



The effects of different therapeutic approaches on oral malodor in a population of Iraqi people in Baghdad city

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Abstract

This study investigates the effects of two types of oral mouthwashes (Corsodyl mouth rinse (MR)) and (Crest multiprotection MR) in combination with mechanical plaque control, on oral malodor of periodontally healthy children and compare it with conventional mechanical plaque control.

Thirty healthy subjects from Baghdad city schools with an average age(9-11)were divided into three groups: Group I: tooth brushing ,interdental flossing ,and tongue brushing; Group II: as group I+ rinsing with Corsodyl MR; Group III :as group I+ rinsing with Crest MR. Oral malodor was measured organoleptically and by using Haliometer before treatment ,then the volunteers performed these oral hygiene procedures for 7 days, then oral malodor was measured again to estimate the effect of mouthwash on oral malodor. Data were analyzed by one way t-test.

There were highly significant differences between group I and group II ,and group I and group III, and even though group II provides a better oral malodor reduction than group III, there was no significant difference between them.

Keywords: Oral malodor, Corsodyl MR, Crest MR , Haliometer.

Introduction

Oral malodor is a generic descriptive term for foul smells emanating from the mouth. It's influenced by a combination of several factors, but although numerous non-oral sites and systemic causes have been suggested (nasal inflammation ,chronic sinusitis, diabetes mellitus, ext),an estimated 80-90% of all bad breath odors originate in the mouth itself⁽¹⁾.

It is well accepted that the pathogenesis of oral malodor is associated with the bacterial degradation of sulphur containing amino acids (methionine, cysteine, cystine) into volatile sulphur

compounds(VSCs) of which hydrogen sulphide (H₂S),methyl mercaptan(CH₃SH),and to lesser extent dimethyl sulphide ((CH₃)₂S)are the principal components.⁽²⁾

Halitosis can affect absolutely any one irrespective of age or gender. The problem does tend to be quite common in the aged because tooth decay generally advances with age. But tooth decay is again not a restrictive condition and could affect anyone. In addition halitosis has many other causes. Halitosis in children is in fact not uncommon, because of unhealthy eating habits and poor dental care⁽³⁾.

Tooth brushing, interdental flossing and tongue brushing reduce oral malodor and should be part of daily home oral hygiene procedure, but recent studies indicated that these methods inadequate in more than 70% of the cases because many of the bacteria in the oral cavity colonizing not only teeth but also the soft tissue of the oral cavity⁽⁴⁾.

Currently, a wide range of options of mouthrinses is available in the market. These products contain compounds with antimicrobial activity. Among these compounds are cationic antibacterial agents such as chlorhexidine (CHX) and cetylpyridinium chloride (CPC)⁽⁵⁾.

Chlorhexidine (CHX), a cationic bis-biguanide biocide with low mammalian toxicity and broad-spectrum antibacterial activity⁽⁶⁾. The primary mechanism of action of this biocide is membrane disruption, causing concentration-dependent growth inhibition and cell death. Secondary interactions causing inhibition of proteolytic and glycosidic enzymes may also be significant⁽⁷⁾.

CPC is a quaternary ammonium compound included in the group of the cationic surface-active agents⁽⁵⁾. It acts primarily by penetrating the cell membrane, causing leakage of cell components, disruption of the bacterial metabolism, inhibition of cell growth, and finally, cell death⁽⁸⁾.

CHX and CPC, have a certain inhibiting effect on oral (VSCs) production⁽⁵⁾. The aim of this study is to compare the effect of Corsodyl MR, that its active ingredient is 0.2% chlorhexidine, and Crest MR, that its active ingredient is 0.07% Cetylpyridinium chloride (CPC), with conventional mechanical plaque removal methods on oral malodor of periodontally healthy children.

Material and methods

Patient population

Thirty healthy children aged (9-11) years, were participated in this study (18 female, 12 male) from Al-Hanan primary school. Questionnaires were designed to get information from parent's children included general health and children were submitted to oral clinical examination. The exclusion criteria were as follows: subjects with medical disorders, visible tongue coating, anyone undergoing antibiotic or other antimicrobial therapy in the previous three months, anyone presenting a probing depth > 3 mm with bleeding on probing and attachment loss > 2mm.

Pretreatment

One week before the beginning of the study, all subjects went through motivation sessions in which standard oral hygiene instructions were given, instructions included conventional dental plaque control with tooth brushing, interdental flossing, tongue brushing (three times daily), and mouth rinsing (rinsing with 15ml of mouth rinse for 10 seconds twice daily (morning and evening)).

In order to standardized baseline measurements and avoid interference from the presence of dental plaque, all volunteers had professional supragingival plaque removal. Supragingival plaque was revealed using a disclosing tablets and then was removed with scalers and tooth polishing with rubber cup and pumice.

Study design

The study was performed in three experimental groups of 7 days. In each group, every volunteer performed the following oral hygiene procedure:

- 1- Group I (Control): tooth brushing, interdental flossing,

tongue brushing(three times daily).

2- Group II : as group I+ rinsing with Corsodyl MR (twice daily).

3- Group III: as group I+ rinsing with Crest multiprotection MR (twice daily).

Each volunteer was supplied with a tooth brush, interdental floss ,tooth paste, and Corsodyl MR for group II, or Crest MR for group III

Breath evaluation

Oral malodor was evaluated at 10:00 am and the volunteers were retrained from tooth brushing ,drinking, eating, gargling, using scented cosmetic product at least one hour before measurement.

Organoleptic assessment (by nose)

Subjects were asked to close their mouths for 60 seconds and not to swallow during this period, then exhale briefly through their mouth towards the examiner nose who is positioned 10 cm from the child. Then the examiner immediately record the odor rating on a four – point scale; 0: no odor ,1:slight malodor,2:moderate malodor,3:high malodor^(9,10).

Volatile sulphur concentration

The volatile sulphur concentration was scored immediately after organoleptic assessment, using a portable industrial sulphide monitor (Halimeter, Interscan Corp, Chatsworth, CA, USA), using the technique established by Marcelo et al⁽⁹⁾.The measurement were taken and the mean of the values was determined in parts per billion(p.p.b)of sulphide equivalents. The measurement was repeated after the end of the treatment for each child (7 days).

Statistical analysis

Volatile sulphide monitor measurements were repeated three times and the peak parts per billion values were recorded at the end of each sample period after which an average peak parts per billion values for all three samples were displayed and recorded .The organoleptic and VSCs concentration data were compared among treatments. Statistical analysis of the results were performed using t-test to evaluate the significance of difference between the groups before and after treatment.

Results

Organoleptic measurements

Organoleptic scores are demonstrated in Table (1). There were highly significant differences before and after treatment for the three studied groups ($p < 0.0001$). The highest halitosis reduction were found in group II, in which Corsodyl mouthrinse were used , the mean was(0.20 ± 0.42),while the lowest halitosis reduction were found in group I, in which only mechanical plaque removal were used, the mean was(0.90 ± 0.88), and the mean organoleptic score in group III, in which Crest mouth rinses were used, was(0.30 ± 0.48).

There was significant difference between group I and II ($P < 0.05$) ,and non significant difference between group I and III ($P > 0.05$), as shown in Table (2). In general, Corsodyl group demonstrated the lowest organoleptic score, and although Crest group, also showed low organoleptic score, the comparison between group II and III revealed non significant difference ($p > 0.05$) .

Volatile sulphide measurements

The sulphide monitor measurements in Table (3) indicated highly significant differences before and after treatment for the three studied groups ($p < 0.0001$). The highest mean VSC concentration values after treatment were found in group I, in which mechanical plaque removal methods were used and mouth rinses were excluded, the mean was (117.20 ± 8.64), while the lowest mean VSC concentration values were found in group II, in which Corsodyl mouth rinses were used, the mean was (85.10 ± 8.59), and the mean VSC concentration values in group III, in which Crest mouth rinses were used, the mean was (88.10 ± 6.24).

There were highly significant difference between group I and II, and between group I and III ($p < 0.0001$) (Table 4). Corsodyl group demonstrated the highest VSC reduction, and even though Crest group, also showed high VSC reduction, there is non significant difference between group II and III ($p > 0.05$).

Discussion

Although mechanical plaque control methods have the potential to maintain adequate levels of oral hygiene and prevent halitosis. Clinical experience and population based studies demonstrate that such methods are not being employed sufficiently by large numbers of the population, especially children. The need for additional help in controlling oral malodor provides the rational for patients using antimicrobial mouth rinses as adjuncts to their mechanical oral hygiene regimens^(11, 12, 13).

There are no accepted standards of care for treating halitosis, and clinical protocols for the diagnosis and treatment of this problem vary widely

⁽⁹⁾. Antiseptic rinses have also been used to control bad breath, these mouth rinses containing several masking and antimicrobial agents^(2, 9).

The data obtained in this study showed that there were highly significant differences (organoleptically and by VSC measurement) before and after treatment for group I where only mechanical plaque control methods were used, this finding agreed with the findings of Marcelo et al⁽⁹⁾, and Tonzetich et al⁽¹⁴⁾ which showed that tooth brushing, interdental flossing and tongue scraping, significantly reduce VSCs concentration in the mouth.

However, most of these studies selected volunteers with features that would interfere with halitosis, for example: individuals with tongue coating, or with periodontal diseases, who will probably present with microbial flora more favorable to exacerbating VSCs formation in comparison with healthy individuals. In this study all volunteers were periodontally healthy and their plaque control was strictly maintained.

The present study also demonstrated highly significant differences before and after treatment for both group II, and group III, where Corsodyl and Crest mouth rinses were used. This came in agreement with Alix et al⁽¹³⁾, who investigated the inhibition effect of CHX and CPC on orally produced VSCs.

Comparison between group I and II, and between group I and III, indicated highly significant differences in VSC measurements, and significant difference between group I and II organoleptically. these results can be explained by the fact that bad breath often originates from the posterior part of the tongue dorsum which is difficult to be cleaned or brushed, other oral cause of bad breath include overhanging restorations and sites of food impaction, which is also difficult

to be cleaned even with tooth brushing and interdental flossing, also some individuals lack the dexterity, skill or motivation for mechanical plaque removal, therefore many individuals may suffer from halitosis despite maintaining a stringent mechanical dental care routine^(15,16). The dentogingival areas account for approximately only 20% of the total surface of the oral cavity. These areas can be recolonized by bacteria carried via saliva from distant mucosal sites, such as the tonsils and dorsum of the tongue. Adjunctive mouth rinses, can help control these areas not usually reached by mechanical means and reduce the overall microbial burden throughout the oral cavity and control halitosis^(17, 18).

However, group III reduce halitosis more than group I organoleptically, but there was no significant difference between them, this may be explained by the fact that direct sniffing of the expired air (organoleptic method), which is the simplest method to evaluate halitosis presents several problems and may be objectionable to the dentist because it depends on the person who makes the evaluation and the technique used^(10,16).

Nowadays, in most studies on mouthwashes, chlorhexidine is used as a positive control to compare the efficacy of other products, since it is believed that chlorhexidine is a gold standard. However, the incidence of side effect such as undesirable tooth discoloration, unpleasant taste, dryness and burning sensation in the mouth discourage patients to use this mouthwash⁽¹⁹⁾.

CPC (cetylpyridinium chloride) is a cationic surfactant with strong bactericidal effect, it has a broad action against bacteria present in the oral cavity⁽²⁰⁾. CPC effectively fighting plaque, gingivitis and bad breath for 12 hours cause it eliminates over 99% of

the microorganisms associated with biofilm/dental plaque formation and gingivitis⁽²¹⁾.

The three groups in the present study demonstrated clearly different anti-halitosis effect. A commercial product (Corsodyl) containing 0.2% CHX showed higher anti halitosis effect than (Crest) containing 0.07% CPC, this difference, however, was non significant. The cause might be to the mode of action of CHX which accumulates on oral surface in aggregates rather than in the form of monolayer or multilayers of drugs and react with the permeability barriers of the cells^(22,23). The adsorption of CHX in the form of aggregates is speculated to provide a slow and long-lasting release of the agent into the oral cavity. Because of their mono cationic nature, CPC is believed to lose their antibacterial activity as they become rapidly desorbed from the bacterial membrane or other oral sites^(24, 25).

The result of this study indicates that the adjunctive use of antimicrobial mouth rinses can provide significant benefits to children patients who cannot maintain adequate levels oral home care to prevent oral malodor through mechanical methods alone, and that Crest MR is a good alternative to Corsodyl MR in controlling oral malodor.

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Table (1): Organoleptic scoring before and after treatment

| | | Mean | ±SD | SE | t-test | P-value | Sig. |
|-----------|--------|------|------|------|--------|---------|------|
| Group I | Before | 2.60 | 0.69 | 0.22 | 4.80 | 0.0002 | HS** |
| | After | 0.90 | 0.88 | 0.28 | | | |
| Group II | Before | 2.80 | 0.42 | 0.13 | 13.79 | 0.000 | HS** |
| | After | 0.20 | 0.42 | 0.13 | | | |
| Group III | Before | 2.60 | 0.69 | 0.22 | 8.56 | 0.000 | HS** |
| | After | 0.30 | 0.48 | 0.15 | | | |

** High significant $P < 0.0001$

N = 10

Table (2): Comparison between groups after treatment (Organoleptic scoring)

| | Mean | ±SD | SE | t-test | P-value | Sig. |
|-----------|------|------|------|--------|---------|------|
| Group I | 0.90 | 0.88 | 0.28 | 2.28 | 0.042 | S* |
| Group II | 0.20 | 0.42 | 0.13 | | | |
| Group I | 0.90 | 0.88 | 0.28 | 1.90 | 0.079 | NS |
| Group III | 0.30 | 0.48 | 0.15 | | | |
| Group II | 0.20 | 0.42 | 0.13 | 0.49 | 0.63 | NS |
| Group III | 0.30 | 0.48 | 0.15 | | | |

NS: Non significant $P > 0.05$

* Significant $P < 0.05$

Table (3): Halimeter Measurement scoring before and after treatment

| | | Mean | ±SD | SE | t-test | P-value | Sig. |
|-----------|--------|--------|-------|-------|--------|---------|------|
| Group I | Before | 318.30 | 72.33 | 22.87 | 8.73 | 0.000 | HS** |
| | After | 117.20 | 8.64 | 2.73 | | | |
| Group II | Before | 322.00 | 63.44 | 20.06 | 11.60 | 0.000 | HS** |
| | After | 85.10 | 8.59 | 2.72 | | | |
| Group III | Before | 279.40 | 60.45 | 19.12 | 10.06 | 0.000 | HS** |
| | After | 88.10 | 6.24 | 1.97 | | | |

** High significant $P < 0.0001$

N = 30

Table (4): Comparison between groups after treatment (Halimeter Measurement)

| | Mean | ±SD | SE | t-test | P-value | Sig. |
|-----------|--------|------|------|--------|---------|------|
| Group I | 117.20 | 8.64 | 2.73 | 8.63 | 0.000 | HS** |
| Group II | 85.10 | 8.59 | 2.72 | | | |
| Group I | 117.20 | 8.64 | 2.73 | 8.33 | 0.000 | HS** |
| Group III | 88.10 | 6.24 | 1.97 | | | |
| Group II | 85.10 | 8.59 | 2.72 | 0.89 | 0.384 | NS |
| Group III | 88.10 | 6.24 | 1.97 | | | |

NS: Non significant $P > 0.05$

** High significant $P < 0.0001$