetivo deste estudo foi avaliar a eficiência da ação antimicrobiana da solução bucal com sistema enzimático associada à higiene oral, em pacientes totalmente dependentes de cuidados internados em UTI.

MÉTODO: Estudo piloto prospectivo duplamente encoberto, realizado com 20 pacientes internados em

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UTI, divididos em 2 grupos com protocolos de higienização bucal com a mesma técnica, mas utilizando-se soluções diferentes, sendo o grupo de estudo (n = 10) utilizando solução bucal com sistema enzimático e o grupo controle (n = 10) utilizando solução bucal à base de cetilpiridínio.

RESULTADOS: Os resultados microbiológicos das culturas coletadas nos grupos de estudo e controle, antes e após o uso da solução enzimática, mostraram que não houve diferença significativa entre os grupos (p = 0,41). Na avaliação clínica do Índice de Higiene Oral Simplificada (IHOS) houve significância estatística pelo teste Exato de Fisher (p = 0,01), quando comparados aos grupos de estudo e controle. O valor de significância estatística foi estabelecido em 5% ou p < 0,05.

CONCLUSÔES: O uso de solução enzimática à base de lactoperoxidase, mostrou ser eficiente na avaliação clínica para higiene oral de pacientes totalmente dependentes de cuidados em ambiente hospitalar. Este estudo reflete a importância de se desenvolverem mais pesquisas quanto aos cuidados bucais com este grupo de pacientes.

Unitermos: manifestações orais, programa de controle de infecção hospitalar, UTI

INTRODUCTION

Infection is a frequent complication with high mortality of intensive care unit (ICU) patients. Infections may be divided in exogenous when the infecting pathogen is directly acquired from the environment and endogenous when it belongs to the microbial flora of the host (patient). The ICU patient is initially colonized by potentially pathogenic agents acquired in the external environment. They modify the resident microbial flora so that infections can be divided into primary (infections produced by the resident microbial flora) and secondary (infections produced by the microbial flora acquired in the ICU)[1-3].

As such, it is estimated that in an ICU patients, endogenous infections correspond to 80% of the overall infections, with a proportion varying between primary and secondary endogenous according to the characteristics of each ICU[4] .

Patients in the ICU in the majority of cases do not have adequate oral hygiene, possibly due to lack of knowledge of the appropriate procedures by the intensive therapy teams and due to lack of inter-professional relationship dentistry/nursing. Such conditions of deficient oral hygiene in critical patients often trigger periodontitis, gingivitis, otitis, chronic rhinopharyngitis and xerostomia, all a potential focus of infection favorable to nosocomial pneumonia[5,6].

Intensive care patients often remain with their mouth open, due to tracheal intubation, permitting dehydration of the oral mucosa. Decrease of the saliva flow, increases the saburra or tongue biofilm (stagnant organic matrix) on the dorsal face of the tongue favouring production of volatile sulphur components such as mercaptans (CH SH) and hydrates of sulphur (HS) with an unpleasant smell and bacterial colonization[7,8].

In these patients comfort must always be taken into account. Oral alterations have a high prevalence in critical hospitalized patients, Furthermore, the strong oral smell, makes the approach difficult for the multiprofessional team. Another consideration is the impact of low nutritional conditions, affecting the oral cavity, as these patients receive enteral or parenteral nutrition reducing tissue repair capacity and reducing the immunity to infection because of inadequate nutrition. Oral pain and discomfort suffered by the patient may discourage food ingestion, as well as verbal communication, once the patient is extubated[9].

Lindhe reported that the bacterial plaque produces irritating substances (acids, endotoxins and antigens) that after some time, invariably destroy teeth and support tissues[10].

In view of the bacterial risks originating in the mouth, complete cleaning of the tissues of the oral cavity is advised including, teeth, gingiva and tongue; by removing rests of food and bacterial plaque. The intention is to foster an oral environment “immune” to oral afflictions. Patients with inadequate oral hygiene and poor dental conditions present a higher risk of local and systemic complications[6].

As an auxiliary method for reduction of the bacterial plaque an enzymatic product is chosen because it contains no abrasive substances (alcohol, detergent, dye) that may further harm the already impaired oral mucosa[7]. It is also important that the enzymatic product contains lactoferrin which by its action and its interactions with the saliva reduces the incidence of *Candida albicans* and *Candida krusei* in the oral mucosa[11,12].

Thus, this study intended to assess the efficacy of the antimicrobial action of a mouth rinse with associated enzymatic system for the oral hygiene of totally dependent patients in an ICU.

METHODS

After approval by the Ethics Committee of the institution a study was carried out with patients admitted to the ICU of the Hospital Central da Irmandade da Santa Casa de Misericórdia de São Paulo (HCISC-MSP), totally care-dependent, who could not perform oral hygiene by themselves, needing help.

Twenty patients were analyzed and distributed in 2 groups: 10 patients using the proposed protocol called study group and 10 patients in the control group. Patients in the study group were submitted to an oral hygiene protocol using an oral solution with enzymatic system (Biotene, Mouthwash® - MS 2.2561.0003.001-6) and foam sticks suitable for oral hygiene, Patients were randomly selected for each group, following inclusion and exclusion criteria.

The utilized inclusion and exclusion criteria were: totally care-dependent patients, not in isolation due to infectious contagious diseases, dentulous or using a partial prosthesis. Partially dependent and edentulous patients were excluded.

The control group was assessed in the same way as the study group. However, in the latter, care with oral hygiene was carried out by nurses following the service routine. This routine, comprises use of foam sticks with oral antiseptic of cetylpyridium and alcohol.

All family members of patients participating in the study were informed by writing and verbally and completed a written consent in accordance with Resolution N. 196 of the National Health Council.

A clinical chart was filled out for each patient at the time of oral exam, with information on age, gender, medical diagnosis, odontological diagnosis, date of odontological evaluation, medication, level of consciousness, condition of the airways: intubated or not, oral cavity – presence or not of injury, saliva consistency, oral motility, lips, tongue use of removable prosthesis, yes-no, upper-lower or both, swallowing, adequate-inadequate, route of nutritional support, product used for oral hygiene and frequency. Oral evaluation after use of the product.

To assess the condition of oral health the criterion of Greene and Vermillion bacterial plaque index was used[13]. This index evaluates surfaces covered by bacterial plaque, such as vestibular and lingual according to upper and lower central molars and incisives. The simplified oral hygiene index (SOHI) is the combination of the indices of inducts-bacterial plaque. Scores of inducts range from zero to three according to the following criteria:

- Level zero (0) – absence of inducts or intrinsic stains;
- Level one (1) – presence of induct covering no more than 1/3 of the examined surface or absence of induct, but presence of intrinsic stains;
- Level two (2) – presence of induct covering more than 1/3, but no more than 2/3 of the examined surface; there may or may not be intrinsic stains;
- Level three (3) – presence of inducts covering more than 2/3 of the examined surface.

A sample of oral biofilm was collected from the vestibular area of the 1st lower molar or of the nearest tooth, if the former is missing. The culture of the pre and post-hygiene oral flora, in the study group as well as in the control group was sent for evaluation. Collection was made by swabbing the cervical regions of the described teeth, placed in a Stuart medium and then sent to the central laboratory of the Santa Casa de Misericórdia de São Paulo. Evaluation period and performance of oral hygiene practices was of 5 days starting from collection of material for culture.

The protocol of intensive oral hygiene was transmitted to the entire ICU team (physicians, physiotherapists, speech specialists and nurses) by text and/or practical training by dentists for the nursing staff.

Instructions for oral hygiene using oral solutions followed this sequence:

1) Put on procedure gloves;
2) Separate Biotene oral solution;
3) Pour into a 10 mL dosing glass;
4) Moisten the swab in the solution:
- Scrape over the tongue in the posterior-anterior direction;
- Swab over the vestibules, cheeks in the posterior-anterior direction;
- Scrape over the palate in the posterior-anterior direction;
- Spread on the vestibular, lingual and occlusal surfaces of the teeth;

5) Aspire the oropharynx during the procedure;
6) For statistical analysis of the collected data on the microorganisms found and of the SOHI, the Chi-square and the Fisher's Exact tests were utilized.

RESULTS

For this study 23 patients were evaluated, however three were excluded for not meeting the inclusion criteria.

The assessed patients were entirely care-dependent as 90% of them were in coma or under continued sedation and only 10% were conscious but tetraplegic. Hundred percent of the patients were under mechanical ventilation through tracheal intubation or tracheostomy. Regarding nutritional support it was noted that 85% of the patients received enteral diet and the others (15%) received oral diet or were fastening. It was observed that only 10% presented with some type of oral lesions while all with trauma characteristics are shown in table 1.

Microbiological analysis disclosed presence of various groups of bacteria and fungi. Overall results of the positive cultures, according to the type of microorganism per collection are shown in decreasing order as follows: *Acinetobacter baumanii* (17), *S. aureus* (11), *S. coagulase negativ* (9), *Enterobacter* (9), *P. aeruginosa* (8), *S. viridans* (7), *Corinebacterium sp* (4), *Enterococcus sp* (4), *Klebisiella sp* (3), *Serratia sp* (2), *Pseudomonas sp* (2), *M. morganii* (2), D group *Streptococcus* (1) and *Candida sp* (1). Description according to the studied groups and the type of flora, assessed before and after hygiene, are described on table 2.

For statistical analysis of microbiological cultures, the Chi-square test was used with the value of statistical significance set at 5% or $p < 0.05$. Cultures were performed for all patients and for all bacteria under study. The number of negative cultures was calculated by subtracting the value of those positive from the total number of cultures. Results in the study group, before and after use of enzymatic solutions, showed that there was no significant difference among groups ($\chi^2 = 0.69$; gL = 1; $p = 0.41$); and in the control group there was no significant difference between groups ($\chi^2 = 3.19$; gL = 1; $p = 0.074$) (Table 3).

Table 1 – Clinical Condition of the Patients under Study

		Study Group (n = 10)	Control Group (n = 10)
UA	Tracheal intubation	6	7
	Tracheostomy	4	3
Level of consciousness	Coma	4	3
	Continued sedation	4	7
	Conscious	2	0
Nutritional Support	ENS (enteral diet)	8	9
	Oral	2	1
Oral Injuries	Yes	2	0
	No	8	10

UA = Upper airways; ENS = enteral nutritional support

Table 2 – Microbiological Laboratory Evaluation of the Studied Groups Before and After Hygiene

	Study Group (n = 10)		Control Group (n = 10)	
	Before Hygiene	After Hygiene	Before Hygiene	After Hygiene
Staphylococcus coagulase negative	3	3		3
Corynebacterium sp.	3	1		
Candida sp.	1			
Staphylococcus aureus	3	2	4	2
Klebsiella sp.	1		2	
Acinetobacter baumanii	3	6	1	7
Enterococcus sp.	3			1
Enterobacter sp.	2	2	1	4
Streptococcus viridans	2	3	1	1
Serratia sp.	2			
Pseudomonas aeruginosa	1	2	2	3
Pseudomonas sp.	1			1
Morganella morganii			1	1
Streptococcus group D			1	

Table 3 – Percentage of Positive and Negative Cultures Before and After Hygiene in the Groups under Study

Study Group	Before		After	
Positive	24	17%	19	14%
Negative	116	83%	121	86%
Total	140		140	
Control Group				
Positive	13	9%	23	16%
Negative	127	91%	117	84%
Total	140		140	

Summing up, it may be noted that prior to hygiene, patients in the study group presented 24 positive cultures and after the hygiene period, only 19 positive cultures were detected. In the control group, before hygiene 13 positive cultures were found and after the hygiene period 23 positive cultures (Figure 1).

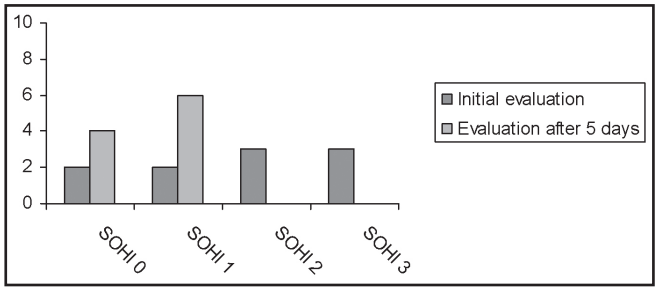

Figure 1 – Initial and After 5 days of Hygiene Evaluation of the Study Group according to the Greene and Vermillion criteria, utilizing the SOHI[13].

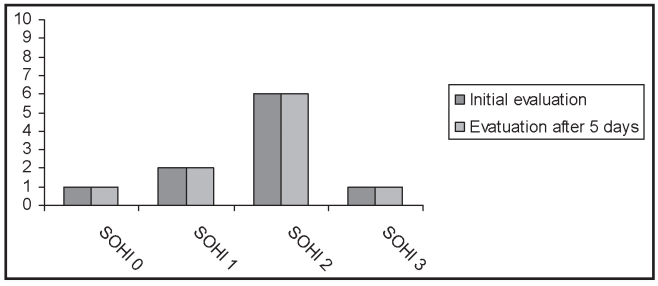

Figure 2 – Initial and After 5 days of Hygiene Evaluation of the Control Group according to the Greene and Vermillion criteria, utilizing the SOHI[13].

In the clinical assessment where the dental bacterial plaque indices, according to the Greene and Vermilllon criteria[13] and the simplified oral hygiene index (SOHI) were observed, the following results were reached: study group before hygiene – SOHI 0 (2), SOHI 1 (2) SOHI 2 (3), SOHI 3 (3); after 5 days of hygiene - SOHI 0 (4). SOHI 1 (6), SOHI 2 (3) and SOHI 3 (0). In the control group before hygiene – SOHI 0 (1). SOHI 1(2), SOHI 2 (6), SOHI 3 (1); after 5 days of hygiene – SOHI 0 (1). SOHI 1 (2). SOHI 2 (6) and SOHI 3 (1).

Statistical analysis of the SOHI evaluation showed statistical significance by the Fisher's Exact test (p = 0.01) when both groups were compared (Table 4).

Table 4 – Percentage of the Simplified Oral Hygiene Indices Before and After Hygiene in the Groups under Study.

Study Group	Before		After	
H0 and H1	4	40%	10	100%
H2 and H3	6	60%	-	-
Total	10		10	
Control Group				
H0 and H1	3	30%	3	30%
H2 and H3	7	70%	7	70%
Total	10		10	

For the two conscious patients who participated in the study group, it was reported that after the period of use of the enzymatic solution they felt a greater oral comfort, decrease of the dry mouth feeling and that use of the product did not cause burning.

DISCUSSION

Concern with oral infections as primary focus of systemic infections in patients totally care-dependent admitted in the ICU, although poorly documented has been relevant in discussions by interdisciplinary teams. Measures to reduce infections of oral origin range from local hygiene care and techniques, such as search for products that help homeostasis of the oral environment and decrease of bacterial flora.

In this study, a solution frequently used in most intensive care services (based on cetylpyridium and alcohol) was evaluated and compared to enzymatic substances based on lactoperoxidase, an enzyme found in human saliva according to the Tenovuo study[7].

Criteria used were based on microbiological assessments and on the bacterial plaque index by Greene and Vermillion[13], using the SOHI. Study results showed that by means of laboratory analyses, in the study group a reduction or elimination of oral bacterial flora took place, when comparing the beginning and end of hygiene, however with the exception of the types: *S. viridans* and *A. Baumanii*. In the control group maintenance, increase or appearance of new oral bacterial flora was observed (*S. coagulase* negative, *A. baumanii*, *Enterococos sp* and *pseudomonas*). Although there was no statistical significance in the comparison of groups and results achieved, in view of the small sample of studied patients in this pilot study suggest that in a larger sample the difference of

the microorganisms found in the two groups may be significant. Regarding SOHI, there was a significant statistical relevance in results confirming the clinical observation carried out by researchers of this study.

According to Lehane et al., in double blind study where patients with periodontal disease and periodically treated patients were assessed, using the enzymatic solution and the control solution, no statistically significant decrease of the bacteria *Streptococos mutans* and of lactobacilli[14] was found among groups. In this study a decrease in the index of bacterial plaque was observed between beginning and end of oral cares with the enzymatic solution, when compared with the control group using cetylpyridium solution which was not effective. Such data clearly show that the association of frequent oral hygiene cares, together with vehicles with bactericide action and maintenance of the oral balance may significantly improve the quality of life of totally care-dependent patients.

This study was considered by researchers as a pilot project. Clinical evidence and the experience of this team of dental surgeons participating in this study brought about discussions regarding the protocols and products currently used for oral hygiene in the ICU for totally care-dependent patients In view of the difficulty to obtain an adequate number of patients for a study in accordance with the inclusion and exclusion criteria proposed in the method, it was concluded that the sample utilized would provide researchers with a perspective for a larger study.

In this study an improvement in the inflammatory aspect of the gingiva, of the oral dryness, of halitosis and easiness in removal of debris were visually observed in the study group. Such conditions favour the action of the nursing team in the care of oral hygiene, decrease primary infection focuses in the mouth and allow dental surgeons to participate in a multidisciplinary team of intensive therapy.

Use of the enzymatic solution based on lactoperoxidase proved efficient in the clinical evaluation for oral hygiene of totally care-dependent patients in a hospital environment. This study stresses the importance of carrying out further research regarding oral cares for such a group of patients.

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