

Psychological Characteristics Related to Subjective Satisfaction Level of Oral Malodor Treatment Outcome

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I. INTRODUCTION

Oral malodor is the result of bacterial putrefaction, a process in which oral bacteria act on proteins coming through various routes into oral cavity and produce some malodorous end-products¹⁻³. Major constituents of that are volatile sulfur compounds (VSC) including hydrogen sulfide, methyl mercaptan, dimethyl sulfide⁴. Oral malodor often has a physiological etiology originating from poor oral hygiene, periodontal diseases, dry mouth, food impaction, improper or faulty restorations, unclean dentures, excessive bacterial growth on the dorsum of the tongue, nasal infections and obstructions, throat

infections, and oral carcinomas^{5,6}. In some cases, kidney failure, metabolic dysfunctions and biochemical disorders can result in oral malodor, but all these diseases affect a very small percentage of people experiencing oral malodor⁷⁻⁹.

Measurement of oral malodor is essential to evaluate the patients complaining oral malodor. It is useful in estimation of the effect of treatment, as well as in diagnosis of the patients. Oral malodor can be measured by various means. Organoleptic evaluation by skilled judge is simple and still available method to measure oral malodor^{10,11}. But it is limited to some extent because it is unreasonable that a vast range of oral malodor is graded into several degrees and objectivity of the method is in question¹². Recently, various attempts have been made to develop and apply instrumental approaches to measure oral malodor. Detection of VSC including hydrogen sulfide, methyl mercaptan, dimethyl sulfide with gas chromatography became generally known¹². But high cost of the equipment, difficulty of breath sampling and need of high-skilled operator limit the clinical application of gas chromatography in oral

malodor measurement. More recently, compact and inexpensive portable sulfide monitor, Halimeter, is available in many of oral malodor clinics by reason of easy clinical approach¹²⁻¹⁵.

As with other human perceptions, smell is subjective and is affected by emotional and cognitive variables¹⁶. Humans possess an acute sense of detecting and distinguishing odorants, but identifying particular odorants may sometimes be difficult¹⁷. Smell is strongly associated with various affective states in the way that it can influence and be influenced by mood¹⁸. People appear to be unaware of their own breath, yet are able to detect it in others¹⁹. Spouge²⁰ blamed the inability to smell our own breath on adaptation, that one's sense of smell is dulled by continuous exposure. In some cases, there is difference between the self-rating intensity of oral malodor and objective measure by some instrumental approach. There are apparently healthy individuals who complain of having oral malodor but do not have real malodor and for which no local or systemic condition can be found²¹. In addition, regardless of apparent decrease of oral malodor by reasonable treatment including tooth brushing instruction, dental flossing, tongue scraping and gargling, etc., some patients complain of poor response to these procedures and unabated his or her oral malodor. They may be greatly distraught by the presumed malodor, separated from his or her friends, interfered with a job, or reluctant to social interaction. The condition in which a patient complains extreme oral malodor, but has no objective oral malodor has been described as olfactory reference syndrome²², imaginary halitosis²³, or delusional halitosis²¹.

In a recent study²⁴, people were asked to score the level of malodor emanating from their mouth, licked wrist and expectorated saliva. The results suggest that preconceived notions of how much

bad breath one thinks one should have has a major confounding effect on subsequent scoring of self-measurement. Measurement of one's own oral malodor is affected by circumstance or attitude of people around him or her, as well as absolute perception.

The present study analyzed psychological characteristics of oral malodor patients, who are not satisfied and complain of poor response to oral malodor treatment regardless of apparent decrease of oral malodor.

II. MATERIALS AND METHODS

Forty subjects were selected from the patients with a primary complaint of oral malodor, who visited the Oral Malodor Clinic of the Department of Oral Medicine & Oral Diagnosis, Seoul National University Dental Hospital, Seoul, Korea. History taking, clinical and radiographic evaluations were carried out on the patients. The levels of volatile sulfur compounds of them were measured with a portable sulfide monitor (Halimeter; RH-17 series, Interscan Corp., CA, USA)^{25,26}. Three readings were taken in each patients, and the average of those readings was accepted as the breath content of the VSC for that patient. A psychological evaluation was carried out with computerized SCL-90-R questionnaire²⁷. They were requested to describe the self-rating intensity (SRI) of oral malodor and self-rating distress (SRD) using visual analogue scale (VAS) of 0 to 10. According to the diagnosis of each patient, various types of treatment including oral prophylaxis, tooth brushing and dental flossing instruction, tongue scraping by proper device, gargling of 0.25% ZnCl₂ solution were performed. If necessary, more extensive treatment including tooth restoration for dental caries, endodontic treatment, scaling, tooth

extraction, etc. were performed also. They were requested to come one or two weeks after first visit. On the day of second visit, the levels of VSC, self-rating intensity of oral malodor and self-rating distress were measured by the same way. Subjects were comprised of the patients whose the VSC levels before treatment were higher than 150 ppb, and the VSC levels after treatment were below half of the VSC levels before treatment. They were divided into two groups according to reduction percentage of self-rating intensity, and the cut point of grouping was 29.7%, mean of the reduction. Subjects of which the reduction percentage of self-rating intensity was above the mean value comprised group A, and the others comprised group B. The levels of VSC, self-rating distress, and SCL-90-R profiles between the two groups were compared.

III. RESULTS

There was not significant correlation between the level of VSC and the self-rating intensity of oral malodor before and after treatment, and the reduction percentage of self-rating intensity did not correlated with the reduction percentage of VSC level (Table 1). The level of VSC before treatment correlated with the reduction of VSC level after treatment ($p < 0.01$) (Table 2). Age and gender distribution of the subjects is presented in Table 3. When the mean ages, the VSC level, the self-rating intensity of oral malodor and the self-rating distress before treatment were compared, there were no significant differences between the two groups. When all the subjects are involved, the VSC level, the self-rating intensity and the self-rating distress were significantly decreased after treatment. When

Table 1. Correlations among SRI before and after treatment, levels of VSC before and after treatment, and reduction percentage of SRI and VSC level

	VSC level before Treatment	VSC level after treatment	Reduction percentage of VSC level
SRI before Treatment	$r = -0.036$	0.217	-0.120
SRI after Treatment	0.058	0.140	0.055
Reduction percentage of SRI	0.001	0.039	-0.125

Table 2. Correlations among levels of VSC before and after treatment, and decrease of VSC level

	VSC before Treatment	VSC after treatment	Decrease of VSC level
VSC before Treatment	-	$r = 0.585^{**}$	0.963^{**}
VSC after Treatment	-	-	-0.345^*
Decrease of VSC	-	-	-

* : $p < 0.05$

** : $p < 0.01$

Table 3. Age and gender distribution of subjects.

	Number, Mean Age (years)					
	Male		Female		Both Sexes	
Group A	8	38.3	12	38.1	20	37.0
Group B	7	32.3	13	30.2	20	31.0
Total	15	35.5	25	33.0	40	34.0

Table 4. The VSC level before and after treatment

	Before Treatment	After Treatment	Significance
Group A	888.3 ± 511.5	172.7 ± 131.0	**
Group B	891.4 ± 517.2	170.1 ± 161.4	**
Total	889.9 ± 507.7	171.4 ± 145.1	**

** : p < 0.01

Table 5. The self-rating intensity before and after treatment.

	Before Treatment	After Treatment	Significance
Group A	7.1 ± 1.5	3.1 ± 1.4	**
Group B	6.7 ± 1.6	6.5 ± 1.8	NS
Total	6.9 ± 1.6	4.8 ± 2.4	**

NS : not significant

** : p < 0.01

Table 6. Correlations among SRI before and after treatment, SRD before and after treatment, and reduction percentage of SRI and SRD

	SRI before Treatment	SRI after Treatment	Reduction percentage of SRI
SRD before Treatment	r=0.521**	0.403*	-0.120
SRD after Treatment	0.291	0.807**	-0.703**
Reduction percentage of SRD	0.265	-0.318	0.560**

* : p < 0.05

** : p < 0.01

Table 7. The self-rating distress before and after treatment.

	Before Treatment	After Treatment	Significance
Group A	5.7 ± 2.1	3.2 ± 1.9	**
Group B	6.4 ± 2.6	5.9 ± 2.5	NS
Total	6.0 ± 2.3	4.6 ± 2.6	**

NS : not significant

** : p < 0.01

Table 8. SCL-90-R profiles in each group.

	Group A		Group B		Significance
	Mean	Std. Dev.	Mean	Std. Dev.	
SOM	43.8	5.6	44.9	6.9	NS
O-C	41.5	5.5	44.1	7.0	NS
I-S	42.6	4.3	47.0	7.	*
DEP	40.5	4.1	44.6	7.2	*
ANX	41.4	3.7	44.6	8.5	NS
HOS	42.4	4.0	45.3	6.0	NS
PHOB	43.7	4.0	44.8	6.2	NS
PAR	40.2	3.2	43.4	7.1	NS
PSY	42.3	3.4	45.4	9.7	NS
GSI	40.6	4.2	44.0	7.0	NS
PST	41.6	2.8	44.4	6.6	NS
PSDI	40.6	7.6	45.1	7.9	NS

NS : not significant

* : p < 0.05

SOM : somatization, O-C : obsessive-compulsive, I-S : interpersonal sensitivity, DEP : depression, ANX : anxiety, HOS : hostility, PHOB : phobic anxiety, PAR : paranoid ideation, PSY : psychoticism, GSI : Global Severity Index, PST : Positive Symptom Total, PSDI : Positive Symptom Distress Index

the subjects were divided into two groups, the VSC levels were significantly decreased in both groups but the self-rating intensity of oral malodor were significantly decreased in group A only (Table 4,5). The self-rating distress was

significantly correlated with the self-rating intensity before and after treatment (p<0.01) (Table 6). The self-rating distress was significantly decreased in group A (p<0.01), but not in group B after treatment (Table 7). When data

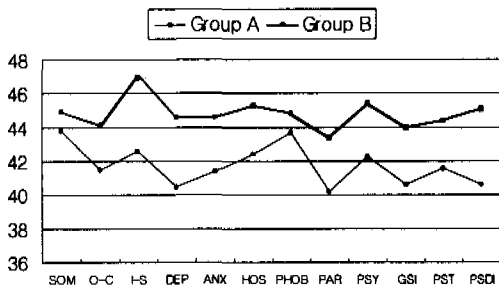


Fig. 1. SCL-90-R profiles in each group. SOM : somatization, O-C : obsessive-compulsive, I-S : interpersonal sensitivity, DEP : depression, ANX : anxiety, HOS : hostility, PHOB : phobic anxiety, PAR : paranoid ideation, PSY : psychoticism, GSI : Global Severity Index, PST : Positive Symptom Total, PSDI : Positive Symptom Distress Index

reading the SCL-90-R profile were compared, there was not significant difference between sexes and a general trend of elevated profiles for group B was evident. Group B showed elevated profiles in all dimensions, significantly in two dimensions : interpersonal sensitivity (I-S) and depression (DEP) (Table 8, Fig.1).

IV. DISCUSSION

Pryse-Phillips²²⁾ was the first to describe an "olfactory reference syndrome" in which the patient claims to actually perceive the bad odor that others cannot detect. Hawkins²³⁾ described that imaginary halitosis is worse than real halitosis for it can become an obsession that dominates the victim's life and turns him into a social outcast. Iwu et al.²¹⁾ reported that there were apparently healthy individuals who complain of having bad breath which no one else can smell and for which no local or systemic condition can be found, and referred that condition as delusional halitosis. If a patient

believes that he has offensive oral malodor, he is distressed in social interaction as much as the real oral malodor patient regardless of objective findings.

In many cases, complaints of oral malodor cannot be substantiated by physical examinations. As in other subjective perceptions, the personal perception of odor is highly affected by emotional and cognitive variables. Central to successful diagnosis and treatment of halitosis is the recognition that the patient's subjective complaint is not necessarily associated with objective parameters²⁸⁾. In the present study, the self-rating intensity of oral malodor before and after treatment did not correlated with the VSC level measured with Halimeter, an objective parameter. This result corresponds with other recent report by Rosenberg etc. Also, the reduction percentage of the self-rating intensity did not correlated with the reduction percentage of VSC level.

The subjects were divided into two groups by cut point of mean of the reduction percentage of self-rating intensity. Group B included the patients who complain constant or even aggravated oral malodor after treatment. VSC level was significantly decreased in both groups after treatment. The treatment of oral malodor was effective and there was apparent decrease of oral malodor in both groups of patients. But the self-rating intensity of oral malodor and self-rating distress weres not significantly decreased in group B. This result means that some patients may be unsatisfied not recognizing the alleviation of the symptom, even though their malodor has been reduced by various treatments.

All subjects completed the SCL-90-R questionnaire, which has been developed by Derogatis et al.²⁷⁾ as a general measurement of psychiatric outpatients in both clinical and research

situation, and which consists of 9 symptom dimensions and 3 global indices. When data reading the SCL-90-R profile were compared, there was not significant difference between sexes and a general trend of elevated profiles for group B was evident. Group B showed elevated profiles in all dimensions, significantly in two symptom dimensions, interpersonal sensitivity (I-S) and depression (DEP). The symptoms that are fundamental to the I-S dimension focus on feelings of personal inadequacy and inferiority, particularly in comparison with other individuals. Self-deprecation, feelings of uneasiness, and marked discomfort during interpersonal interactions are characteristic of persons with high levels of I-S. Feelings of acute self-consciousness and negative expectancies regarding interpersonal communications are also typical sources of distress²⁷⁾. The scales subsumed under the DEP dimension reflect a broad range of the concomitants of the clinical depressive syndrome. Symptoms of dysphoric affect and mood are represented, as are signs of withdrawal of interest in activities, lack of motivation, and loss of vital energy. The dimension mirrors feelings of hopelessness and futility as well as other cognitive and somatic correlates of depression, and several items are included concerning suicidal ideation²⁷⁾.

When compared to a general population of dental patients, the patients with a complaint of oral malodor show general trend of elevated profile in SCL-90-R^{16,28,29)} and elevated psychological profile of the oral malodor patients is positively related to their self-evaluation of oral malodor¹⁶⁾. In addition, the present study reveals that some patients who have objective oral malodor may be reluctant to recognize the effect of oral malodor treatment even though their oral malodor has been apparently reduced. Clinicians must encourage those patients to make an effort

to perceive the true intensity of their oral malodor through asking their family or intimate friends who can offer an objective opinion about their oral malodor.

V. CONCLUSIONS

Forty patients were involved in the present study, who have had objective oral malodor, and of which oral malodor decreased absolutely after various treatments. The subjective and objective intensity of oral malodor, and distress from that were measured before and after treatment. The subjects completed the computerized SCL-90-R questionnaire. The author divided the subjects into two groups according to the reduction percentage of self-rating intensity of oral malodor after treatment, then compared the VSC level, distress level, and the SCL-90-R profiles between the two groups.

The obtained results were as follows:

1. There was not significant correlation between the level of VSC and the self-rating intensity of oral malodor, and the reduction percentage of self-rating intensity did not correlate with the reduction percentage of the VSC level.
2. The level of VSC before treatment correlated with the reduction of VSC level after treatment ($p < 0.01$).
3. The self-rating distress was significantly correlated with the self-rating intensity before and after treatment ($p < 0.01$). The self-rating distress was significantly decreased in group A ($p < 0.01$), but not in group B after treatment.
4. Group B showed elevated profiles significantly in two dimensions: interpersonal sensitivity (I-S) and depression (DEP), compared to Group A ($p < 0.05$).

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구취 환자의 주관적 치료 만족도와 인성적 특성의 상관관계에 관한 연구

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구취를 주소로 내원한 환자 중 구취의 치료 후 객관적인 구취의 감소가 인정되는 데도 불구하고, 계속해서 구취를 호소하며 만족해 하지 못하는 환자들의 심리적 특성을 알아보고자 하였다. 구취를 주소로 서울대학교 치과병원 구강진단과 구취클리닉에 내원하여 검사 및 치료를 시행한 환자 중, 치료 전 객관적 구취의 소견을 보였으나, 치료 후 할리미터 수치의 객관적인 감소를 보이는 40명의 구취 환자를 대상으로 하였다. 치료 전, 모든 환자들은 자신의 주관적 구취 심도 및 그로 인한 불편감 정도를 표시하였고, 간이정신진단검사 (SCL-90-R)를 시행하였으며 할리미터를 이용하여 구강내 휘발성황화합물의 농도를 측정하였다. 치료 후, 구강내 휘발성황화합물의 농도, 주관적 구취 심도 및 불편감 정도를 재측정하였다. 주관적 구취 심도의 감소 정도에 따라 환자들을 두 군으로 분류하여 할리미터 수치와 불편감 정도 및 간이정신진단검사항목을 비교, 분석하였다; A군-주관적 구취 심도가 평균값 이상으로 감소한 환자군; B군-주관적 구취 심도가 평균값 이하로 감소한 환자군.

1. 치료 전후 모두에서 주관적 구취 심도와 휘발성황화합물 농도 사이에는 유의한 상관관계가 없었으며 주관적 구취 심도의 감소 정도 또한 휘발성황화합물의 감소 정도와 상관관계가 없었다.
2. 치료 전 휘발성황화합물의 농도는 치료 후 휘발성황화합물의 감소치와 유의한 상관관계를 보였다 ($p < 0.01$).
3. 구취로 인한 불편감 정도는 주관적 구취 심도와 유의한 상관관계를 보였으며 ($p < 0.01$), 치료 후 A군에서는 유의하게 감소 ($p < 0.01$) 하였으나, B군에서는 유의한 감소를 보이지 않았다.
4. B군은 A군에 비하여 간이정신진단검사 항목 중 대인예민성과 우울증의 항목에서 유의하게 높은 수치를 보였다 ($p < 0.05$).

주요어 : 구취, 간이정신진단검사, 할리미터, 구취 심도, 구취 불편감