

A New Approach to a Successful Management of Burning Mouth Syndrome

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ABSTRACT

Background: The accurate treatment of burning mouth syndrome (BMS) can be achieved just when the cause is properly identified. This study had been conducted to find out the relationship between symptoms and the causative factor(s) of the disease, so that to make successful treatment more easily reachable.

Method: The study was conducted with informed consent on 124 patients (63 females and 61 males, ages ranging from 39 to 66) complaining of burning mouth syndrome visited the Oral Medicine Clinic in Dentistry College/ Muthanna University and referred by dentists to private clinic for consultation from January 2014 to November 2016. Medical and social history was taken from each patient, haematological investigations and measurement of stimulated salivary flow rate were done for all patients. Intraoral exam was done for each patient to exclude any detectable lesion. Findings were recorded and matched with symptoms for each patient. Each patient received treatment according to diagnosis of causative factor(s) and 6 months follow up was done for each patient after initiation of treatment to evaluate the outcome of treatment and to confirm the accuracy of diagnosis in case of good response to treatment for each patient.

Results: Group A: no 41 subjects (33% of all groups): complained of continuous symptomatic day with asymptomatic night, examination and investigations showed that 35 of them (85.4% of group A) were complaining of chronic anxiety and menopause women, while the rest 6 were of similar symptoms but due to different causative factor(s). **Group B:** Symptoms for one day with asymptomatic following days was the criteria of 27 subjects (21.8% of all groups), 22 of them (81.5% of group B) were with nutritional deficiency and good results were obtained after treatment, the rest 5 were with tongue thrust habit, psychotic and sharpness. **Group C:** No symptoms on waking which increase throughout the day was associated with 36 subjects (29% of all groups), 30 of them (83.3%) suffer from dry mouth (diabetes, medications or age-related causes), the rest 6 patients complained of sharpness, ill fitted denture and menopause. **Group D:** Restricted night symptoms with inconstant day symptoms (no 20) (16.1% of all groups), of whom, 18 were associated with sharpness and bad prosthesis (90%) who showed excellent response after treatment, the rest 2 subjects complained of menopause and anxiety.

Conclusion: Each causative factor of burning mouth syndrome is characterized by specific criteria of symptoms differ from symptoms caused by another factor(s) which must determine treatment methods.

KEY WORDS:

Burning mouth syndrome, symptoms, causes.

المستخلص

مقدمة: يمكن التوصل الى علاج صحيح لمتلازمة حرقة الفم بشرط معرفة السبب المؤدي لهذا المرض بشكل دقيق. تهدف هذه الدراسة لإيجاد العلاقة بين اعراض المرض و العوامل المسببة من اجل التوصل الى العلاج الصحيح بصورة أسهل.

طريقة البحث: أجريت هذه الدراسة على 124 مريض (63 نساء و 61 رجال تتراوح اعمارهم بين 39-66 سنة) وقد تم اعلامهم جميعا بطبيعة الدراسة، راجعوا العيادة الخاصة و عيادة طب الفم في المستشفى التعليمي لكلية طب الأسنان في جامعة المتنى للفترة من كانون الثاني 2014 الى تشرين الثاني 2016 حيث كانوا جميعا يشكون من ألم حارق في الفم. تم تدوين التاريخ الطبي و الاجتماعي لكل مريض و اجريت لهم فحوصات الدم و قياس معدل جريان اللعاب المحفز كما تم فحص داخل الفم بشكل دقيق لاستثناء أمراض الفم التي قد تسبب اعراض مشابهة. تم تسجيل نتائج الفحوصات و مقارنتها بالأعراض التي يعاني منها كل منهم. تمت معالجة كل مريض وفقا لتشخيص العامل المسبب و تمت متابعة كل منهم لسته أشهر بعد الشروع بالعلاج لتقييم نتائج العلاج و لأثبات العامل المسبب في حالة الاستجابة الجيدة للعلاج.

النتائج: المجموعة أ عددهم 41 مريض (33% من المجموع الكلي) يعانون من أعراض المرض على طول النهار بشكل مستمر و تختفي الأعراض ليلا وقد أظهرت الفحوصات و التحاليل ان 35 مريضا منهم (85,4% من مجموعة أ) يعانون من انزعاج نفسي مزمن و بلوغ سن اليأس للسيدات، أما الستة المتبقين في هذه المجموعة فقد كانوا يعانون نفس الأعراض ولكن لسبب مختلف. **المجموعة ب** كانوا يعانون من الأعراض ليوم واحد و تختفي هذه الأعراض لعدة ايام ثم تعود و كان عددهم 27 مريض (21,8% من مجموع المرضى). أظهرت التحاليل ان 22 منهم (81,5% من مجموعة ب) كانوا يعانون من نقص التغذية و قد تحسنت حالتهم كثيرا بعد العلاج. بينما الخمسة المتبقين كانوا يعانون من مشاكل نفسية و حدة حافات الأسنان و الطقم الجزئي. **المجموعة ج** و عددهم 36 مريض (29% من مجموع المرضى) حيث لم تكن لديهم أعراض عند الاستيقاظ صباحا ولكن الألم يزداد أثناء اليوم. أظهرت نتائج الفحوصات ان 30 منهم (83,3% من المجموعة) كانوا يعانون من تبيس الفم و قلة اللعاب بسبب اصابتهم بداء السكري أو بسبب الأدوية التي يتعاطونها أو بسبب تقدم العمر. بينما الستة المتبقين في هذه المجموعة فقد كانوا يعانون من حافات التركيب الحادة، التكلسات، عدم ثبات تراكيب الأسنان و سن اليأس. **المجموعة د** و عددهم 20 (16,1% من مجموع المرضى) فقد كانوا يشكون من الألم الحارق ليلا بشكل ثابت و في النهار يكون منقطع. أظهرت نتائج الفحوصات ان 18 منهم (90% من المجموعة) كانوا يعانون من خشونة و حدة الأسنان و رداءة تراكيب الأسنان الثابتة و المتحركة حيث تحسنت كثيرا بعد انتهاء وجود السبب بينما كان الاثنان المتبقيان في المجموعة يعانون من اضطرابات نفسية و سن اليأس.

الاستنتاج: كل عامل مسبب لحرقة الفم يتميز بنوعية أعراض تختلف عن الأعراض التي يسببها عامل آخر.

INTRODUCTION

Burning mouth syndrome (BMS) or glossodynia whether idiopathic or secondary is characterized by bilateral burning sensation in a normal oral mucosa without any apparent oral lesion^(1,2). The tongue is the most commonly affected site, but the burning sensation has a chronic course and may affect any area of oral mucosa with variable intensities^(3,4). The well known

etiological factors of this syndrome are xerostomia or reduced salivary flow, although some studies predominate changes in salivary protein contents rather than quantity^(5, 6, 7), parafunctional habits (bruxism, clenching and tongue thrust⁽⁸⁾), depression, anxiety, emotional, social and financial stress and cancerphobia^(7, 9 10), reduction in estrogen hormone in menopause women^(11, 12), allergies⁽¹³⁾, nutritional

or pathological deficiency of iron, folate and vitamin B12⁽¹⁰⁾. The etiology of BMS is poorly understood and considered multifactorial, i.e. different factors may precipitate the condition which may increase the challenge for clinician to reach the most proper and accurate method of treatment for a particular patient, because each case requires a method of treatment differs from that which may treat another case of this syndrome according to etiological factor, hence, the need to a protocol that minimizes this difficulty in achieving the most appropriate treatment of this syndrome becomes important.

PATIENTS AND METHODS

This prospective study was done from January 2014 to November 2016 on 124 patients complaining of BMS (63 females and 61 males, ages ranged from 39- 66 years) visited Oral Medicine Clinic in Dentistry College/ Muthanna University and private clinic.

Examination procedure: Each patient was carefully examined extra and intra-orally for any detectable lesion, habits, paleness of mucosa, any roughness, sharpness or bad prosthesis that may precipitate the condition. A specialist psychiatrist*, physician** and gynaecologist*** were consulted for stopping, changing and/or adding medications on need. The intensity of burning sensation at the time of first visit for each patient was recorded on a visual analogue scale (VAS) ranging from 0 (no pain) to 10 (intolerable pain).

The following informations were taken from all patients:

- Details of medical history including any systemic disease, medication(s) taken and allergies. Dental history for any previous oral lesion or use of oral rinses
- Any oral habit like bruxism, clenching tongue bite and tongue thrust habits which could be estimated on intra-oral examination by wearing of cusps, rubbing or scarring of anterior part of tongue and protrusion of upper central incisors
- Feeling of dry mouth during day, or whether the patient is mouth breather at night
- Details of social, economic and emotional condition, personal mood and any type of phobia
- Precise description of pain regarding the time of onset, intensity, what time it may increase or decrease, duration, is pain was experienced at day or at night time, intermittent or continuous, if it is felt daily or not, any precipitating causes (e.g.

stress, food).

- Hematologic investigations were performed for all patients including serum vit B12, Hb and fasting blood sugar for suspected subjects.

Treatment

Diagnosis of the causative factor(s) was made for each patient by exclusion method depending on findings appeared from examinations above, and according to this diagnosis, treatment and instructions were given for each patient. In patients who were taking medications causing burning sensation or dry mouth (e.g. ACEI, thyroxin, chemotherapy or they were diabetic, the consultant physician only agreed to change ACEI to Candesartan 16 mg daily which does not cause dryness or burning sensation, Accordingly, sialogogue was prescribed for others. In patients on psychotropic medications, the consultant psychiatrist refused to change or reduce medications, so sialogogue was prescribed to them, for anxious patients, the psychiatrist recommended Buspiron 5- 30 mg daily in divided doses (according to his instructions for each case) which is a new non-benzodiazepines anxiolytic (does not cause tolerance). Subjects who were proved diabetics were referred to their physicians for checking and more control of the disease to reduce mouth dryness as much as possible. Subjects who were suspicious to be diabetics were instructed to do fasting blood sugar, patients with elevated levels were referred to physicians for treatment.

Sialogogue Pilocarpine HCL tablets (Salagen R) (MGI Pharma, Inc. FDA approved since 1994) was prescribed to be taken 3 - 4 times a day for 12 weeks after meals (the effect of this drug usually lasts from 2 - 4 hours according to leaflet of drug) to increase salivary flow rate for patients suffering from xerostomia whether its cause was due to age-related dry mouth, proved diabetes, heavy smoking, psychotropic or anticholinergic and antihypertensive (β - blockers) medications, but it was not given for patients whose medications were changed or with nutritional deficiencies who were treated with triple therapy (B co, Fersolin and Folic acid tablets) for 6 months only⁽¹⁷⁾. Patients with oral habits like tongue thrust or tongue biting were instructed to quit. In menopause women, estrogen replacement was achieved by giving them piperazine oestrone sulphate 1.25 mg daily for 6 months with Medroxyprogesterone acetate 5 mg once daily added at day 10 of replacement to prevent the estrogen from overgrowing the uterine

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**Dr Ali Yasin (consultant physician in medical city teaching hospital).

***Dr Lamia Al sa'di (consultant gynaecologist in Al Elwea teaching hospital).

lining ⁽²⁰⁾ according to consultation of the specialist gynecologist. Smoothing of sharpness teeth and fillings was done. New partial and complete dentures were constructed for patients suffering from ill fitted prosthesis and all denture wearers were instructed to remove it at night and put it in chlorhexidine solution 0.12% during night ⁽¹⁰⁾. bad bridges were removed. After treatment, all patients were examined twice at 3 months and 6 months periods and the severities of pain were recorded at the visual analogue scale for each patient and a comparison of three records on that scale was made to find out whether there is improvement or reduction in symptoms or not, on the other hand, this will give good evaluation about the efficacy of treatment as well as will confirm the

diagnosis in case of positive response to treatment.

RESULTS

As shown in table (1), results showed that 41 patients (mean age 55.26) were complaining of continuous day symptoms with asymptomatic night (group A), 27 patients (mean age 49.1) complain of symptoms for one day with asymptomatic following days (group B), 36 patients (mean age 55.3) have no symptoms on waking, but they experience burning sensation later which increases throughout the day (group C), and 20 patients (mean age 49.4) complain of restricted night symptoms and inconsistent day symptoms (group D).

Table 1: Frequency distribution of the study sample by symptoms group.

Groups	N	%
Continuous day symptoms with asymptomatic night	41	33.1
Symptoms for one day with asymptomatic following days	27	21.8
No symptoms on waking which increase throughout the day	36	29
Restricted night symptoms and inconstant day symptoms	20	16.1
Total	124	100

As shown in table (2), 90% of patients with anxiety and 81.8% of menopause women were in group A, 91.7% of patients with nutritional deficiencies were in group B, 91.3% of diabetic patients and all drug-related hyposalivation patients were in group C, while

77.8% of patients with sharp teeth or restorations, ill fitted prosthesis and bad bridges were in group D. This may give us an impression about the relation of each criteria of symptoms to a precipitating factor.

Table 2: The association of 4 symptoms categories with possible causes.

Possible cause of symptoms	Symptoms group									
	Continuous day symptoms with asymptomatic night		Symptoms for one day with asymptomatic following days		No symptoms on waking which increase throughout the day		Restricted night symptoms and inconstant day symptoms		Total	
	N	%	N	%	N	%	N	%	N	%
Anxiety	27	90	2	6.7	0	0	1	3.3	30	100
Menopause	9	81.8	0	0	1	9.1	1	9.1	11	100
DM	1	4.3	1	4.3	21	91.3	0	0	23	100
Nutritional	2	8.3	22	91.7	0	0	0	0	24	100
Mechanical	0	0	2	11.1	2	11.1	14	77.8	18	100
Drug related (ACEI, Thyroxine, Psychotroic)	0	0	0	0	7	100	0	0	7	100
Others	2	18.2	0	0	5	45.5	4	36.4	11	100

Table 3: Frequency distribution of the study sample by possible cause and treatment.

N=124		N	Treatment	%
Possible cause				
Anxiety		30	Buspirone	24.2
Menopause		11	Estrogen	8.9
DM		23	Sialogogue	18.5
Nutritional		24	Triple	19.4
Sharpness		22	Removal	17.7
Drug related (ACEI, Thyroxine, Psychotropic)		7	Change & sialog	5.6
Heavy smoker		2	Quit, cessation	1.6
Habitual		1	quit	0.8
Age-related hyposalivation		4	Sialogopue	3.2
Total		124		100

After careful intraoral examination, thorough medical and dental history, hematologic investigations and consultations, treatment was performed for each patient according to causative factor, as shown in

table (3) which describes the number and percentage of patients for each causative factor and treatment for each.

Table 4: The mean visual analogue scale and changes after treatment by possible cause.

Possible cause of symptoms	Visual analog score					Mean rank
	at baseline (before treatment)	after 3 months	changes after 3 months compared to baseline	after 6 months	changes after 6 months compared to baseline	
Anxiety						59.3
Range	(4 to 8)	(2 to 7)	(-3 to -1)	(1 to 6)	(-6 to -2)	
Median	6	4	-2	3	-3	
Interquartile range	(5 to 7)	(3 to 4)	(-3 to -1)	(2 to 3)	(-4 to -3)	
N	30	30	30	30	30	
P (Wilcoxon signed rank test) =			<0.001		<0.001	
Menopause						102.23
Range	(5 to 9)	(4 to 8)	(-2 to 0)	(3 to 8)	(-3 to 0)	
Median	7	6	-1	4	-1	
Interquartile range	(6 to 7)	(4 to 7)	(-2 to 0)	(4 to 7)	(-3 to -1)	
N	11	11	11	11	11	
P (Wilcoxon signed rank test) =			0.009(NS)		0.007(NS)	
DM						78.46
Range	(4 to 9)	(3 to 6)	(-3 to 0)	(1 to 5)	(-5 to 0)	
Median	6	4	-1	4	-3	
Interquartile range	(5 to 7)	(4 to 5)	(-2 to -1)	(2 to 4)	(-3 to -2)	
N	23	23	23	23	23	
P (Wilcoxon signed rank test) =			<0.001		<0.001	
Nutritional						58.94
Range	(3 to 8)	(2 to 6)	(-3 to 0)	(0 to 3)	(-6 to -2)	
Median	6	4	-1	2	-3	
Interquartile range	(4 to 6)	(3 to 5)	(-2 to -1)	(1 to 3)	(-4 to -2)	
N	24	24	24	24	24	
P (Wilcoxon signed rank test) =			<0.001		<0.001	
Mechanical						40.92

<i>Possible cause of symptoms</i>	<i>Visual analog score</i>					<i>Mean rank</i>
	<i>at baseline (before treatment)</i>	<i>after 3 months</i>	<i>changes after 3 months compared to baseline</i>	<i>after 6 months</i>	<i>changes after 6 months compared to baseline</i>	
Range	(4 to 7)	(1 to 6)	(-4 to -1)	(0 to 5)	(-7 to -2)	
Median	5	2	-3	1	-4	
Interquartile range	(5 to 6)	(2 to 4)	(-4 to -2)	(1 to 2)	(-5 to -3)	
N	18	18	18	18	18	
P (Wilcoxon signed rank test) = Drug related (ACEI, Thyroxine, Psychotropic)			<0.001		<0.001	52.64
Range	(5 to 8)	(2 to 6)	(-4 to -1)	(0 to 6)	(-6 to -2)	
Median	6	4	-2	2	-4	
Interquartile range	(5 to 6)	(2 to 5)	(-3 to -1)	(1 to 3)	(-4 to -3)	
N	7	7	7	7	7	
P (Wilcoxon signed rank test) = Others			0.017		0.017	47.5
Range	(4 to 6)	(1 to 5)	(-5 to 0)	(0 to 5)	(-6 to 0)	
Median	5	2	-3	1	-4	
Interquartile range	(5 to 6)	(1 to 3)	(-3 to -2)	(0 to 3)	(-4 to -3)	
N	11	11	11	11	11	
P (Wilcoxon signed rank test) =			0.004		0.004	
P (Kruskal-Wallis test) for difference in median =	0.02					<0.001

Table 5: The mean visual analogue scale and changes after treatment by symptoms group.

<i>Symptoms group</i>	<i>Visual analog score</i>					<i>Mean rank</i>
	<i>at baseline (before treatment)</i>	<i>after 3 months</i>	<i>changes after 3 months compared to baseline</i>	<i>after 6 months</i>	<i>changes after 6 months compared to baseline</i>	
Continuous day symptoms with asymptomatic night						68.89
Range	(4 to 9)	(2 to 8)	(-3 to 0)	(1 to 8)	(-5 to 0)	
Median	6	4	-2	3	-3	
Interquartile range	(5 to 7)	(4 to 5)	(-2 to -1)	(2 to 4)	(-4 to -2)	
N	41	41	41	41	41	
P (Wilcoxon signed rank test) =			<0.001		<0.001	
Symptoms for one day with asymptomatic following days						58.56
Range	(3 to 8)	(2 to 6)	(-3 to 0)	(0 to 3)	(-6 to -2)	
Median	5	4	-1	2	-3	
Interquartile range	(4 to 6)	(3 to 4)	(-2 to -1)	(1 to 3)	(-4 to -2)	
N	27	27	27	27	27	
P (Wilcoxon signed rank test) =			<0.001		<0.001	
No symptoms on waking which increase throughout the day						72.36

<i>Symptoms group</i>	<i>Visual analog score</i>					<i>Mean rank</i>
	<i>at baseline (before treatment)</i>	<i>after 3 months</i>	<i>changes after 3 months compared to baseline</i>	<i>after 6 months</i>	<i>changes after 6 months compared to baseline</i>	
Range	(4 to 9)	(2 to 6)	(-4 to 0)	(0 to 6)	(-6 to 0)	
Median	6	4	-2	3	-3	
Interquartile range	(5 to 7)	(3 to 5)	(-3 to -1)	(2 to 4)	(-4 to -2)	
N	36	36	36	36	36	
P (Wilcoxon signed rank test) =			<0.001		<0.001	
Restricted night symptoms and inconstant day symptoms						36.98
Range	(4 to 7)	(1 to 7)	(-5 to 0)	(0 to 6)	(-7 to -1)	
Median	5	2	-3	1	-4	
Interquartile range	(5 to 6)	(1 to 3)	(-4 to -3)	(0 to 1)	(-5 to -4)	
N	20	20	20	20	20	
P (Wilcoxon signed rank test) =			<0.001		<0.001	
P (Kruskal-Wallis test) for difference in median =						0.002

The changes in mean visual analogue scale after 3 and 6 months of treatment by possible cause showed a significant reduction $P < 0.001$ compared to base line (1st visit) except for menopause women which was non significant, as shown in table (4), while changes in the mean visual analogue scale of symptoms for all groups were all significant $P < 0.001$ after 3 and 6

months treatment compared to base line as shown in table (5). The changes in mean VAS for all patients (no 124) after 3 and 6 months were significant $P < 0.001$ compared to base line as shown in table (6) and figure (1). Those results confirm the diagnosis and revealed that the treatment for each causative factor was accurate.

Table 6: The mean visual analogue score and changes after treatment.

<i>Overall</i>	<i>Visual analog score</i>					<i>Mean rank</i>
	<i>at baseline (before treatment)</i>	<i>after 3 months</i>	<i>changes after 3 months compared to baseline</i>	<i>after 6 months</i>	<i>changes after 6 months compared to baseline</i>	
Range	(3 to 9)	(1 to 8)	(-5 to 0)	(0 to 8)	(-7 to 0)	
Median	6	4	-2	2	-3	
Interquartile range	(5 to 7)	(3 to 5)	(-3 to -1)	(1 to 3)	(-4 to -2)	
N	124	124	124	124	124	
P (Wilcoxon signed rank test) =			<0.001		<0.001	

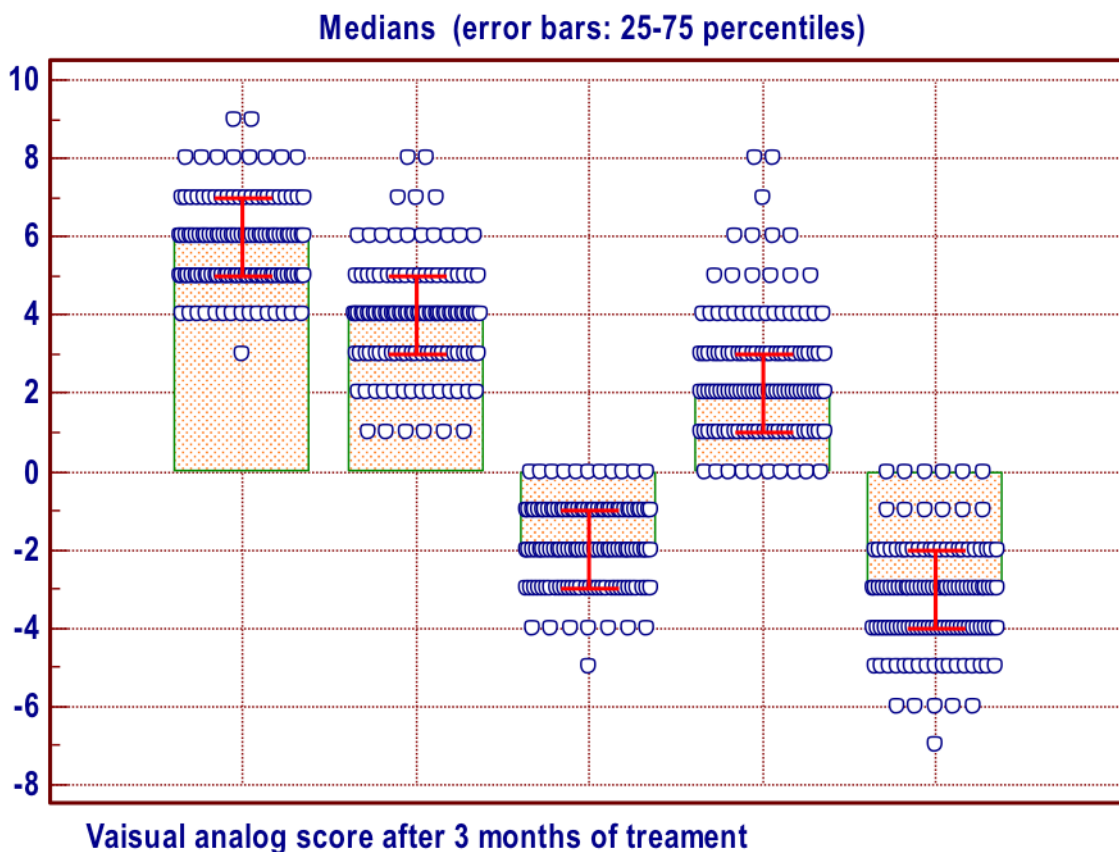


Figure 1: The mean visual analogue score for all patients and changes after treatment compared to base line with interquartile range.

DISCUSSION

Menopause is associated with burning mouth syndrome (BMS), and the mechanism is unclear. Estrogen has documented effects on oral mucosa, and reduction may lead to atrophic changes thereby altering stimulation of the nerve endings within the epithelium^(11, 12), so replacement may prevent those changes resulting in reduction of symptoms. In this study many of them did not respond to treatment and this comes in line with many previous studies which stated that there may be moderate reduction in symptoms of some while others did not respond to treatment^(11, 20).

Peripheral neuropathy secondary to DM is a cause of secondary burning mouth syndrome (BMS) which may be due to improper signaling carried along sensory nerve fibers or due to deepethlialization caused by dry mouth induced by DM^(1, 18), so referring them to their physicians to more control of the disease and stimulation of salivation by sialogogues were the appropriate choice in reducing the intensity of burning mouth sensation.

Nicotinic acid in heavy smokers is a well known mucosal irritant which may lead to BMS⁽⁵⁾, so cessation of smoking may contribute to reduction of burning mouth sensation in those subjects.

Deficiencies of B vitamins 1, 2, 6, and 12, as

well as zinc, folate and iron, have been suggested as causes of secondary burning mouth syndrome (BMS), either from direct neurologic damage or in relation to anemia or due to impaired renewal of epithelial lining⁽¹⁰⁾, so replacement of those deficiencies by triple therapy and encouraging patients to eat specific foods and vegetables along 6 months resulted in excellent reduction in symptoms.

Anxiety is usually considered an exacerbating factor, rather than a cause of the chronic pain picture of burning mouth syndrome (BMS)⁽⁷⁾. Cases of spontaneous resolution of symptoms after positive life events have been reported⁽¹⁰⁾, this may explain the action of anxiolytic medications in restoring a positive mood of life and subsequent reduction in symptoms. Patients with burning mouth syndrome (BMS) may also have increased salivary cortisol relative to controls, indicative of higher levels of stress⁽⁹⁾. A proportion of patients have anxiety centered around concerns of cancer, or cancerphobia, at this point, the nature of the association between burning mouth syndrome (BMS) and anxiety is not clear⁽¹⁰⁾.

The most commonly noted medication associated with BMS is ACE inhibitors^(15, 21) which may lead to an increase in salivary bradykinin which contains kallikrein (a molecule active in the kinin inflammatory pathway) resulting in oral burning symptoms⁽²²⁾. Endogenous or reactive depression as well as anxiety

are associated with serotonin deficiency which has been suggested as a possible mechanism for sensory alterations in burning mouth syndrome (BMS) because of its role in the descending inhibition of pain⁽²³⁾, also psychotropic medications result in reduced salivary flow and subsequent burning sensation⁽²³⁾, so sialogogues were the choice to enhance flow of saliva and reduce symptoms. Allergies are associated with signs of mucosal irritation which may be due to dental materials such as mercury (present in amalgam), methyl methacrylate (acrylic prosthesis)⁽¹³⁾.

Thyroxines have also been implicated in burning mouth syndrome (BMS), hypothyroidism may cause peripheral neuropathy which may results in BMS⁽²⁴⁾. Although whether the medication itself or the underlying hypothyroidism is the cause is unclear⁽²⁵⁾.

Bad oral habits like tongue biting or thrust may cause deepithelialization of the tongue and reactive stimulation to underlying trigeminal sensory fibers which may result in burning sensation⁽²⁶⁾.

Sialogogue increases the flow of saliva by stimulating parasympathetic activity in patients with peripheral neuropathy, drug related oral dryness and age related reduction of acinar cells⁽²⁷⁾. But they have no effect after destruction of acinar cells (saliva producing cells) like what occurs after high dose irradiation and chemotherapy⁽²⁷⁾.

CONCLUSION:

Each causative factor of burning mouth syndrome is characterized by specific symptoms differ from symptoms caused by another factor(s).

Continuous symptomatic day with asymptomatic night was mainly the criteria of patients associated with chronic anxiety and menopause women.

Symptoms for one day with asymptomatic following days was mainly the criteria of nutritional deficiency and tongue thrust habit.

No symptoms on waking which increase throughout the day is associated with reduced salivary flow rate whether physiologic (aging) or to underlying disease like hypothyroidism, DM and medications taken like psychotropic, anticholinergic and antihypertensive.

Restricted night symptoms with inconstant day symptoms were associated with bad prosthesis, bad and rough restorations and teeth and may be allergies.

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