



Protocol for treating the psychological consequences of halitosis complaint

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INTRODUCTION

INTRODUCTION: People with halitosis suffer various consequences, incurring social, professional, and affective limitations that impair their confidence, spontaneity, and self-esteem. However, the existing treatment protocols focus on treating halitosis alone, rather than its psychological consequences. **OBJECTIVE:** The objective of this study is to present a new protocol for treating the consequences of halitosis, as well as investigating its clinical application. **METHODS:** After briefly reviewing existing halitosis classifications and their limitations, this paper presents new classifications and techniques appropriate for the present protocol, such as the use of in vivo exposure, adequate to halitosis treatment. A total of 156 people complaining of halitosis were selected. The participants' breath was evaluated using the organoleptic test and Halimeter®. The psychological consequences of halitosis were assessed using the Halitosis Consequences Inventory (ICH). The symptoms of Social Anxiety Disorder (SAD) were measured using the Social Phobia Inventory (SPIN) and its short version (Mini-SPIN). **RESULTS:** The results showed that all participants had tongue coating or tongue biofilm. Of the 156 volunteers, 74.38% had halitosis (n=116), of whom 100% had oral halitosis, and 3.21% had oral halitosis simultaneous with extraoral halitosis (n=5). A comparison between the pre- and post-treatment results indicated that the protocol was effective to treat bad breath as well as the feeling of insecurity, since significantly decreased the psychological consequences of halitosis and SAD symptoms; 62.6% of participants reported a significant improvement in their confidence and spontaneity at the end of treatment. **CONCLUSION:** Taken together, these findings were most effective for those who followed the treatment guidelines strictly.

KEYWORDS: Halitosis. Psychological Tests. Clinical Protocols. Phobic Disorders. Phobia, Social.

Introduction

Although earlier studies have proposed several halitosis treatment protocols, all of these focus on breath treatment alone.¹⁻⁴ In fact, most people who complain of halitosis also experience significant social, professional, and affective damage, feeling less spontaneous and more insecure, with low self-esteem. Even when their halitosis is properly treated, many people complaining of having bad breath say their problem remains. It is challenging to manage such patients.⁴⁻¹⁰ In this way, three factors are essential in managing patients with halitosis: classifications, origins, and intensity.

The halitosis classification proposed by Miyazaki et al.^{4, 11} is the most widely used worldwide; it uses the terms “genuine halitosis”, “pseudo-halitosis”, and “halitophobia”. Halitosis is considered genuine when breath-odor changes are detected; pseudo-halitosis is diagnosed when a person complains, without evidence, of having bad breath; and halitophobia diagnosis occurs if after the treatment for either genuine halitosis or pseudo-halitosis, the patient still believes that he or she has bad breath. The terms pseudo-halitosis and halitophobia are not appropriate for the treatment protocol proposed in this study.

Many people classified with pseudo-halitosis do have bad breath, which is not noticed by others because they have an efficient tongue-hygiene routine and adopt a defensive posture that allows them to coexist with others day by day. When these

individuals are asked to stop cleaning their tongues for 24 hours before an initial breath evaluation (request included in an international consensus halitosis treatment protocol for the general dental practitioner¹²), many people who were previously diagnosed with pseudo-halitosis are re-classified as having genuine halitosis.¹³ Concerning the term halitophobia, patients treated for genuine or pseudo-halitosis who continue to believe they have halitosis, despite there being no physical or social evidence of bad breath, are reclassified as having halitophobia which, according to Aydin & Harvey-Woodworth¹⁴ this condition is diagnosed after an unsuccessful halitosis treatment.

Tangerman & Winkel¹⁵ have classified halitosis as either oral or extraoral, with the latter divided into blood-borne and non-blood-borne halitosis. Non-blood-borne halitosis originates in the digestive system or airways; it can be of nasal origin or originating in the oropharynx, hypopharynx, or lower respiratory tract.

Worldwide, halitosis intensity and severity are generally classified using scales proposed by Bornstein et al.,¹⁶ Rosenberg,¹⁷ and Murata et al.,¹⁸ as recommended in the consensual clinical protocol proposed by Semmann et al.¹² Although this protocol recommends routine oral and nasal organoleptic testing to allow for differential diagnoses of halitosis origins,¹² the suggested scales do not check for organoleptic nasal breath.¹⁹

Given the limitations of the existing protocols in diagnosing and treating the aversive consequences that halitosis has on the lives of those who complain about having the problem, this study aims to present a diagnostic and treatment protocol for the consequences of halitosis as well as to investigate its clinical application. Both patients

with diagnosed halitosis and those who complain of bad breath, not noticed on a daily basis, are considered in this treatment protocol. The essential elements needed to diagnose these patients correctly will be presented hereafter, alongside treatment techniques and results.

Method

This study was approved by the Research Ethics Committee of São Francisco University (CAAE: 36081314.4.0000.5514). Participation was voluntary, with the consent given via online acceptance of an Informed Consent Form (ICF).

The study method has been divided into two stages. The first step presents the essential protocol elements used to treat halitosis's psychological consequences, hereinafter referred to as "the consequences of halitosis," defining the appropriate classification, diagnostic, and treatment techniques for this protocol.²⁰⁻²⁵ The second stage involves checking the clinical application of the protocol. After a mean follow-up period of four months, the pre- and post-treatment results (relating to both halitosis consequences and social-anxiety symptoms) are compared.

Step 1 - Essential elements of the Halitus protocol

The procedures included in the protocol are set out ahead. When used together, they can

diagnose and treat the consequences of halitosis. First, for the breath to be correctly evaluated, the patient must follow some pre-consultation assessment guidelines, so that the presence of halitosis can be accurately assessed, including suspending the tongue cleaning for 24 hours. The following is the *Halitus* oral and nasal organoleptic scale and the diagnostic technique for assessing halitosis origin using oral and nasal organoleptic tests,¹⁹ so that, according to the results of the organoleptic test, it is possible to infer the origin of the breath alteration.

Following is the Inventory of the Consequences of Halitosis (ICH),¹³ to assess what consequences the patient developed due to his belief in having halitosis and then the explanations to the patient about the importance of treating these consequences, so that he gradually regains his safety, spontaneity, and self-esteem through in vivo exposure. Finally, the Halitus classification of halitosis is explained below, relating halitosis's presence to its consequences.

Pre-consultation guidelines for breath assessment

To properly assess halitosis, with no risk of false-positive or negative results, the guidelines must be followed correctly, prior to the initial assessment consultation.²⁶ Eating two hours before the consultation ensures that the patient is not fasting and does not have hypoglycemic halitosis. The other guidelines stipulate abstaining from foods that change breath odor for 24 hours (e.g., garlic, onion, fatty meats); abstaining from alcoholic beverages, coffee, cigarettes, gum, candies, mouth wash or sprays for 12 hours before the consultation; not using antibiotics for three weeks before the evalua-

tion; attending the consultation with trusted person (confidant); and stopping tongue cleaning 24 hours before the consultation.

Degree of halitosis propagation and the organoleptic oral and nasal test

As an initial protocol procedure, the degree of halitosis propagation must be standardized (Table 1); it is essential to carry out the oral and nasal organoleptic tests accurately, since professionals use both tests to check the patient’s breath before and during treatment, as well as by the patient to check his or her oral and nasal breath odor with a confidant during treatment.^{19,25}

Table 1. Halitus oral and nasal organoleptic scale.

GRADE	DESCRIPTION
0 – Absence of odor (No Halitosis)	No odor is perceived by the examiner at a distance of up to 15 centimeters.
1 – Natural breath (No Halitosis)	It is clear that there is an odor in the breath, but it is not considered to be halitosis, perceived at a distance of up to 15 centimeters.
2 – Slight halitosis (or intimate halitosis)	A slight halitosis odor is detected by blowing slowly through the mouth or exhaling through the nose, perceived at a distance of up to 15 centimeters.
3 – Moderate halitosis (or interlocutor’s halitosis)	The odor of halitosis is detected by blowing slowly through the mouth or exhaling through the nose, perceived at a distance of 30 centimeters.
4 – Strong halitosis (or social halitosis)	The odor of halitosis is detected when the patient talks, perceived at a distance of 1 meter.
5 – Severe halitosis	Aside from halitosis being easily perceived throughout the environment, it is also difficult for the examiner or people close by to tolerate the odor.

Grades 0.5, 1.5, 2.5, 3.5 or 4.5 are accepted and considered intermediate to the levels above.

The patient must not start breath checks with the confidant until proper halitosis control has been completed. The Diagnostic Technique for Assessing Halitosis Origin is also used for this purpose via oral and nasal organoleptic tests.¹⁹

Figure 1 shows the Tangerman & Winkel¹⁵ halitosis classification. According to the results of the oral and nasal organoleptic tests, it is possible to infer the origin of halitosis, with a very small margin of error.^{19,20,22}

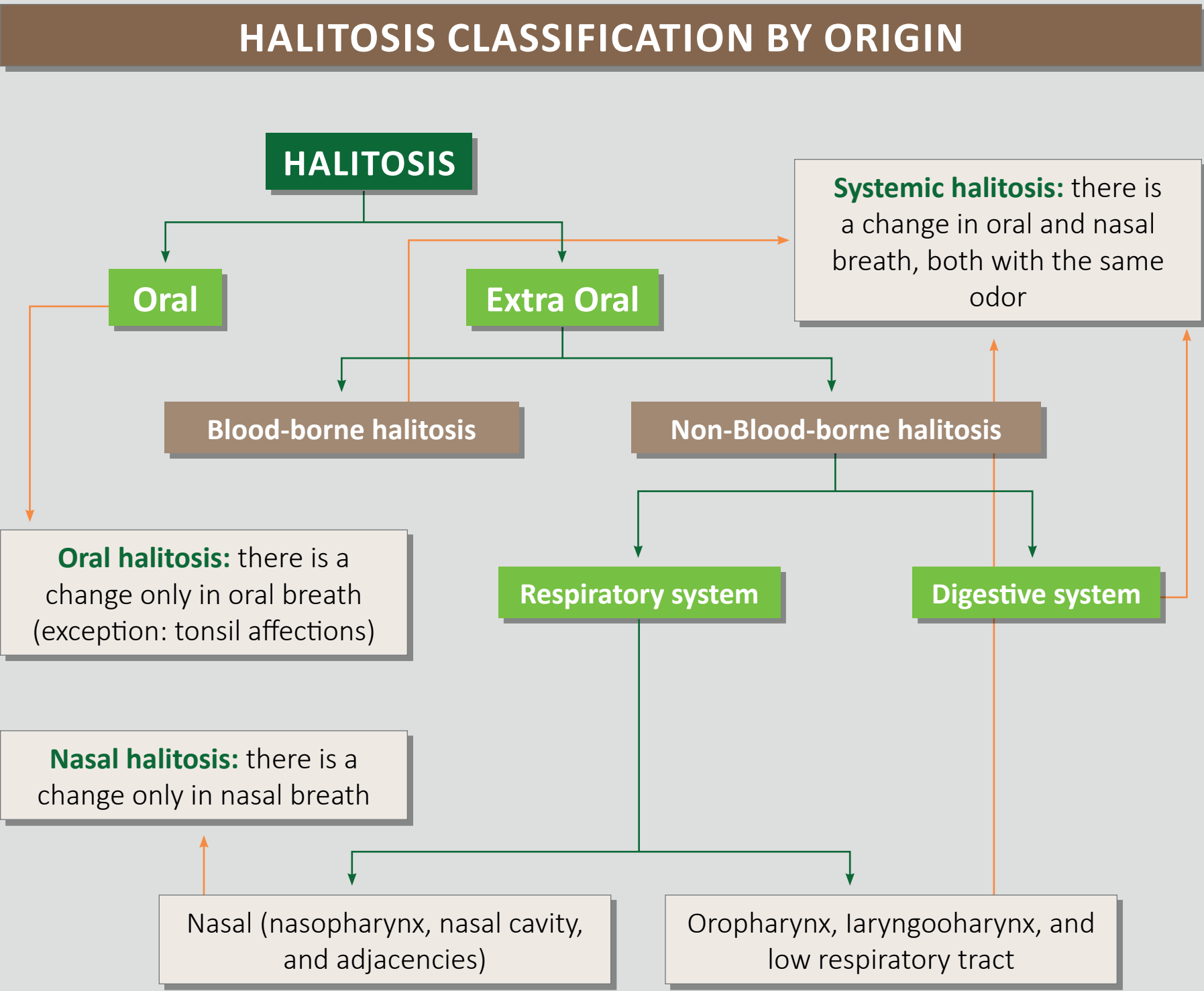


Figure 1. Classification of halitosis by origin and its subdivisions, with their respective manifestations in the air exhaled through the mouth and / or air exhaled through the nose. Source: Conceição et al.^{19,20,22}

Halitosis-consequences inventory (ICH)

The strong conviction that patients have for believing they have halitosis has several implications in their lives; these include behavioral changes, feelings of insecurity, social withdrawal, and a tendency to misinterpret other people’s ordinary gestures by misattributing them to their supposed bad breath.¹³ This set of thoughts, feelings, misinterpretations,

and behavioral changes is referred to as the consequences of halitosis. Together, they make affected individuals less spontaneous and more withdrawn and insecure, reducing their self-esteem. The ICH was developed to carry out this assessment correctly. It consists of questions designed to evaluate the consequences of halitosis patients developed, as shown in Table 2.¹³

Table 2. Halitosis-Consequences Inventory (ICH).

Mark YES if you have experienced any of the 18 consequences of halitosis two or more times:		YES	NO
1.	Do you talk less because of bad breath?		
2.	Do you turn your face when talking to someone because of bad breath?		
3.	Do you avoid talking close to people because of bad breath?		
4.	Do you chew gum, have breath mints, or use mouthwash to mask your bad breath?		
5.	Do you have worries about bad breath (for instance: 'Do I have bad breath?' 'Is it strong?' and so on)?		
6.	Do you put your hand over your mouth while talking because of bad breath?		
7.	Do you believe that you will be a more spontaneous person in your social life if you stop having bad breath?		
8.	Do you believe that you will be a more spontaneous person in your professional life if you stop having bad breath?		
9.	Do you believe that you will be a more spontaneous person in your affective relationships if you stop having bad breath?		
10.	Because of bad breath, have you ever mumbled (holding your breath) in a situation you had to talk very close to someone?		
11.	Do you talk less when in closed or crowded spaces, such as a car or elevator, because of bad breath?		
12.	Because of bad breath, did you start taking better care of your oral hygiene (teeth brushing, flossing, and/or tongue cleaning)?		
13.	Because of bad breath, have you ever given up going out or attending a social event or a commitment?		
14.	If you stop having bad breath, will your self-esteem improve?		
15.	Has someone ever covered his or her nose, and you thought it was because of your bad breath?		
16.	Has someone ever offered you mint drops, and you thought it was because of your bad breath?		
17.	Has someone you were talking to ever stepped back a little or turned away while you were speaking, or got up when you sat next to him or her, and you thought it was because of bad breath?		
18.	Do you believe you have heard comments (indirect and/or by third parties) about your bad breath?		

Explaining the treatment of halitosis consequences to patients

This treatment stage should always be carried out before the patients’ breath is evaluated to make them aware of the limitations they experience in their daily lives, due to the consequences of halitosis. It is crucial for patients to understand why it is necessary to treat their confidence, spontaneity, and self-esteem, in addition to their breath. Patients must also understand how in vivo exposure works, a technique derived from Cognitive-Behavioral Therapy, adequate for halitosis treatment.

Once they have learned to keep their halitosis under control, patients should know that they must choose someone they trust (a “confidant”) to check their treated oral and nasal breath at home or at work. Patients must understand that they cannot check their breath, due to a physiological process

known as olfactory fatigue, in which the olfaction cells adapt to a constant odor and cease to perceive it. This is why it is difficult to notice our own breath.²⁷

The Halitus classification of halitosis²⁵

The classification of halitosis used in this method (Table 3) relates its presence to consequences, which are divided into the following types:

- **Objective halitosis:** bad breath is clinically confirmed; it can be chronic (constant), or intermittent (sometimes it is present and sometimes absent). Patients with objective halitosis who are unaware of their bad breath or know that their breath has changed but do not take the problem seriously, tend to develop few consequences. This pattern is common among children and adolescents

96

Table 3. Halitus classification of types of halitosis and their consequences.

Halitus classification of halitosis types	Is halitosis often present in the initial consultation?	In everyday life, do others confirm the presence of halitosis?	Are there evident reasons for having halitosis?	Mean number of halitosis consequences developed:	Clinical frequency: rare, less frequent, or frequent?
Objective halitosis in patients not aware of their condition	YES	YES	YES	0 to 6	Less frequent
Objective halitosis in patients aware of their condition	YES	YES	YES	7 to 18	Frequent
Controlled halitosis	YES	NO	YES	14 to 18	Frequent
Subjective halitosis	NO	NO	NO	14 to 18	Rare

brought in for treatment by their parents, as well as in patients who seek treatment because their spouses, relatives, or friends have recommended it. On the other hand, there are individuals with objective halitosis who are aware of their condition; their conviction that their halitosis is strong and perceived by others leads to various consequences.

- **Controlled halitosis:** bad breath is not perceived on a daily basis due to the patient's efficient oral hygiene routine. However, it returns when tongue hygiene is interrupted for 24 hours. Patients with this condition complain of having halitosis and experience several consequences, resulting from their conviction that their halitosis is strong and perceived by others.
- **Subjective halitosis:** is when a patient complains of having halitosis without evidence, based on feelings or opinions instead of facts.²⁵

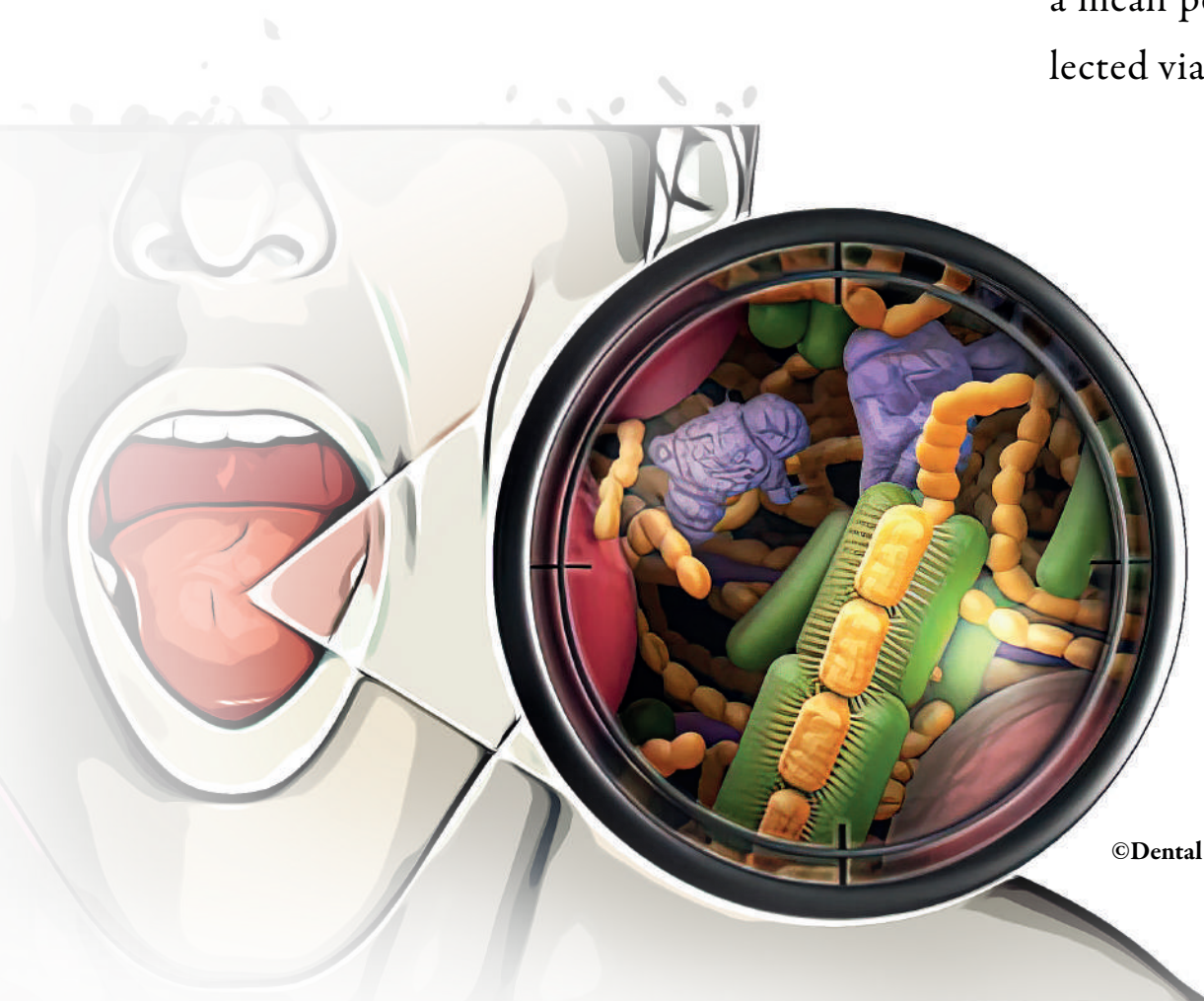
To accurately diagnose subjective or objective intermittent halitosis, it is important to carry out serial breath assessments. Tongue cleaning can be suspended for 48 hours for the differential diagnosis.

Step 2 - Clinical application of the Halitus protocol

After structuring the protocol in the previous step, the protocol was administered to a sample group of volunteers to verify its clinical application. Following a mean follow-up period of four months, the pre- and post-treatment results were compared to assess the volunteers' halitosis consequences and social-anxiety symptoms.

Participants

The sample consisted of 156 people (66.7% women, aged between 18 and 68 years; $M = 38.15$, $SD = 10.21$) who responded to the instruments, had their breath evaluated, and were followed for a mean period of four months. Volunteers were selected via publicity on sites related to halitosis.



Instruments

The following six instruments were used: (1) a socio-demographic questionnaire, (2) the SPIN, a scale to evaluate Social Anxiety Disorder (SAD) typical symptoms, (3) the Mini-SPIN, a short version of SPIN, (4) an anamnesis related to the complaint of having halitosis, (5) the ICH used to evaluate the psychological consequences of halitosis and (6) an anamnesis and clinical examination to assess the causes of halitosis. The breath assessment was carried out using two different methods (these measurements were made using a portable Halimeter® sulfide monitor and an organoleptic test conducted by two trained evaluators – MC and MS).

The SPIN, a self-administered tool for evaluating physiological symptoms of fear and escape related to SAD, has been validated for Portuguese.²⁸ The SPIN consists of 17 items, rated using a five-point Likert scale that ranges from 0 = nothing to 4 = extremely, with a maximum total score of 68, sensitivity of 0.72, and specificity of 0.84 for a cutoff of 19 points. The Mini-SPIN includes three items from the SPIN and demonstrates good efficiency as a screening tool for Generalized SAD. A cutoff score of six or more points demonstrates a sensitivity of 88.7%, a specificity of 90.0%, a positive predictive value of 52.5%, and a negative predictive value of 98.5%.²⁹

The self-administered ICH is used to evaluate the consequences of halitosis developed by patients, with a maximum score of 18 positive responses.

To assess the presence of halitosis, two techniques were used to measure oral and nasal breath. The first was an oral and nasal organoleptic test, carried out by two trained evaluators. According to the Halitus organoleptic scale, grades higher than or equal to two were considered halitosis (Table 1). The second was a portable sulfide monitor (Halimeter® RH-17, Interscan®), which was used to measure oral and nasal breath. The results were classified as positive or negative for the presence of halitosis. A positive result was above 100 ppb of VSC (100 parts per billion of volatile sulfur compounds, the main gases responsible for oral halitosis: hydrogen sulfide, methyl mercaptan, and dimethyl sulfide). A negative result was equal to or under 100 ppb. In case of a discrepancy between the organoleptic test and the Halimeter® measurement, the organoleptic measurements provided the correct result. According to our findings, patients were classified as having normal breath, slightly changed breath (midway between normal and mild halitosis), oral halitosis, extraoral halitosis, nasal halitosis, or simultaneous halitosis (two of the previous causes occurring simultaneously). Concerning halitosis presence, it was classified as objective (chronic or intermittent) or subjective halitosis.

Procedures

To collect data, an email invitation was sent to potential participants using SurveyMonkey online survey software. Volunteers consented to participate in the survey by accepting the Informed

Consent Form - ICF. The Statistical Package for the Social Sciences (SPSS 22.0) software was used for the data analysis. Initially, descriptive analyses were based on the scores obtained by the instruments, then inferential analyses were used.

The volunteers were taught how to control halitosis during a single 30-minute session, according to the causes reported in the anamnesis and / or verified in the clinical examination. In general, the main prescriptions for controlling halitosis were related to tongue coating, gingivitis, tonsilloliths and halitosis due to hypoglycemia and ingestion of odorous foods, with few exceptions. They also received pertinent written treatment guidelines and the address of a webpage (www.testeoseuhalito.com.br) that provided detailed instructions on how to check breath with the help of a confidant. Patients with difficulties, such as excessive gag reflex, ankyloglossia, or high levels of insecurity, were offered other appointments to help with these problems. After following the guidelines provided in the

evaluation consultation for four months, on average, the participants were sent another SurveyMonkey online survey. The questions asked participants how closely they followed the treatment, whether they checked their breath with a confidant, and whether and how much their confidence, spontaneity, and self-esteem improved after they started treatment. The participants then responded to the ICH, SPIN, and Mini-SPIN again to compare the consequences of halitosis and social anxiety at the beginning and end of treatment.

Descriptive analyses were used to characterize the sample. The sample was subdivided into groups using the SPIN and Mini-SPIN pre- and post-treatment scores for the social anxiety scales and ICH halitosis consequences. Statistically significant differences between groups were assessed using the Student's t-tests. The effect size was obtained using Cohen's d. These groups were analyzed to compare differences between the means.

Results

In the sample, 9% of volunteers were unaware of or unconcerned by their halitosis, while 91% complained of having halitosis. The mean ICH score of the 156 volunteers was 14.87, while that of volunteers who complained of having halitosis (91% of the sample) was 15.77. In all, 54.50% of volunteers presented social-anxiety symptoms, according to the SPIN cutoff, and 39.9% had symp-

toms according to Mini-SPIN. In terms of the presence of tongue coating or biofilm, 100% of the volunteers presented with tongue coating at the initial evaluation.

As for the degree of halitosis propagation,^{19,25} at the initial consultation, 25.65% of volunteers had natural breath (grade 1), 15.38% had slightly changed breath (grade 1.5), 23.07% had mild hal-

itosis (grade 2), 8.33% had perceived halitosis between 20 and 25 cm (grade 2.5), 23.07% had moderate halitosis (grade 3), 0.65% had perceived halitosis between 35 and 95 cm (grade 3.5), and 3.85% had perceived halitosis at one meter (grade 4). As for the origin of the halitosis, oral and nasal organoleptic tests showed that 15.38% of the volunteers had slightly changed oral breath (grade 1.5), 58.97% had oral halitosis, and 3.21% had both oral and systemic halitosis, while 25.65% had no halitosis. The classification of the presence of halitosis showed that 1.3% of participants had subjective halitosis, 42.9% had intermittent objective halitosis, and 55.8% had chronic objective halitosis (see summary of these results in Table of Appendix A).

When it came to the number of consultations, 83.33% of the participants had only one consultation, 11.53% had two consultations, 4.50% had three consultations, and 0.64% had four consultations. Of the 131 volunteers who responded to the survey on how closely they followed the treatment, 2.3% did not follow the treatment (less than 29% dedication), 6.1% followed it a little (30–49% dedication), 22.9% followed it to a moderate degree (50–69% dedication), 42.7% followed it closely (70–89% dedication), and 26% followed it strictly (90–100% dedication). When asked whether they checked their breath with a confidant, 16% of participants did not check their breath with a confidant, 12.2% checked their breath with a confidant once or twice, 12.2% checked their breath far few-

er times than recommended, 32.9% checked their breath fewer times than recommended, and 26.7% checked their breath as recommended. When asked whether their spontaneity and self-confidence improved after treatment began, 11.5% said it did not improve, 3.8% said they did not have these problems before the survey, 22.1% said it improved a little in relation to the pre-survey results, 33.6% said it improved well regarding the pre-survey results, and 29% said it improved greatly with regard to the pre-survey results (see summary of these results in Table of Appendix A).

The correlation between pre- and post-treatment scores was moderate (correlation was significant at the level of 0.01—two-tailed), with the best results for SPIN (0.679), Mini-SPIN (0.623), and ICH (0.571). Table 4 shows the statistical differences between the pre- and post-treatment scores.

“In terms of the presence of tongue coating or biofilm, 100% of the volunteers presented with tongue coating at the initial evaluation.”

Statistical differences between the pre- and post-treatment ICH, SPIN, and Mini-SPIN results, measured using the Student’s t-test, showed a significant difference between the samples, with the best result for ICH, the same occurring in relation to the magnitudes, all were expressive, with the most expressive result also for ICH. Table 5 compares pre- and post-treatment cutoff.

The results indicate that a significantly lower percentage of participants reached the cutoff for social-anxiety scales in the post-treatment, while an even lower percentage of participants reached the cutoff for halitosis consequences. These results show a significant reduction after treatment in both the symptoms of social anxiety and the aversive consequences of halitosis.

Table 4. Student’s t-test comparing the ICH, SPIN, and Mini-SPIN scores pre- and post-treatment.

	Pre/Post	N	M (SD)	T	g	Sig. (2-tailed)	d
ICH	Pre-treatment	156	14.87 (3.63)	6.579	285	0.001	0.78
	Post-treatment	131	11.27 (5.56)				
SPIN	Pre-treatment	156	23.31 (15.47)	3.797	285	0.001	0.45
	Post-treatment	131	16.87 (12.83)				
Mini-SPIN	Pre-treatment	156	4.81 (3.49)	3.819	285	0.001	0.45
	Post- treatment	131	3.35 (2.90)				

In bold d > 0.20.

Table 5. Percentages of volunteers who reached the pre- and post-treatment cutoff for SPIN, Mini-SPIN, and ICH.

SPIN	SPIN—Pre-treatment	SPIN—Post-treatment
Reached the cutoff	54.5%	37.41%
Mini-SPIN	Mini-SPIN—Pre-treatment	Mini-SPIN—Post-treatment
Reached the cutoff	35.9%	20.61%
ICH	ICH—Pre-treatment	ICH—Post-treatment
Reached the cutoff	83.3%	50.41%

Appendix A.

CONSIDERING THE 156 VOLUNTEERS THAT PARTICIPATED IN RESEARCH	
DEGREE OF HALITOSIS PROPAGATION	
GRADE	RESULTS (%)
Natural breath (grade 1)	25.65
Slightly changed breath (grade 1.5)	15.38
Mild halitosis (grade 2)	23.07
Halitosis perceived between 20 and 25 cm (grade 2.5)	8.33
Moderate halitosis (grade 3)	23.07
Halitosis perceived between 35 and 95 cm (grade 3.5)	0.65
Halitosis perceived at one meter (grade 4)	3.85
ORIGIN OF THE HALITOSIS THROUGH ORAL AND NASAL ORGANOLEPTIC TESTS	
ORIGIN	RESULTS (%)
Slightly changed oral breath (grade 1.5)	15.38
Oral halitosis (grades 2 to 4)	58.97
Oral and systemic halitosis occurring simultaneously	3.21
Normal breath	25.65
CLASSIFICATION OF THE PRESENCE OF HALITOSIS	
TYPE	RESULTS (%)
Subjetive halitosis	1.3
Intermittent objective halitosis	42.9
Chronic objective halitosis	55.8
OF THE 131 VOLUNTEERS WHO ANSWERED AT THE END OF RESEARCH	
NUMBER OF CONSULTATIONS CARRIED OUT	
NUMBER OF CONSULTATIONS	RESULTS (%)
One	83.33
Two	11.53
Three	4.50
Four	0.64
DEDICATION TO FOLLOW THE TREATMENT STRICTLY	
DEDICATION	RESULTS (%)
Had less than 29% of dedication	2.3
Had between 30 and 49% of dedication	6.1
Had between 50 and 69% of dedication	22.9
Had between 70 and 89% of dedication	42.7
Had between 90 and 100% of dedication	26
DEDICATION TO CHECK THE BREATH WITH THE CONFIDANT	
DEDICATION	RESULTS (%)
Didn't check	16
Checked only once or twice	12.2
Checked a lot less times than recommended	12.2
Checked breath less often than recommended	32.9
Checked breath as recommended	26.7
IMPROVED SELF-CONFIDENCE AND SPONTANEITY IN RELATION TO BEGINNING OF TREATMENT	
EVOLUTION	RESULTS (%)
Have not improved	11.5
Didn't have these problems before the research	3.8
Improved a little	22.1
Improved a lot	33.6
Improved greatly	29

Discussion

The protocol for diagnosing and treating halitosis was based on the gold standard for halitosis therapy, including nasal and oral organoleptic tests and prescriptions to treat and control its main causes. The novelty in this study was the protocol to treat the psychological consequences patients develop, because they believe they have a breath alteration everyone perceives, which is usually not true. This new protocol for treating the consequences of halitosis was found to be effective, significantly decreasing the consequences of halitosis and SAD symptoms.

An important finding was the significant decrease in the percentage of volunteers who reached the cutoff for SPIN, Mini-SPIN and ICH pre- and post-treatment. These data showed a significant reduction in the mean scores for halitosis consequences and social-anxiety symptoms, reinforcing the importance of *in vivo* exposure in eliminating fear.^{30,33} The *in vivo* exposure technique involved direct and graduated confrontation with feared objects or situations, with fear tending to decrease through habituation during systematic exposure to stimuli.³⁴ Some factors that made it easier for patients to adhere to the treatment with greater commitment were checking their breath only after halitosis control and with someone they trusted, understanding how *in vivo* exposure should occur, understanding its mechanisms, and coming to follow-up appointments to have their treatment adjusted.²¹

Although more than 80% of participants had only one consultation, more than 60% reported a significant improvement in their spontaneity and confidence, compared with the beginning of treatment. A similar percentage of participants followed the treatment regimen with dedication, having their breath checked regularly by a confidant. This finding reinforces the importance of active patient participation in the treatment of halitosis. It also shows that checking the breath with a confidant can help to achieve and maintain confidence.^{21,23}

Regarding the number of individuals with subjective halitosis ($n = 2$), formerly classified as pseudo-halitosis or halitophobia, the sample of 156 volunteers had different results from previous studies.^{9,10,35-37} One influential factor was the fact that the volunteers stopped cleaning their tongues 24 hours before their breath assessments. Another important difference was that participants with pseudo-halitosis or halitophobia previously had no psychological diagnoses, from a psychological point of view, a fact that this protocol contemplates, relating the consequences of halitosis with SAD.

When it came to the degree of halitosis propagation, 64.10% of the volunteers had normal, slightly changed breath or mild halitosis, similar to the results of Oho et al., 2001,⁸ in which 55% of patients had normal or slightly changed breath. When it came to the consequences of halitosis, the mean ICH score of participants who complained of hal-

itosis was 15.77 (out of 18 possible points). These data show that almost two-thirds of the volunteers had a normal, slightly changed breath or mild halitosis, while 91% had a strong belief that they had halitosis, along with behavioral changes and social, professional, and affective damage. They devalue themselves, with feeling of low self-esteem, having thoughts of insecurity related to halitosis and interpreting people's typical gestures and attitudes as if they were expressions of disgust for their breath; this certainly had an extremely negative impact on their lives.

The percentages of oral and extraoral halitosis in the present study corroborate recent research,³⁵⁻³⁷ but differ in the sense that 100% of the sample with halitosis had oral causes, although 4.31% of these also had concomitant extraoral halitosis. In this respect, this research presented two innovations, already suggested in the consensual protocol proposed by Seemann et al.¹², which should be followed in future studies. The first is to recommend that participants stop cleaning their tongues 24 hours before their initial assessment, avoiding classifying patients with controlled halitosis as cases of pseudo-halitosis.²⁵ And the second is to perform the nasal organoleptic test in conjunction with the oral test and, consequently, make a more accurate diagnosis of the origin of halitosis.¹⁹

Finally, for the proposed protocol to succeed, it is essential for patients to learn about the consequences of halitosis and how it can be treated

through in vivo exposure. The more they understand this mechanism, the greater their chances of adhering to the treatment with increased commitment. To achieve this, the material developed to teach patients how to take oral and nasal organoleptic tests with a confidant, how to detect the origin of their halitosis, and how to identify or treat the most common causes of halitosis, must use simple, clear, and objective language to facilitate learning. Patient commitment to halitosis treatment is essential, because professionals depend on patients to follow treatment protocols completely, so as to achieve the best possible results.

One important limitation of this study was the time spent explaining how to use an organoleptic test to identify the origin of breath changes, classify them, and solve or identify these changes if they occur. Another limitation was the number of consultations, given that more consultations would have reinforced the participants' confidence through organoleptic testing and breath measurement via portable sulfur meters. Besides, the criteria for classifying patients without halitosis, with intermittent objective halitosis, and with subjective halitosis need to be better defined.

Future studies should use didactic material focused on the patient learning process to improve patient commitment to treatment, not only of the breath, but especially of the aversive consequences of halitosis. They should also carry out serial assessments for patients who have normal breath at

the first appointment and longer follow-up periods to determine whether patients should be referred to mental-health professionals at the end of their treatment. It is important to emphasize that this is a preliminary study. Future studies are needed to better understand the limitations of this protocol and to improve it.

An important advice to future studies is the potential risk of cross infections following organoleptic tests, especially with regards to the recent contagious potential of SARS-CoV-2 worldwide. In this sense, Conceicao et al.¹⁹ proposed important

safe guidelines such as avoiding performing organoleptic tests whenever feeling flu-like symptoms, such as fever, dry cough, difficulty breathing, and not electing as confidants, individuals at higher risk for severe illness. These authors also proposed a safer way of performing organoleptic tests, highlighting that organoleptic assessment should be temporarily suspended until the COVID-19 pandemic situation has normalized and that further studies should evaluate the safety of different organoleptic tests methods.

Conclusion

Scales designed to evaluate social-anxiety symptoms can be used clinically in the treatment of halitosis as a screening tool for SAD, besides the Halitosis Consequences Inventory. The present protocol has been shown to be effective in reducing ICH and SAD scores, especially by using in vivo exposure.

This approach improved spontaneity and confidence in a significant number of participants, especially those who followed the guidelines for checking their breath with a confidant. All of the steps mentioned in the protocol are interrelated and should be followed to achieve the best possible results.

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