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CLINICAL STUDY

A RETROSPECTIVE ANALYSIS OF THE CLINICAL DATA OF THE PATIENTS WITH TEMPOROMANDIBULAR JOINT DYSFUNCTION

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SUMMARY

Objective: Temporomandibular joint (TMJ) dysfunction is a common pathology in the population. This pathology, which may cause many different symptoms, adversely affects the quality of life. Therefore, its diagnosis and treatment are important.

In this study, we aimed to retrospectively analyze the current complaints and findings of patients with TMJ dysfunction.

Materials and Methods: 100 patients who were admitted to the Otorhinolaryngology Clinic were included in this study. Etiological factors, additional symptoms, examination findings, affected muscles and pain scores of the patients were examined. The clinical informations were compared with the findings of the examination. Different treatment modalities were recommended to the patients. Pain scores were re-analyzed after treatment.

Results: Of the patients included in the study, 75 were female and 25 were male. 64% of the patients were affected by one side. Myofascial pain was the most common etiological factor. The most common findings were palpation tenderness and crepitation. The masseter was the most affected muscle. The pain scores of the patients were 3.62 ± 2.21 (0-8; 4) and after the appropriate treatments decreased to 2.59 ± 1.61 (0-7; 2) ($p < 0.05$).

Conclusions: Temporomandibular joint dysfunction is a pathology caused by many etiologic factors and may lead to different findings. It is important to analyze the patient's current complaints and clinical findings in order to ensure appropriate treatment. Accurate analysis and appropriate treatment modality resulted in a significant reduction in pain intensity in patients.

Keywords: Temporomandibular Joint Disorders, pain measurement, myofascial pain

TEMPOROMANDİBULER EKLEM DİSFONKSİYONLU HASTALARDA KLİNİK VERİLERİN RETROSPEKTİF ANALİZİ

ÖZET

Amaç: Temporomandibular eklem (TME) disfonksiyonu toplumda sıkça rastlanan bir patolojidir. Birçok farklı semptoma neden olabilen bu patoloji hayat kalitesini olumsuz yönde etkilemektedir. Bu nedenle tanı ve tedavisi önem arz etmektedir. Bu çalışmada TME disfonksiyonu olan hastaların mevcut şikayetlerini ve tespit edilen bulgularını retrospektif olarak analiz etmeyi amaçladık.

Gereç ve Yöntem: Bu çalışmaya Kulak Burun Boğaz Kliniği'ne başvuran 100 hasta dahil edilmiştir. Hastaların etyolojik faktörleri, ek semptomları, muayene bulguları, etkilenen kaslar ve ağrı skorları incelendi. Elde edilen verilerle muayene bulguları karşılaştırıldı. Hastalara farklı tedavi modaliteleri önerildi. Tedavi sonrası ağrı skorları tekrar analiz edildi.

Bulgular: Çalışmaya dahil edilen hastaların 75'i kadın 25'i erkekti. Hastaların %64'ünde tek taraf etkilenmişti. Miyofasiyal ağrı en sık saptanan etyolojik faktör idi. En sık saptanan muayene bulguları palpasyonla hassasiyet ve krepitasyon varlığı idi. En çok etkilenen kas ise masseter kasıydı. Hastaların ağrı skorları 3.62±2.21 (0-8; 4) iken uygun tedaviler sonrasında 2.59±1.61'(0-7; 2) e geriledi ($p<0.05$).

Sonuç: Temporomandibular eklem disfonksiyonu, birçok etyolojik etkene bağlı olarak ortaya çıkan ve farklı bulgulara neden olabilen bir patolojidir. Uygun tedavinin sağlanması amacıyla hastanın mevcut şikâyet ve bulgularını analiz etmek çok önemlidir. Doğru analiz ve uygun tedavi modalitesi hastalarda anlamlı derecede ağrı şiddetinin azalmasını sağlamıştır.

Anahtar Sözcükler: Temporomandibular eklem bozuklukları, ağrı ölçümü, miyofasiyal ağrı

INTRODUCTION

Temporomandibular joint (TMJ) dysfunctions occur as a result of structural or functional deterioration in muscles involved in structures constituting the joint movement and/or joint movement[1]. Symptoms that adversely affect the quality of life such as chin pain, limitation in mouth opening and sound from the joint during chewing may occur because of this pathology. Many factors such as occlusion disorders, bruxism, alteration of tooth structure and/or tooth loss, depression and anxiety become prominent in the etiology of this disease[2,3]. In the clinical classification by Okeson, myofascial pain, intraarticular disorders and osteoarthritis have been identified as three main causes[2].

In temporomandibular joint dysfunction, the treatment is based on the etiologic factors of the patient and a higher-level treatment is applied

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if necessary[4].The psychosocial evaluation of these patients is important in order to avoid unnecessary treatment methods. In addition, soft diet, physical therapy, medication and splint applications are recommended in order to regress the existing symptoms. Orthodontic and orthognathic surgeries are considered in patients where these treatments do not work[4].

Many etiological causes and many different treatment modalities have been described in this pathology and further researches continue still on which treatment should be applied to which pathology. For this reason, we aimed to retrospectively analyze and present the etiological factors, detected findings, affected muscles and treatments and the relationship of these data in patients with TMJ dysfunction.

MATERIAL and METHODS

One hundred out of 138 patients, who applied to Aydın State Hospital Otorhinolaryngology Clinic between September 2017 and October 2018 and u were diagnosed with TMJ dysfunction, were included in this retrospective study. 38 patients were excluded from the study because of insufficient data and accompanying other known pathological diseases that would limit the objective evaluation of the TMJ joint. All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and the 2000 Helsinki Declaration and subsequent amendments or comparable ethical standards. This study was conducted with the approval of the local ethics committee (AAMKAEK 2018/1543).

The TMJ disfunction of the patients were diagnosed according to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD)[5]. The patients" history and the examination of the joint were important the diagnosis. Beside this, imaging methods like computing tomography, magnetic resonance and joint graphy assisted to the diagnosis. Pain in the jaw or ear and pain with the movement were asked to the patient. For the physical examination, palpation of the TMJ, skin, and masticator muscles were performed and mandible movements were observed. Tenderness of the muscles and joint was determined with Intra-and extraoral palpation of the joint. The temporal muscle and masseter muscle can be easily palpated from the outside. The anterior edge of the medial pterygoid muscle is palpated with the index finger in the medial of the retromandibular trigon. The lateral pterygoid muscle attached to the TMJ capsule can be evaluated by palpating the lateral part of the TMJ capsule directly in front of the tragus and the posterior part from the outer ear canal.The presence of deflection, deviation, disk displacement and joint sounds in TMJ examination were recorded as dysfunction. Individuals with the rheumatologic disease, herpes simplex, lichen planus, neuralgia, psychiatric disorders, sinusitis, and salivary gland disorders, head and neck cancer were not included in the study.

The present etiologic factors of the patients were myofascial pain, bruxism, unilateral chewing, posture disorder, malocclusion, previous oral and dental interventions, history of hard body fracture, joint laxity, jaw trauma, structural joint disorders, parafunctional behaviors (nail eating, pencil biting) and idiopathy. Accompanying symptoms were stated by the patients as ear pain, tinnitus, headache, dizziness, oral aphthae, toothache, systemic joint pain, ear fullness, and muscle fatigue. Following the physical examination, the presence of sensitivity in the masseter, temporal, external pterygoid, internal pterygoid, and sensitivity in sternocleidomastoid muscles were recorded. The treatments implemented to patients were pharmacological therapy (myorelaxant), physical therapy, occlusive splint, night plate application, orthodontic treatment, surgical treatment, acupuncture treatment, intraarticular injection (corticosteroid and hyaluronic acid). We determined the etiological factors detected, the affected muscles and the additional symptoms mentioned than once.

Etiological factors, physical examination findings, affected muscles and additional findings of the patients were recorded with the entry of multiple response data analysis. Pain levels of the patients were determined by the Visual Analogue Scale test. Prior to this test, patients were informed about the test and were

asked to score their current pain as 0 (no pain) and 10 (unbearable pain). This scoring was performed at the time of diagnosis and was repeated at the patient's post-treatment controls. The Wilcoxon test was used for statistical analysis and median, minimum and maximum values were determined. Statistical analyzes were performed using the SPSS 16.0 (IBM, USA) program.

RESULTS

Fifteen out of 138 patients with physical TMJ dysfunction were excluded due to lack of regular follow-up and lack of treatment modality, 7 patients diagnosed rheumatological diseases (RA, ankylosing spondylitis), 2 patients lichen planus, 3 patients trigeminal neuralgia, 4 patients psychiatric disorders (schizophrenia, major depression, somotoform disease), 2 patients were excluded from the study because of chronic sinusitis, 3 patients with salivary gland disease and 2 patients with head and neck cancers (Larynx CA, mandibular ossified fibroma). The mean age of the patients was 36.7±8.0 years. While 34 patients had bilateral TMJ dysfunction, 64 patients had unilateral complaints. The most common etiologic factor was myofascial pain syndrome and it was found in 23.8% of the patients (Table 1). While 85 patients had sensitivity by palpation, crepitation was detected in 62 patients. There was the loss of function in 39 patients and loss of joint strength in 30 patients. A total of 55 patients underwent myorelaxant medication, 14 patients underwent occlusive splint, 5 patients underwent physical therapy, 11 patients underwent intra-articular injection, 3 patients underwent night plate therapy, 6 patients underwent orthodontic treatment and surgery, and 6 patients underwent acupuncture treatment (Table 2).

The pre-treatment VAS score was determined as 3.62±2.21 (0-8; 4). The VAS score was found to be 2.59±1.61 (0-7; 2) after training to reduce TMJ dysfunction, soft diet, physical therapy, pharmacotherapy and other treatments and the change obtained was statistically significant (p=0.001). After pharmacological treatment, occlusive splint, night plate, physical therapy, orthodontic treatment, surgery, acupuncture treatment, there was a significant improvement in pain scores, whereas in injection-oriented treatments, there was no significant improvement in pain scores.(Table 2).

When we examine the etiological factors, myofascial pain, bruxism, unilateral chewing and occlusion disorders are common causes. Joint sensitivity was found to be high in all etiological factor subgroups. The presence of crepitation was found to be high in patients with myofascial pain, bruxism and occlusion problem. (Table 3). Dysfunction is more common in patients with occlusion disorders and intraoral intervention. The sign of weakness was especially seen in patients with joint laxity. Specifically, when we examined the ethological factors, in patients with bruxism, tenderness and crepitation were higher in palpation than in other findings. However, in patients with etiological causes other than idiopathic cases, the presence of tenderness and crepitation was found to be high with palpation. Pain scores were high in patients with joint dysfunction after hard body breaking. (Table 3).

It was seen that crepitation, sensitivity by palpation, loss of function and weakness were high in patients with muscular involvement. However, pain scores were higher in groups with affected masseter and sternocleidomastoid muscle (Table 4).

Tinnitus, dizziness, headache and fullness in the ear were the most common symptoms in patients. Patients with tinnitus, dizziness, toothache, ear fullness, and muscle weakness had increased sensitivity with palpation. Similarly, in patients with additional symptoms, crepitation is taken at a high rate. Dysfunction was higher in patients with headache. Weakness is not a common finding, but only in patients with systemic pain was observed at a higher rate than in patients with other additional symptoms. Patients who described systemic pain and ear pain were the group with the highest pain score (Table 5).

Table 1: Causes determined in the etiology of the TMJ dysfunction

	Number	Ratio
Myofascial Pain Syndrome	**67**	**23.8%**
Bruxism	**44**	**15.6%**
Unilateral Chewing	**46**	**16.3%**
Occlusion Disorders	**31**	**11.0%**
Intraoral interventions	**16**	**5.7%**
Hard Body Fracture History	**19**	**6.7%**
Joint Laxity	**16**	**5.7%**
Jaw Trauma History	**7**	**2.5%**
Structural Disorders of Joint	**3**	**1.1%**
Parafunctional Behaviors	**28**	**9.9%**
Idiopathy	**5**	**5%**

Table 2: The effect of different treatment modalities on pain levels in patients with temporomandibular joint dysfunction

		Number (N)	Mean
Pharmacological Therapy	Pre-treatment	55	3.60±2.25
	Post-treatment	55	2.80±1.79
Occlusive splint	Pre-treatment	14	3.42±2.13
	Post-treatment	14	2.21±1.62
Night Plate	Pre-treatment	3	5.33±1.15
	Post-treatment	3	1.33±1.52
Physical Therapy	Pre-treatment	5	3.20±1.78
	Post-treatment	5	1.80±0.83
Orthodontics	Pre-treatment	4	4.50±1.91
	Post-treatment	4	2.50±1.29
Surgery	Pre-treatment	2	8.00±0.00
	Post-treatment	2	2.50±0.70
Acupuncture	Pre-treatment	6	4.00±1.26

	Post-treatment	6	2.83±1.72
Injection	Pre-treatment	11	2.36±2.15
	Post-treatment	11	2.18±1.25

Table 3: Comparison of demographic and clinical findings for etiologic causes in patients with TMJ dysfunction

	Sex (N)		**Sensitivity with Palpation (N)**		**Crepitation (N)**		**Loss of Function (N)**		**Weakness (N)**		**Pain Score**
	Female	**Male**	**Present**	**Absent**	**Present**	**Absent**	**Present**	**Absent**	**Present**	**Absent**	
Myofascial Pain Syndrome	48	19	55	12	51	16	29	38	20	47	3.4±2.1
Bruxism	32	12	39	5	36	8	20	24	19	25	3.6±1.9
Unilateral Chewing	35	11	36	10	27	19	15	31	6	40	3.3±2.4
Occlusion Disorders	20	11	29	2	22	9	17	14	13	18	3.7±1.7
Intraoral intervention History	11	5	16	0	10	6	11	5	9	7	3.7±1.7
Hard Body Fracture History	16	3	19	0	9	10	3	16	3	16	5.03±1.4
Joint Laxity	12	4	15	1	12	4	9	7	14	2	3.4±1.6
Jaw Trauma History	6	1	6	1	5	2	3	4	3	4	4.0±1.6
Structural Disorders of the Joint	2	1	3	0	3	0	2	1	3	0	3.7±1.7
Parafunctional Behaviors	21	7	20	8	22	6	10	18	3	25	3.1±2.4
Idiopathy	4	1	3	2	3	2	1	4	0	5	2.8±2.6

Table 4: Comparison of demographic and clinical findings of patients with TMJ dysfunction in terms of affected muscles

	Sex (N)		Sensitivity with Palpation (N)		Crepitation (N)		Loss of Function (N)		Weakness (N)		Pain Score
	Female	Male	Present	Absent	Present	Absent	Present	Absent	Present	Absent	
Masseter	28	12	38	2	31	9	26	14	27	13	4.1±1.9
Temporal	16	9	22	3	17	8	17	8	17	8	3.8±2.2
External Pterygoid	16	7	19	4	17	6	10	13	12	11	3.5±2.2
Internal Pterygoid	12	8	18	2	17	3	14	6	12	8	3.6±1.7
Sternocleidomastoid	8	4	12	0	12	0	11	1	9	3	4.3±1.8

Table 5: Comparison of demographic and clinical findings of patients with TMJ dysfunction in terms of additional symptoms

	Sex (N)		Sensitivity with Palpation (N)		Crepitation (N)		Loss of Function (N)		Weakness (N)		Pain Score
	Female	Male	Present	Absent	Present	Absent	Present	Absent	Present	Absent	
Ear Pain	5	2	6	1	5	2	2	5	4	3	4.2±1.3
Tinnitus	36	11	37	10	31	16	17	30	12	35	3.6±1.9
Headache	30	12	39	3	30	12	23	19	19	26	3.3±2.4
Dizziness	36	9	36	9	31	14	12	33	10	35	3.2±2.2
Oral aphthae	6	4	9	1	5	5	4	6	4	6	3.7±1.7
Toothache	11	5	18	1	8	11	5	14	1	18	3.7±1.7
Systemic pain	16	3	33	5	30	8	17	21	19	19	5.03±1.4
Fullness in the ear	12	4	39	10	36	13	17	32	14	35	3.4±1.6
Muscle fatigue	6	1	59	11	52	18	31	39	26	44	4.0±1.6

DISCUSSION

The temporomandibular joint is a structure that functions significantly in chewing, swallowing and speaking, and is therefore under constant stress. Conditions that impair the function of the muscle and skeletal structures involved in the function of this joint cause temporomandibular joint dysfunctions. The symptoms of patients with this dysfunction are generally reported as pain and sound during jaw movement, deviation of the jaw during movement and pain in the head region[6]. Internal irregularity has been charged as the cause of this dysfunction.[7]

Anatomical disorders, bruxism, myofascial pain syndrome, and parafunctional disorders were found to be responsible for the etiology of the disease. This affects 70% of the population and one-fourth of the patients are aware of the situation[3]. This condition, which usually affects middle-aged women, was 5 times higher in female patients than in male patients in the analysis performed for the present study. However, this clinical picture may be more severe in women and therefore women have a higher need for treatment[8]. It is stated that female hormones are a predisposing factor in the development of this disease. Increased hormones can be seen as the cause of increased disease incidence in women compared to men[9]. In clinical observations, TMJ dysfunction is more common in middle-aged women. When ages are grouped according to etiological causes, these causes occur on average in the 35-37 age range. However, in the present study, the mean age of patients with structural disorders of the jaw joint was 31 years. In a study, it was reported that this pathology is most frequently in people over 50 years old[10]. It comes to mind that the difference in studies may be related to geographic differences and emotional stress. Although pain scores were slightly higher in women, the difference was not statistically significant. In a series of 1000 patients, it was reported that women had higher pain scores, but other symptoms were similar[11].

Revealing the etiological factors and findings is very important in terms of applying the most appropriate treatment. Studies have shown predisposing factors in TMJ dysfunctions due to conditions such as occlusion disorders, trauma, bruxism, dental problems, joint laxity as well as stress, anxiety and depression[12]. Myofascial pain syndrome is a condition characterized by pain and limitation of movement along with psychological disorders[13]. In patients with TMJ dysfunction, the rate of patients with myofascial pain with palpation sensitivity was found to be 45%[3]. in patients with myofascial pain, TMJ dysfunction pain scores were higher than those without myofascial pain syndrome[14]. In the current study, no significant difference was observed between myofascial pain and pain scores between other subgroups. In addition, sleep disorders and depression that may accompany myofascial pain syndrome have been identified as an important predisposing factor in TMJ dysfunctions[12]. It is important to observe the effect of jaw movements on existing pain in order to reveal TMJ dysfunction in such pains. .It has been stated that the crepitation and click sounds occurring during jaw movement are a mechanical problem rather than myofascial pain[15]. However, in our current study, sensitivity to positivity was high in patients with myofascial pain etiology with crepitation and palpation. Similarly, patients with mechanical etiological factors such as bruxism, occlusion disorder, structural disorder and trauma had sensitivity in both crepitation and palpation. Okeson et al. They alleged that in the inference they made for this situation, the damage to the front of the TME formed a crepitation sound[2].

Sensitivity in masticatory muscles is one of the most important examination findings of TMJ dysfunction. In the same study, it was stated that sensitivity in these muscles should rather be evaluated as local myalgia[4]. The occurrence of pain with movement and limitation of bilateral and mandibular movements are the evidence that the masticatory muscles are affected. Increased sensitivity with pain may be associated with increased thickness of the muscles. In the study conducted in patients with

bruxism in Turkish society, it was revealed that the forward displacement of the joint causes an increase in thickness in the masseter and especially in the temporal muscle[16]. In a study of 105 patients with TMJ dysfunction, magnetic resonance imaging was demonstrated in which masseter muscle was significantly edited in patients who described pain with palpation[17]. In our current study, masseter sensitivity was found to be 40%, and joint sensitivity was high with palpation. Sawada et al. In their study, increased diffusion involvement in magnetic resonance in the masticating muscles of the affected side in TMJ dysfunctions affecting one side[18]. It has been reported that long-term use of masticating muscles on one side causes the release of neuromeditors, thereby causing hypertrophy and hyperalgesia in these muscles[4]. These changes in the muscles cause myositis and myospasm, which can lead to weakness and loss of function[19,20].Similar to studies in the literature, loss of function and weakness were found to be higher in patients with affected muscles. First, training in chewing and soft oral diet and then physical therapy and pharmacotherapy are implemented in patients with involvement in masticatory muscles. Especially in patients with muscle involvement, myorelaxant treatment may provide a dramatic efficacy[4]. In the present study, different treatment methods were proposed and applied to the patients and patients" pain scores decreased significantly. In a study analyzing the TMJ dysfunctions and evaluating the treatment methods, it was emphasized that the detailed evaluation made during diagnosis was important in terms of increasing the effectiveness of the treatment to be recommended and/or applied[21]. In the present study, it was observed that myorelaxant treatment was beneficial in patients with muscle involvement, physical therapy in patients with crepitation, loss of function and weakness, and psychotherapy and anxiolytic treatment in patients with bruxism.

Ear pain is a symptom that frequently accompanies the TMJ dysfunction. However, tinnitus and fullness of the ear were determined to be higher compared to ear pain in this study. In a study that analyzed ear findings in patients with TMJ dysfunction, ear fullness and tinnitus were found to be higher compared ear pain[22]. In another study, it was revealed that the existing tinnitus regressed after the treatment of TMJ dysfunction[23]. TMJ dysfunction has an important place among the causes of ear pain. However, ear pain is not always expected in patients with TMJ dysfunction.

The present study has some limitations. Firstly, the study was designed retrospectively and there were differences between the follow-up periods of the patients. In the study, it was not possible to compare the efficacy of different treatment modalities due to the limited number of patients in some groups. In addition, it was not observed how well the patients were in compliance with the recommended training and diet practices.

CONCLUSION

In this study, 100 patients with TMJ dysfunction were evaluated retrospectively. The current etiologic findings, symptoms, affected muscles, pain scores and additional symptoms of the patients and their relationship with each other were attempted to be determined. In the light of these, we have observed that this ailment affects middle-aged women frequently and myofascial pain is a frequent cause. More comprehensive studies on this subject will be more beneficial for obtaining more data.

REFERENCES

1. Eroğlu CN, Tunç SK, Işık M, Elasan S. Prevalence of Posttraumatic Stress Disorder and Depression among the Individuals within Faculty of Dentistry, who Experienced Earthquake and who did not, and the Relation with Temporomandibular Joint Disorders. . Van Med J 2017;24:94-100
2. Okeson JP, de Leeuw R. Differential diagnosis of temporomandibular disorders and other orofacial pain disorders. Dent Clin North Am 2011;55:105-20.
3. Manfredini D, Guarda-Nardini L, Winocur E, Piccotti F, Ahlberg J, Lobbezoo F. Research diagnostic criteria for temporomandibular disorders: a systematic review of axis I epidemiologic findings. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011;112:453-62.
4. De Rossi SS, Greenberg MS, Liu F, Steinkeler A. Temporomandibular disorders: evaluation and management. Med Clin North Am 2014;98:1353-84.
5. Schiffman E, Ohrbach R, Truelove E, Look J, Anderson G, Goulet JP, et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: recommendations of the International

RDC/TMD Consortium Network* and Orofacial Pain Special Interest Groupdagger. J Oral Facial Pain Headache 2014;28:6-27

6. Murphy MK, MacBarb RF, Wong ME, Athanasiou KA. Temporomandibular disorders: a review of etiology, clinical management, and tissue engineering strategies. Int J Oral Maxillofac Implants 2013;28:e393-414
7. Farrar WB, McCarty WL, Jr. The TMJ dilemma. J Ala Dent Assoc 1979;63:19-26
8. Rugh JD, Solberg WK. Oral health status in the United States: temporomandibular disorders. J Dent Educ 1985;49:398-406.
9. Chisnoiu AM, Chisnoiu R, Moldovan M, Lascu LM, Picos AM. Etiological factors associated with temporomandibular joint disorder - study on animal model. Rom J Morphol Embryol 2016;57:185-9.
10. Johansson A, Unell L, Carlsson GE, Soderfeldt B, Halling A. Gender difference in symptoms related to temporomandibular disorders in a population of 50-year-old subjects. J Orofac Pain 2003;17:29-35
11. Ferreira CL, Silva MA, Felicio CM. Signs and symptoms of temporomandibular disorders in women and men. Codas 2016;28:17-21.
12. Donovan TE, Anderson M, Becker W, Cagna DR, Carr GB, Albouy JP, et al. Annual Review of selected dental literature: report of the Committee on Scientific Investigation of the American Academy of Restorative Dentistry. J Prosthet Dent 2013;110:161-210.
13. DM SBL. The Temporomandibular Joint: A biological basis for clinical practice. 4th ed Philadelphia: WB Saunders 1992:163-78
14. Poluha RL, Grossmann E, Iwaki LCV, Uchimura TT, Santana RG, Iwaki Filho L. Myofascial trigger points in patients with temporomandibular joint disc displacement with reduction: a cross-sectional study. J Appl Oral Sci 2018;26:e20170578
15. Scrivani SJ, Keith DA, Kaban LB. Temporomandibular disorders. N Engl J Med 2008;359:2693-705.
16. Garip H, Tufekcioglu S, Kaya E. Changes in the temporomandibular joint disc and temporal and masseter muscles secondary to bruxism in Turkish patients. Saudi Med J 2018;39:81-5
17. Nikkuni Y, Nishiyama H, Hyayashi T. The relationship between masseter muscle pain and T2 values in temporomandibular joint disorders. Oral Surg Oral Med Oral Pathol Oral Radiol 2018;126:349-54
18. Sawada E, Kaneda T, Sakai O, Kawashima Y, Ito K, Hirahara N, et al. Increased Apparent Diffusion Coefficient Values of Masticatory Muscles on Diffusion-Weighted Magnetic Resonance Imaging in Patients With Temporomandibular Joint Disorder and Unilateral Pain. J Oral Maxillofac Surg 2019;77:2223-9
19. Lobbezoo F, Drangsholt M, Peck C, Sato H, Kopp S, Svensson P. Topical review: new insights into the pathology and diagnosis of disorders of the temporomandibular joint. J Orofac Pain 2004;18:181-91
20. Sessle BJ. The neural basis of temporomandibular joint and masticatory muscle pain. J Orofac Pain 1999;13:238-45
21. Gauer RL, Semidey MJ. Diagnosis and treatment of temporomandibular disorders. Am Fam Physician 2015;91:378-86.
22. Kusdra PM, Stechman-Neto J, Leao BLC, Martins PFA, Lacerda ABM, Zeigelboim BS. Relationship between Otological Symptoms and TMD. Int Tinnitus J 2018;22:30-4
23. Lina-Granade G, Truy E, Ionescu E, Garnier P, Thai Van H. [Tinnitus and temporomandibular joint: State of the art]. Rev Stomatol Chir Maxillofac Chir Orale 2016;117:458-62