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RESEARCH ARTICLE

Assessment of the State-Trait Anxiety Relationship in Patients with Myalgia of Masticatory Muscles

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Abstract

Background

In clinical practice, non-dental facial pain patients are often seen. The hypothesis of this trial was that a link exists between trait anxiety and local myalgia of masticatory muscles. The study aimed to determine both the pre- and post-treatment anxiety levels of patients diagnosed with local myalgia.

Materials and Methods

Sixty patients diagnosed with local myalgia were asked to complete the State-Continuous Anxiety Inventory questionnaire before and 2 months after treatment. Scores were compared with a reference standard previously standardized for Turkish people on dental anxiety.

Results

State and trait anxiety levels were lower after the treatment than before the treatment. Trait anxiety before the treatment was the most intensive type, whereas that after the treatment was the least intensive type.

Conclusion

Although establishing a cause–effect relationship between local myalgia and anxiety is difficult, patients presenting with local myalgia symptoms should also be evaluated for clinical anxiety.

Practical Implications

It should be known by dentists that local myalgia patients who do not resolve with standard procedures should be evaluated for anxiety.

Key Words: Anxiety, State–trait anxiety, Myalgia, Temporomandibular disorders, TMD

Introduction

The term "temporomandibular disorders," (TMDs) first defined by Bell[1] and currently used by the American Dental Association[2], refers to all functional disorders of the mastication system. Temporomandibular disorders may originate from a joint pathology or various conditions involving the mastication muscles. According to DC/TMD classification updated by Schiffman et al in 2014, most common types of pain-related temporomandibular disorder is myalgia. Myalgia can be considered in two subgroups are myofascial pain which is the refers to a distant site and local myalgia which is the refers to overall muscle pain[3,4]. Local myalgia (LM) is characterized by pain or associated muscular spasms, tenderness, limited articular range of motion, stiffness, fatigue, or sometimes autonomic dysfunction originating from the trigger points found in stiff bands emerging from muscles and/or fascia. Its etiology is controversial and remains incompletely understood; although many factors may cause LM, psychiatric disorders such as anxiety, depression, personality disorders, fatigue, and stress appear to be the most critical[5].

State anxiety (SA) defines subjective fear in response to conditions of repression, which can be described as a state of perturbation, tension, fear, or unhappiness, and which disappears once the threatening factor is eliminated. Conversely, trait anxiety (TA) is defined as the tendency toward an oversensitive demeanor under stress or pessimism and intense emotive reactions independent of environmental

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conditions[6]. The prevalence of psychiatric disorders associated with TMD has been reported to be approximately 66%–76%. The majority of accompanying psychiatric disorders have been emphasized as anxiety, atypical depression, somatoform disorder, and hypochondriasis alongside mild depression[7].
Previous studies have revealed a clear relationship between TMD and various psychiatric disorders. However, few studies have assessed psychiatric disorders specific to Turkish people, the validity and reliability of which have not been tested. The hypothesis of this trial was that a link exists between state–trait anxiety and LM. It aimed to determine both the pre- and post-treatment anxiety levels of patients diagnosed with LM.

Materials and methods

This study followed the Declaration of Helsinki regarding medical protocols and ethics and the Regional Ethical Review Board of Ankara University Faculty of Dentistry approved the study (2013/36290600/05). This study included 60 patients older than 18 years of both sexes, who presented to the Department of Oral and Maxillofacial Surgery of Ankara University Faculty of Dentistry between 2011 and 2014 with acute facial pain, limited mouth opening, and difficulty eating. Clinical and radiological examinations confirmed that the patients were free of intraarticular disorders such as internal derangement, osteoarthritis, or degeneration; they had accompanying complaints such as muscular spasm, tenderness, stiffness, fatigue in the facial musculature and no muscle pain to refers to distant site and thus all of them were diagnosed with LM. Thirty patients with internal derangement with joint noises, osteoarthritis, suspected pregnancy, or age under 18 years were excluded from the study.
This study involved a treatment group and a reference standard group. The treatment group consisted of the 60 aforementioned patients, whereas the reference standard group comprised values from a study conducted by Öner et al. that are regarded as the norm for Turkish society on dental anxiety[8].
Patients were re-evaluated by a more experienced clinician after being examined by the same investigator. Patients diagnosed with LM who agreed to participate in the trial were informed about the study and signed informed consent forms. The patients were asked about complaints and medical history and their answers were recorded in detail. The visual analog scale was used to determine how current complaints affected each patient's life, and the utmost care was taken to record patient conditions as accurately as possible. Muscle palpations (masseter and temporal muscle); joint sounds; maximum mouth opening; quantity of leftward, rightward, and protrusive joint motions; and any notable intraoral examination findings were recorded in detail. The patients were administered the Signed Trait–State Anxiety Inventory (STAI FORM TX-1) and the Signed Trait–Anxiety Inventory (STAI FORM TX-2). These inventory forms were validated and tested by Öner et al. for the Turkish population[8].
The patients who completed the STAI FORM TX-1 underwent the first session of infrared treatment (a thermotherapy agent) for 30 min, which targeted the tender points of the chin and face muscles that were detected during the examination and identified as trigger points. Trigger points are the oversensitive points inside palpable nodes located on stiff bands that are situated inside the musculoskeletal system. On the same day, the patients were prescribed tenoxicam 1 tablet per day and phenprobamate 1 tablet per day for 15 days to support thermotherapy with pharmacological agents. The patients were informed of the sedative and addictive effects of the phenprobamate. No further anxiolytic agents were used in our study. Thermotherapy can be described as the application of moist-hot and dry-hot agents to a patient's skin. Hot application evokes vasodilatation through direct or reflex pathways, thereby reducing the pressure on trigger points and relieving pain. After the first session, the patients were provided with a Points to Take into Consideration information sheet for home treatment, and they were instructed to comply with the written recommendations as far as possible. The patients received 30-min thermotherapy sessions using the infrared device for 5 sessions with 3-day intervals for a total of 15 days. The patients were instructed to stop their medications at the end of 15th day but to continue home treatment for 1 month from the start of treatment. Home therapy promotes habits relating to local formants, eating, mastication, and cushion and lying positions, as well as parafunctional habits that should not be performed. Patients received an explanation and were provided with a form that clarified these procedures. At the end of the 1-month period, the patients were invited to a control visit and any changes in their complaints were assessed. No other procedure was performed by the end of the 2-month period from the start of the treatment. When the 2-month period was completed, the patients were requested to complete STAI FORM TX-1 and STAI FORM TX-2.
The mean pre-treatment and post-treatment SA and TA scores were calculated separately. The scores were evaluated according to the Spielberger classification: a STAI score of 20–37 indicated no anxiety or low anxiety; a score of 38–44 indicated moderate anxiety; and a score ↗45 indicated high anxiety[6].
Prior to data analysis, the patient responses to the state–trait anxiety inventory, accuracy of the study data, completeness of the responses, and missing data were checked using various subprograms of the Statistical Package for the Social Sciences (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp).
The present study used data obtained from the norm groups defined by Öner et al.[8] as the reference standard. A sample in the state–trait anxiety inventory handbook was used as the norm group, which comprised 48 patients (Xtrait=35.13, standard deviation (SD)=9.43; Xstate=32.04, SD=10.7) who presented to a dentistry unit for toothache. The study data were analyzed using a one-sample t-test, an independent samples t-test with Spearman's correlation analysis, a decision tree analysis, and a dependent t-test with Spearman's correlation analysis. A p-value ←0.05 was considered statistically significant. In the decision tree analysis, further power analysis was deemed unnecessary because nonsignificant variables were automatically excluded from the analysis.

Results

Among the study patients, 48 (80%) were women and 12 (20%) were men. The youngest patient was 19 years old and the oldest was 66 years old. The mean age of the study population was 38.5 years. The minimum duration of pain was 1 month, the maximum duration was 36 months, and the mean duration of

7.15 months. Forty-five (75%) patients stated that pain caused limitations in their lives, whereas 15 (25%) patients stated the opposite. Twenty-four (40%) patients experienced pain in the morning, 22 (36.7%) in the evening, 1 (1.7%) at night, and 13 (21.7%) through the day. Forty-five (75%) patients could open their mouth less widely than before, whereas 15 (25%) patients could open their months as wide as before. Fifty-nine (98.3%) patients had tenderness of the masseter muscle, whereas 1 (1.7%) patient did not. Forty-five (75%) patients had temporal muscle tenderness, whereas 15 (25%) did not. The mean mouth opening was 43.42 mm. Forty-four (73.3%) patients had class I occlusion, 13 (21.7%) had class II occlusion, and 3 (5%) had class III occlusion. One (1.7%) patient stated that joint complaints did not affect daily life; 1 (1.7%) patient stated that joint complaints barely affected daily life; 16 (26.7%) patients stated that joint complaints mildly affected daily life; 30 (50%) patients stated that joint complaints markedly affected daily life; and 12 (20%) patients stated that joint complaints excessively affected daily life. The pre-treatment and post-treatment SA and TA scores of the study group are shown in Figure 1.

Tables 1–8

Table 1. Comparison of pre-treatment SA scores of the study and control arms (Single sample t-Test)

Group	N	Minimum	Maximum	Mean	SD	
Study pre-SA	60	21	69	54.97	10.13	
	Kolmogorov-Smirnov Normality Test					
	Test value	Degree of freedom		Asymptotic significance		
	0.14	60		0.055		
	t-Test					
	Reference standard group mean=32.04			Confidence interval		
	T test value	Degree of freedom	Asymptotic significance	Difference of means	Lower	Upper
	17.517	59	0.000	22.927	20.31	25.55

Since Kolmogov-Smirnov normality test results had a p=0.055→0.05, it can be stated with a 95% confidence level that the distribution of patients in the treatment arm conformed with a normal distribution and t-Test was applicable. It can be stated with 95% confidence level that the mean pre-treatment and post-treatment SA score of the study arm (54.97-anxious) was **significantly greater** than that of the control arm (32.04- less anxious). (SA: State anxious, SD: Standard Deviation)

Table 2. Comparison of pre-treatment TA scores of the study and control arms (Single sample t-Test)

Group	N	Minimum	Maximum	Mean	SD	
Study pre- TA	60	33	72	58.08	8.96	
	Kolmogorov-Smirnov Normality Test					
	Test value	Degree of freedom		Asymptotic significance		
	0.08	60		0.2		
	t-Test					
	Reference standard group mean=35.13			Confidence interval		
	T test value	Degree of freedom	Asymptotic significance	Difference of means	Lower	Upper
	19.835	59	0.000	22.953	20.64	25.27

Since Kolmogorov-Smirnov normality test results yielded p=0.2→0.05 and as the distribution of the pre-TA values of the patients in the treatment arm was normal in a confidence level of 95%, t-Test was applicable. It can be stated with 95% confidence level that the mean pre-treatment TA score of the study arm (58.08- most anxious) was significantly greater than that of the control arm (35.13-less anxious). (TA: Trait anxious, SD: Standard Deviation)

Table 3. Comparison of the post-treatment SA scores of the study arm and the SA scores of the control arm

Group	N	Minimum	Maximum	Mean	SD	
StudyPost-SA	60	21	48	33.62	5.04	
	Kolmogorov-Smirnov Normality Test					
	Test value	Degree of freedom		Asymptotic significance		
	0.075	60		0.2		
	t-Test					
	Reference standard group mean=32.04			Confidence interval		
	T test value	Degree of freedom	Asymptotic significance	Difference of means	Lower	Upper
	2.42	59	0.059	1,577	0.27	2.88

Since Kolmogorov-Smirnov normality tests results showed p=0.2→0.05, the distribution of SA values of patients in the treatment arm was normal with the confidence level of 95%, t-Test was applicable. It can be stated with 95% confidence level that there was no significant difference between the mean post-treatment SA score of the study arm and the mean state anxiety score of the control arm. (SA: State anxious, SD: Standard Deviation)

Table 4. Comparison of the post-treatment TA score of the study arm and the post-treatment TA scores

Group	N	Minimum	Maximum	Mean	SD	
Study postTA	60	34	57	46.05	4.63	
	Kolmogorov-Smirnov Normality Test					
	Test value	Degree of freedom		Asymptotic significance		
	0.098	60		0.2		
	t-test					
	Reference standard group mean=35.13			Confidence interval		
	T test value	Degree of freedom	Asymptotic significance	Difference of means	Lower	Upper
	18.254	59	0.000	10.920	9.72	12.12

Since Kolmogorov-Smirnov normality tests results showed p=0.2→ 0.05, TA Values of patients in the treatment arm showed a normal distribution at a confidence level of 95%, t-Test is applicable. It can be stated with 95% confidence level that the study arm had a greater mean post-treatment TA score than the control arm. (TA: Trait anxious, SD: Standard Deviation)

Table 5. Comparison of post-treatment SA scores of the study and control groups

Group	N	Minimum	Maximum	Mean	SD	
Study post SA	60	21	48	33.62	5.04	
	Kolmogorov-Smirnov Normality Test					
	Test value	Degree of freedom		Asymptotic significance		
	0.075	60		0.2		
	t-Test					
	Reference standard group mean=32.04			Confidence interval		
	T test value	Degree of freedom	Asymptotic significance	Difference of means	Lower	Upper
	2.42	59	0.059	1.577	0.27	2.88

Since Kolmogorov-Smirnov normality tests results showed p=0.2→0.05, distribution of SA Values of patients in the treatment arm had a normal distribution at a confidence level of 95%, t-Test was applicable. According to t-Test results, since p=0.059→0.05, it can be stated with a confidence level of 95% that there was no statistically significant difference between groups. (SA: State anxious, SD: Standard Deviation)

Table 6. Comparison of pre- and post-treatment SA scores

Study Group	N	Minimum	Maximum	Mean	SD	
Pre-SA	60	21	69	54.97	10.13	
Post-SA	60	21	48	33.62	5.04	
Dependent t test	Test value	Degree of Freedom	Asymptotic significance	Difference of Means	Lower confidence interval	Upper confidence interval
	19.71	59	0.000	21.35	19.18	23.51

Since Dependent T-Test results showed p=0.000←0.05, it can be stated with ← confidence level of 95% that a statistically significant difference was present between the two groups. It can be stated with 95% confidence level that the mean pre-treatment SA score (54.97-anxious) was greater than the mean post-treatment SA score, and the post-treatment SA was reduced compared to the pre-treatment level. (SA: State anxious, SD: Standard Deviation)

Table 7. Comparison of pre- and post-treatment TA scores

Study Group	N	Minimum	Maximum	Mean	SD	
Pre-TA	60	33	72	58.08	8.96	
Post-TA	60	34	57	46.05	4.63	
Dependent t test	Test value	Degree of Freedom	Asymptotic significance	Difference of Means	Lower confidence interval	Upper confidence interval
	13.332	59	0.000	12.033	10.227	13.839

It can be stated with confidence level of 95% that the mean pre-treatment TA score (58.08-anxious) was greater than the post-treatment TA score (46.05-anxious), and that it was reduced after the treatment. (TA: Trait anxious, SD: Standard Deviation)

Table 8. Comparison of the Pre-treatment TA, post-treatment SA, pre-treatment TA, and post-treatment TA scores (ANOVA)

	Difference of means	Standard error	Asymptotic significance	Confidence interval	
				Lower	Upper
Pre-treatment SA					
Post-treatment SA	21.35	1.385	0,00	18.62	24.08
Pre-treatment TA	-3.117	1.385	0,25	-5,84	-0,39
Post-treatment TA	8.917	1.385	0,00	6.19	11.64
Post-treatment SA					
Pre-treatment SA	-21.350	1.385	0,00	-24.08	-18.62
Pre-treatment TA	-24.467	1.385	0,00	-27.19	-21.74
Post-treatment TA	-12.433	1.385	0,00	-15.16	-9.71
Pre-treatment SA					
Pre-treatment SA	3.117	1.385	0,25	0,39	5.84
Post-treatment SA	24.467	1.385	0,00	21.74	27.19
Post-treatment TA	12.033	1.385	0,00	9.31	14.76
Post-treatment SA					
Pre-treatment SA	-8.917	1.385	0,00	-11.64	-6.19
Post-treatment SA	12.433	1.385	0,00	9.71	15.16
Pre-treatment TA	-12.033	1.385	0,00	-14.76	-9.31

It can be stated with a confidence level of 95% and a significance level of p←0.05 that the magnitudes of the scores were in the order of Pre-treatment TA→Pre-treatment SA→Post-treatment TA→post-treatment SA. (TA: Trait anxious, SA: State anxious)

Discussion

The importance of psychological factors in the development of temporomandibular disorders is well-known[7,10]. Numerous studies have also reported that temporomandibular disorders accompany some psychological disorders, such as anxiety, depression, and personality disorders[11-17]. The hypothesis of the current study was that a cause and effect relationship exists between LM and state–trait anxiety levels. The present study results showed that the patients in the treatment group had higher levels of both anxiety types compared to those of the reference standard. The mean post-treatment TA scores of the treatment group were higher than those of the reference standard, indicating that TA persisted after treatment. SA is thought to be resolved by LM treatment, but TA requires other advanced treatment modalities, such as cognitive behavior therapy or long term used anxiolytic medication.

Although epidemiological data on LM in temporomandibular disorders remain unclear, the disorder has been reported to typically affect women 3–6 times more often than men. This difference has been explained by women seeking treatment more commonly than men, but also by hormonal and ergonomic factors. A study of patients with acute temporomandibular joint disorders revealed that pain-related TMD patients seeking treatment was predicted by sex, pain intensity, and psychosocial stress[18]. Friction et al.[19] reported that 135 (82.3%) of 164 patients with myofascial pain in the neck or face were women. The present study also demonstrated that 48 (80%) of 60 patients were women, thus supporting previous studies suggesting that the disorder is more common among women. Myofascial pain most commonly occurs between 20 and 40 years of age. In accordance with previous reports, the patients in the current study had a mean age of 38.5 years[20-22].

In a study by Arı[23], patients with myofascial pain had the most severe pain in the morning immediately after waking up, and it recurred following both excess activity and prolonged periods of inactivity. The present study showed that 40% of patients had pain in the morning, 36.7% in the evening, 1.7% at night, and 21.7% throughout the day.

Questioning the patients about the duration of their symptoms revealed that the majority of patients had a chronic disease. Their myofascial pain lasted between 1 month and 36 months, with a mean duration of 7.15 months. The duration of myofascial pain was 1–9 months in 76.7% of patients; 10–19 months in 11.7%; 20–29 months in 5%; and 30–39 months in 6.7%. These findings are in agreement with previous reports, which have shown that the age of onset of the disorder is 18–26 years and the age at the time of presentation to a physician is 20–50 years[24].

Among the whole study group, 66.7% (40 patients) considered their disorder to have started because of stress. The patients commonly had difficulties with personal relationships. Emotional stress has been reported as a predictor of myofascial pain or local myalgia because it causes the emergence of parafunctional behaviors[25]. In a study of the effect of stressful life events on pain intensity and depression, anxiety levels, and treatment outcomes, social interaction problems originating from interpersonal problems were significantly more common in patients with myofascial pain than in those with non-muscular temporomandibular joint disorders[14].

Simons et al.[26] described myofascial pain as a syndrome in which limited mouth opening may or may not be present. According to the statements of the patients in the current study, 68.3% of patients had difficulty in opening their mouth, whereas 31.7% had no difficulty; in general, 75% of patients could open their mouth less than before, whereas 25% had the same mouth opening as before. Simons et al.[26] defined myofascial pain as a syndrome originating from the trigger points found in the stiff bands in which facial pain accompanies muscle tenderness on palpation, which is formed by local and referred pain, and which limits daily life. Seventy-five of our patients reported a limitation in daily life caused by pain, whereas 25% of them did not. We did not formally detect or evaluate trigger points within stiff bands. Regarding the findings of muscular tenderness upon palpation, 98.3% of patients had tenderness in the masseter muscle, whereas 1.7% of them did not; additionally, 75% of patients had tenderness in the temporal muscle, whereas 25% of them did not.

The results of the chi-square test suggested, at a confidence level of 95%, a significant relationship between sex and pre-treatment TA. Thus, pre-treatment TA varies by sex. The coefficient of this correlation (i.e., the Phi coefficient) was 0.379. Considering that the Phi coefficient can have a value between 0 and 1, 0.379 may be considered small, but it was statistically significant. Based on pre-treatment TA levels, 66.7% of women and 25% of men had high anxiety.

Frederiksson et al.[27] conducted a pain threshold study and advocated that evaluating men and women separately would be more useful. Women have an increased incidence of 30–49 years of age and the trigger points are more common at a ratio of 3:1[28].

Although myofascial pain occurs in both sexes, its prevalence was higher among women than men and has been reported to be more common in the second half of the menstrual cycle, reaching a maximum prevalence between 30 and 39 years of age, and has a lower prevalence in elderly people[26,28,29].

Numerous studies have indicated that temporomandibular disorders accompany psychological disorders such as anxiety, depression, and personality disorders [10-16]. A study by Merksey[30] showed that anxious and depressive symptoms increased in prevalence in facial arthromyalgias, albeit to a lesser degree than other conditions characterized by chronic pain. Although many factors lead to myofascial pain, psychiatric disorders, fatigue, and stress appear to be the most critical. Suvinen et al.[31] and Koh[32] reported that among temporomandibular disorders, myofascial pain or local myalgia is the most thoroughly studied from the psychiatric aspect; the researchers also added that no definitive conclusions could be drawn from available studies because of a lack of consensus regarding the diagnosis, diversity of psychiatric assessment and evaluation systems, and the multidimensional property

of myofascial pain. Generally, however, myofascial pain is emphasized as a disorder that is closely related to stress, in which both first axis and second axis psychiatric disorders are common.

Similar to our study, Krishnan et al.[33] and Brown[34] found that depressive and anxious symptoms were more common in chronic pain populations than in control groups.

Conclusion

The current study results suggest that the mean pre-treatment SA score regressed following treatment, indicating that the applied treatment protocol was effective against SA. The mean pre-treatment TA score was higher than the mean post-treatment TA score, and post-treatment TA was lower than pre-treatment TA. Similarly, the applied protocol exerted a beneficial effect on the TA level but failed to completely abolish TA.

In patients with myofascial pain or myalgia, a prominent psychopathological condition may be correlated to anxiety levels. Although establishing a cause–effect relationship between myalgia and anxiety is difficult, patients presenting with myalgia symptoms should also be evaluated for anxiety. Our findings suggest that clinicians should carefully assess and provide guidance for reducing muscle tension, parafunctional activity, emotional distress and high levels of overall stress in their patients experiencing TMD-related myofascial pain.

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