ORIGINAL ARTICLE

Evaluating Burning Mouth Syndrome as a Comorbidity of Atypical Odontalgia: The Impact on Pain Experiences

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■ **Abstract**

Objective: This study aimed (1) to investigate the differences in clinical characteristics of patients between 2 groups, those who have atypical odontalgia (AO) only and those who have AO with burning mouth syndrome (BMS), and (2) to assess the influence of psychiatric comorbidity factors on patients' experiences.

Method: Medical records and psychiatric referral forms of patients visiting the Psychosomatic Dentistry Clinic of Tokyo Medical and Dental University between 2013 and 2016 were reviewed. The final sample included 2 groups of 355 patients: those who have AO only (n = 272) and those who have AO with BMS (AO-BMS; n = 83). Clinicodemographic variables (gender, age, comorbid psychiatric disorders, and history of headache or sleep disturbances) and pain variables (duration of illness, pain intensity, and severity of accompanying depression) were collected. Initial pain assessment was done using the Short-Form McGill Pain Questionnaire, and depressive state was determined using the Zung Self-Rating Depression Scale.

Results: The average age, female ratio, and sleep disturbance prevalence in the AO-only group were significantly lower than those in AO-BMS group. AO-BMS patients rated overall pain score and present pain intensity significantly higher than did the AO-only patients (P = 0.033 and P = 0.034, respectively), emphasizing sharp (P = 0.049), hot-burning (P = 0.000), and splitting (P = 0.003) characteristics of pain. Patients having comorbid psychiatric disorders had a higher proportion of sleep disturbance in both groups and a higher proportion of depressive state in the AO-only group.

Conclusions: AO-BMS patients have different epidemiological characteristics, sleep quality, and pain experiences compared to AO-only patients. The presence of psychiatric comorbidities in both groups may exacerbate sleep quality. We suggest that BMS as a comorbid oral disorder in AO patients contributes to a more intensively painful experience. ■

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INTRODUCTION

Atypical odontalgia (AO) is recognized as being a continuous pain in the teeth or tooth socket after extraction in the absence of any identifiable cause.[1] The exact pathophysiology mechanism remains controversial among the hypotheses about neuropathic, psychogenic, vascular, or even idiopathic origins.[2–7] Previous studies have suggested that several accompanying symptoms are present in AO patients, including burning mouth syndrome (BMS), another chronic oral pain in the absence of any organic cause.[1,8–10] According to the International Classification of Headache Disorders 3 beta (ICHD-3 beta) of the International Headache Society, AO and BMS are classified separately. However, they are both psychiatrically considered to be somatic symptom disorders.[11] Regarding hyperactivity in the sensory and motor components of the trigeminal nerve, a unified relationship between AO and BMS was hypothesized.[12] Takenoshita et al. pointed out the differences in the nature of pain between the 2 diseases but failed to observe any significant discrepancies in overall pain score or causal trigger.[13]

Clinical examination of AO and BMS patients frequently showed the presence of a psychiatric condition such as depression or anxieties.[2–7,13–15] In both pain conditions, psychiatric symptoms seem to be a reaction than an exact trigger to chronic pain.[5,13] However, while those emotional factors were believed to be primary or secondary to the pain problem, their specific effects on pain and life quality were evident.

Though prior research has examined and compared AO and BMS,[13,15] the characteristics of patients who suffered from both AO and BMS (AO-BMS) have not been established in any previous report. This article compared an AO-BMS group and an AO-only group with the aims to broaden current knowledge in terms of (1) investigating the differences in clinical characteristics of AO-BMS patients compared to those of AO-only patients and (2) evaluating the influence of psychiatric comorbidity factors on patients' pain experiences.

METHODS

This study was a retrospective study reviewing the medical records of patients diagnosed with AO seen between January 2013 and August 2016 at the Psychosomatic Dentistry Clinic of Tokyo Medical and Dental University. All patients agreed to participate in the study and signed the relevant informed consent. This study protocol was approved by the Ethical Committee of Tokyo Medical and Dental University (D2013-005).

Patients whose conditions met the ICHD-3 beta criteria for AO (Category 13.8.4: Persistent Idiopathic Facial Pain)[1] were screened by an expert with 30 years of experience in psychosomatic dentistry assessment. The diagnostic criteria were as follows: (1) continuous pain in 1 or more teeth or in a tooth socket after extraction; (2) pain recurring daily for >2 hours per day for >3 months; (3) normal clinical neurological examination results; and (4) a dental cause for the pain had been excluded by appropriate investigations. For patients who had additional symptoms satisfying the diagnostic criteria of BMS (ICHD-3), an oral comorbidity was recorded simultaneously. Exclusion criteria included (1) patients with painful symptoms caused by any local or systemic disorder; (2) patients suffering from AO and other oral psychosomatic disorders/conditions such as oral cenesthopathy, phantom bite syndrome, temporomandibular disorder (TMD), or halitophobia; (3) patients with severe psychiatric disorders that might compromise the reliability of their self-reports.

A final sample of patients was divided into 2 groups: patients who had AO only and patients who had AO with BMS. Collected data included (1) demographic variables (gender, age at the moment of diagnosis, and the presence of a history of headache, sleep disturbance, or comorbid psychiatric disorders); and (2) pain variables (duration of illness, characteristics/intensity of pain, and severity of accompanying depression).

History of headache or sleep disturbance was documented by doctors at the initial interview. All kinds of headaches were noted without classification. We diagnosed patients with sleep disturbances if, at the first visit, any of these conditions was confirmed by the patients using our questionnaire: trouble falling asleep, staying asleep, frequently waking up at night several times, waking up too early, and feeling tired nearly every day for at least 2 weeks. Our semistructured interview recorded patients' sleep histories, sleep diaries, and the use of sleep medicine, if available. Psychiatric diagnoses were based on patients' medical records and referral forms from a psychiatrist, classified using the *Diagnostic and Statistical Manual of Mental Disorders,* 5th edition (DSM-5).[3] Before the initial visit, patients were required

to submit referral forms if they had experienced any history of psychiatric disorders.

The intensity of pain was evaluated using the Short-Form McGill Pain Questionnaire (SF-MPQ), in which the visual analog scale (VAS) and present pain intensity subscale (PPI) were included. Therein, the VAS indicates subjective pain intensity ranging from 0 (no pain) to 100 (worst pain imaginable), while the PPI score provides indices of overall intensity (0 = no pain, 1 = mild, 2 = moderate, 3 = severe). For the SF-MPQ, descriptors 1 to 11 represent the sensory dimension of pain experience, and descriptors 12 to 15 represent the affective dimension. Each descriptor is ranked on an intensity scale of 0 = none, 1 = mild, 2 = moderate, and 3 = severe. In addition to depression assessment, the patients were required to answer the 20 questions of Zung's Self-Rating Depression Scale (SDS); thus, a total score was calculated that ranged from 20 (no depression) to 80 (major depression).

Using the statistical software package PASW for Windows, version 17 (SPSS Inc., Chicago, IL, U.S.A.), we applied the Kolmogorov–Smirnov test to determine whether the variables' distribution was normal or not. Thus the *t*-test or Mann–Whitney *U* test was chosen to find the association between the continuous data. For categorical valuables, the chi-square test was used for analysis. A *P* value of <0.05 was considered statistically significant.

RESULTS

From January 2013 to August 2016, 383 patients (58 male, 325 female, average age 53.62 ± 13.81 years) came to our clinics and were diagnosed with AO. Of these, 272 patients had AO only, while 111 patients had other oral psychosomatic disorders. Twenty-eight persons were eliminated according to exclusion criteria (13, 10, 3, and 2 AO patients also had oral cenesthopathy, phantom bite syndrome, TMD, and halitophobia, respectively). A final sample included 355 patients (53 male, 302 female).

Clinicodemographic Characteristics

Table 1 shows the clinicodemographic data of patients in the AO-only group (n = 272) and AO-BMS group (n = 83). There were no significant differences in the presence of a history of headache or comorbid psychiatric disorders, or in the SDS score, between the 2 groups. However, the average age, female ratio, and sleep disturbance proportion were statistically significantly higher in AO-BMS patients compared with those in AO-only patients (P = 0.000, P = 0.009, and P = 0.014, respectively).

Table 1. Clinicodemographic Variables in Patients with Atypical Odontalgia (AO) Only and AO with Burning Mouth Syndrome (BMS)

Variables	AO Only (n = 272)	AO with BMS (n = 83)	P
Age (years) (mean ± SD)*	51.72 ± 14.47	58.49 ± 11.35	0.000†
Gender (% female)‡	224 (82.4)	78 (94.0)	0.009§
A history of headache (%)‡	151 (55.5)	47 (56.6)	0.858
Sleep disturbance (%)‡	122 (44.9)	50 (60.2)	0.014¶
Comorbid psychiatric disorder (%)‡	272 (44.5)	43 (51.8)	0.173
SDS (mean ± SD)*	45.14 ± 10.47	45.96 ± 10.94	0.391

*Mann–Whitney *U* test. †P < 0.0001. ‡Chi-square test. §P < 0.01. ¶P < 0.05. SDS, Self-Depression Scale.

In the AO-only group, the presence of a sleep disturbance and the SDS score were significantly higher in patients who had psychological comorbidities compared with those in patients who did not have psychological comorbidities (P = 0.000 and P = 0.000, respectively). In a similar comparison of the AO-BMS group, only 1 significant difference was noted in sleep disturbance between the 2 groups (P = 0.000) (Table 2).

Pain Variables

The general indices that represent the overall intensity of pain (VAS and PPI scores) were significantly higher in AO-BMS patients in comparison with AO-only patients (P = 0.033 and P = 0.034, respectively). The indices of overall intensity in both groups varied in level of severity. Among 15 descriptors in the SF-MPQ to compare specific characteristics of pain between the 2 groups, only 3 descriptors (sharp, hot-burning, and splitting) were rated significantly higher in the AO-BMS group compared with the AO-only group (P = 0.049, P = 0.000, and P = 0.003, respectively). These 3 characteristics belong to the sensory dimension of pain, while those that represent the affective dimension aspect did not show any significant difference. These results are displayed in Table 3.

Interestingly, there were no significant differences of any elements between AO-BMS patients with and without psychological comorbidities. However, AO-only patients with psychological comorbidities had higher scores in 2 affective descriptors (sickening, P = 0.049; and fearful, P = 0.035) in comparison to those without psychological comorbidities (see Table 2).

Table 2. Comparison Between Variables in Patients With and Without Psychiatric Comorbidities

Variables	AO Only (n = 272)			AO with BMS (n = 83)		
	With Psychiatric Comorbidities (n = 121)	Without Psychiatric Comorbidities (n = 151)	P	With Psychiatric Comorbidities (n = 43)	Without Psychiatric Comorbidities (n = 40)	P
Age (years)*	51.02 ± 14.58	52.28 ± 14.40	0.398	59.30 ± 11.63	57.63 ± 11.11	0.438
Gender (% female)†	102 (84.3)	122 (80.8)	0.451	38 (88.4)	40 (100.0)	0.056
A history of headache (%)†	71 (58.7)	80 (53.0)	0.347	25 (58.1)	22 (55.0)	0.773
Sleep disturbance (%)†	74 (61.2)	48 (31.8)	0.000‡	35 (81.4)	15 (37.5)	0.000‡
SDS*	47.85 ± 9.26	42.61 ± 9.99	0.000‡	47.35 ± 11.44	44.48 ± 10.31	0.322
Throbbing*	0.95 ± 1.07	0.93 ± 1.10	0.795	1.05 ± 1.05	1.18 ± 1.11	0.691
Shooting*	0.45 ± 0.78	0.40 ± 0.77	0.404	0.49 ± 0.88	0.48 ± 0.75	0.693
Stabbing*	0.47 ± 0.84	0.53 ± 0.96	0.841	0.67 ± 1.04	0.63 ± 0.80	0.741
Sharp*	0.80 ± 1.08	0.61 ± 0.98	0.109	0.95 ± 1.17	0.85 ± 0.94	0.988
Cramping*	0.90 ± 1.09	0.85 ± 1.04	0.818	1.05 ± 1.23	1.05 ± 1.10	0.880
Gnawing*	0.66 ± 0.98	0.59 ± 0.93	0.527	0.70 ± 1.03	0.65 ± 0.97	1.000
Hot-burning*	0.41 ± 0.85	0.29 ± 0.65	0.388	0.74 ± 1.19	1.00 ± 1.19	0.165
Aching*	1.31 ± 1.04	1.09 ± 1.11	0.066	1.12 ± 0.95	1.28 ± 1.03	0.483
Heavy*	1.11 ± 1.09	1.03 ± 1.06	0.581	1.26 ± 1.23	1.25 ± 0.98	0.861
Tender*	0.93 ± 1.06	0.81 ± 0.99	0.375	0.86 ± 0.91	1.10 ± 1.15	0.460
Spitting*	0.20 ± 0.63	0.20 ± 0.61	0.911	0.35 ± 0.81	0.53 ± 1.06	0.565
Tiring-exhausting*	1.40 ± 1.16	1.28 ± 1.14	0.414	1.70 ± 1.30	1.40 ± 1.10	0.237
Sickening*	1.16 ± 1.07	0.92 ± 1.05	0.049§	1.19 ± 1.25	1.10 ± 1.12	0.839
Fearful*	0.64 ± 0.98	0.45 ± 0.91	0.035§	0.88 ± 1.21	0.45 ± 0.74	0.200
Punishing-cruel*	0.81 ± 1.09	0.61 ± 1.03	0.074	1.14 ± 1.33	0.68 ± 0.99	0.143
Duration of pain (months)*	49.90 ± 63.83	38.70 ± 52.79	0.094	47.35 ± 11.44	63.95 ± 86.25	0.172
VAS*	51.47 ± 31.56	49.37 ± 28.47	0.167	63.30 ± 30.28	56.15 ± 26.93	0.249
PPI*	2.43 ± 1.26	2.39 ± 1.22	0.691	2.85 ± 1.45	2.72 ± 1.25	0.815

Values are presented as means ± SD and frequency (%).
*Mann–Whitney U test. †Chi-square test. ‡$P < 0.0001$. §$P < 0.05$. AO, atypical odontalgia; BMS, burning mouth syndrome; SDS, Self-Depression Scale; VAS, visual analog scale of pain; PPI, present pain intensity subscale.

Table 3. Pain Characteristics in Patients with Atypical Odontalgia (AO) Only and AO with Burning Mouth Syndrome (BMS)

Pain Descriptors	AO Only (n = 272)	AO with BMS (n = 83)	P
Throbbing	0.94 ± 1.08	1.11 ± 1.07	0.137
Shooting	0.42 ± 0.78	0.48 ± 0.82	0.547
Stabbing	0.50 ± 0.91	0.65 ± 0.93	0.064
Sharp	0.69 ± 1.03	0.90 ± 1.07	0.049*
Cramping	0.87 ± 1.06	1.05 ± 1.17	0.280
Gnawing	0.62 ± 0.95	0.67 ± 1.00	0.672
Hot-burning	0.34 ± 0.75	0.87 ± 1.20	0.000†
Aching	1.19 ± 1.09	1.19 ± 0.99	0.850
Heavy	1.07 ± 1.08	1.25 ± 1.11	0.175
Tender	0.86 ± 1.03	0.98 ± 1.04	0.303
Splitting	0.20 ± 0.62	0.43 ± 0.94	0.029*
Tiring-exhausting	1.33 ± 1.15	1.55 ± 1.21	0.146
Sickening	1.02 ± 1.07	1.14 ± 1.19	0.564
Fearful	0.53 ± 0.95	0.67 ± 1.04	0.220
Punishing-cruel	0.70 ± 1.06	0.92 ± 1.20	0.175
Duration (months)	43.68 ± 58.12	52.59 ± 71.42	0.590
VAS	51.43 ± 29.82	59.90 ± 28.79	0.033*
PPI	2.41 ± 1.24	2.79 ± 1.36	0.034*

Values are presented as means ± SD and analyzed using the Mann–Whitney U test.
*$P < 0.05$. †$P < 0.0001$. VAS, visual analog scale of pain; PPI, present pain intensity subscale.

DISCUSSION

There is little doubt that AO, a little-known chronic pain, is a rare condition but always a difficult challenge for any dentist.[2–4,16,17] Previous researchers have reported that AO is linked to TMD, episodic/chronic tension-type headache, and BMS.[8,12,18] The present study addressed a small part of this comorbid system by using retrospective review.

We found that (1) the average age and female ratio in the AO-BMS group were significantly higher than those in the AO-only group, particularly during the menopause years; (2) AO-BMS patients suffered more sleep disturbances and pain experiences than the AO-only group (especially in sharp, hot-burning, and spitting aspects of sensation); and (3) the presence of psychiatric comorbidities in both groups might impact on sleep quality and depression state, but probably does not affect pain experiences.

Gender and Age

Our findings confirm the high proportion of females among AO patients, which has varied from 80% to 85% in previous studies.[4,19] However, in our study, there were a significant number of women with AO in their mid-fifties (53.62 ± 13.81 years), which differs from reports from 1980 to 1990, when AO usually occurred in women in their forties.[19–23] This finding is consistent with the average age reported by Pigg et al. and Ram

et al. (56.9 and 55.4 years, respectively).[19,24] The proportion of females and average age in BMS patients were usually reported to be higher compared with those in AO patients.[15,25] This could explain why there is a statistically significant difference in gender distribution and average age between the 2 groups.

Sleep Disturbance

More than 45% of the patients in our study were experiencing a deterioration of sleep quality at the time of their initial visit. This statistic is slightly different from that reported in the previous literature on AO, which described that "pain is continuous throughout all of part of the day except during sleep" or "sleep is not disturbed by the pain which starts again after awakening."[6,8,23,26] Because our study lacked a control group and did not identify existing confounding factors that might have negatively affected sleep quality (eg, depression, headache),[27–30] a tendency for sleep disturbances in AO patients cannot be demonstrated using our data only. Furthermore, an accurate diagnosis of sleep disorders requires a proper tool or validated instrument. Aware of that restriction, here we only focused on determining whether the patients had sleep disturbances or not instead of pointing out a particular sleep disorder in detail.

Psychiatric Comorbidities

Previous studies have supported the hypothesis about a strong correlation between AO and psychiatric conditions.[2,5,7,13,15,18,20] The prevalence of various psychiatric conditions among AO patients has been reported (Baad Hansen et al., 41%; Rees and Harris, 66%).[7,18] In our study, the respective prevalences were approximately 45% (AO only) and 52% (AO-BMS). In fact, these differences depended on the psychological evaluating method. We used official referral letters to review the psychological aspects, while other studies usually emphasized the depressive state instead of a specific diagnosis.[7,18]

In comparison research between AO and headache or TMD patients, depression has been suggested to be the common factor but not the sole cause of AO.[5,31,32] Also, das Neves de Araujo Lima et al. emphasized that depression should be considered as a possible factor for BMS development.[33] These findings suggest a possible hypothesis to explain why some AO patients develop comorbid BMS.

Interestingly, our findings indicated that although the prevalence of comorbid psychiatric disorders between the AO-only and AO-BMS groups was not significantly different, the presence of psychiatric comorbidities showed a powerful impact on sleep quality in each subgroup. This finding is in agreement with Krystal, who affirmed that depression has complex associations with sleep disturbance.[34] In addition, many mental disorders like obsessive-compulsive disorder or anxiety disorder have consistently proved to be associated with greater sleep disturbance.[35,36] From these statements we suggest the significant correlation between sleep quality and psychiatric comorbidities in both groups.

Pain Characteristics

There was no significant difference in duration of pain between the 2 groups. Overall VAS and PPI score comparisons thus suggest that AO-BMS patients might suffer from more intense painful experiences than AO-only patients. Among 15 descriptors of the SF-MPQ, AO-BMS patients seemed to more frequently describe their pain in sensory terms (eg, sharp, splitting, and hot-burning). This finding highlights the differences in pain characteristics: AO typically presents as "burning, aching or throbbing pain of mild to moderate intensity,"[4] while BMS is defined as an intraoral burning, tingling, or dysesthetic sensation.[1,10,25] Clinically, even though pain location is a typical factor to diagnose a patient as having BMS (most affected area is the tip and anterior two-thirds of the tongue)[1,25] or AO (tooth or tooth socket after extraction),[1] in some cases when the pain spreads to oral mucous membranes or is hard to identify, the diagnosis must be based on the type of pain rather than the position. This important note might help clinicians more accurately observe BMS symptoms in AO patients and vice versa.

Another significant highlight of this study is the presence of BMS as a comorbid increased pain in patients with AO, described as an extremely hot-burning sensation. Said a different way, pain from BMS is more likely to evoke a stronger anxiety than that from AO. This discrepancy supports the statement that AO and BMS should be considered as 2 separate disorders than a unified taxonomy. The impact of this point on medication therapy needs further outcome analysis.

One of the particular strengths of this study is the sample size of patients, which allowed us to examine factors with low effect sizes. Furthermore, the initial

diagnosis was obtained from a single specialist, ensuring consistency. However, the present findings must be interpreted in the context of a number of potential limitations. Firstly, the lack of a control group limited our ability to more accurately assess the impact of BMS symptoms in AO patients. Secondly, we have not used validated instruments to assess patients' sleep quality, resulting in a less accurate diagnosis of sleep disturbances.

In conclusion, AO-BMS patients have different epidemiological characteristics, sleep quality, and pain experiences compared to AO-only patients. The presence of psychiatric comorbidities in both groups aggravated the quality of sleep but had little impact on pain experiences. We suggest that the presence of BMS as a comorbid oral disorder in AO patients might play a noteworthy role in contributing to a more intensively painful experience.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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