Review Article

What is "Temporomandibular Disorders"?

Yuh-Yuan Shiau, D.D.S, M.S., F.I.C.D.
Professor Emeritus, National Taiwan University School of Dentistry, Taipei, Taiwan
Chair Professor, China Medical University Taichong, Taiwan

Corresponding author:
Yuh-Yuan Shiau, D.D.S, M.S., F.I.C.D.
National Taiwan University Hospital, Department of Dentistry, Taipei, Taiwan
Tel: +886-2-2312-3456 ext. 66849
Fax: +886-2-2312-3456
E-mail: shiauyy@ntu.edu.tw

Abstract

Pain and dysfunction at the orofacial area, or more specifically at the masticatory system are fairly common complaints of modern humans. There are many names applied for this problem, but the term "temporomandibular disorders (TMD)" is most often used. Based on information of recent publications related to the nomenclature, symptomatology, etiology, classification and diagnosis of TMD, the author tended to provide readers, especially dental health providers, a reference for better understanding of patients with orofacial pain complaints, and then more reasonable diagnosis and treatment.

Keywords: TMD, nomenclature, etiology, symptomatology, diagnosis

The nomenclature of temporomandibular disorders

"Temporomandibular disorders(TMDs)" or "temporomandibular disorder (TMD)" are terms used for a disease involving two specific parts of the anatomy, namely, the temporal and mandibular portions of the head. The abbreviation of this disease is more often TMD than TMDs in the literature. Therefore, in this article, TMD is used to represent either TM disorders or TM disorder. The word "joint" is not included in this term because it refers not limited to the temporomandibular joint (TMJ). The term was first seen in the 1960s, and replaced the term "Costen's syndrome," which was coined by Dr. J.B. Costen, who described a so-called "syndrome" related to a number of problems involving the ear and TMJ area, including hearing impairment, tinnitus, headache, and pain at or near the TMJ. Many other names for this type of disease were proposed subsequent to Costen's coinage based on the understanding of the anatomic parts, as well as the pain and/or functional disturbances involved. Among these other names, the term "temporomandibular arthrosis"[2] referred to TMJ disturbances without evident pain with inflammation. "TMJ pain-dysfunction syndrome," a term described by Schwartz[3], included of the TMJ area with pain and functional disorders. Schwartz also used the term "disorders of the temporomandibular joint," which indicated his emphasis on the TM joint itself, although he did not exclude muscle pain from his defini-

tion. Meanwhile, "myofascial pain-dysfunction syndrome," a name suggested by D. Laskin[4], focused more on the muscles of the head, face, and neck. However, Laskin's definition of myofascial pain does not meet the definition of myofascial pain generally used in the physical therapy field of general medicine. Moreover, the implied definition of "syndrome" in his designation is also different from the generally accepted definition of "syndrome," which refers to a series of symptoms and signs caused by a single disease. In fact, TMD is now generally believed not to be caused by a single factor and is thus regarded as a multifactorial disease. In 1958, Shore[5] used the term "temporomandibular joint dysfunction" to refer to disorders of the TM system, and while he was primarily concerned with the joint itself, he noted that these disorders were often accompanied by complaints of muscle pain and dysfunction. In 1995, Ramfjord and Ash used the name "temporomandibular joint and/or muscle disorders"[6] to describe problems at or near the TMJ while specifically pointing out that these disorders are not exclusively localized at the TMJ. Their nomenclature is no longer used now, but its definition is similar to that of the presently accepted term "temporomandibular disorders", or TMD.

The term "temporomandibular disorders" was first used by W. Bell in 1982[7]. This term covered pain and dysfunction in both the muscles and joints of the temporal and mandibular areas of the head. Prior to Bell's definition, the American Academy of Craniomandibular Disorders (AACMD) [8], which was founded in 1975, used the term "craniomandibular disorders," which referred to disorders involving the whole head rather than the temporal area alone. Subsequently, in 1982, the aforementioned academy changed its name to "the American Academy of Orofacial Pain (AAOP)", and went on to provide "Diagnosis Guidelines for Orofacial Pain" [9] in 1993. Thereafter, the terms "orofacial pain," "CMD," and "TMD" have all frequently been used by different academies and authors to describe roughly the same problems of the head, face, and neck areas. In 1996, the US National Institutes of Health (NIH) held meetings of experts on TMD and, led by Okeson, published a book titled "Orofacial Pain, Guidelines for Assessment, Diagnosis, and Management"[10]. This book subsequently became the most important reference for clinicians and researchers when dealing with orofacial pain and TMJ problems.

The symptomatology of TMD

The complaints most commonly raised by TMD patients consist of pain in unilateral facial areas including the ear, eye, temporal area, cheek, mandibular angle, and neck. Such pain is typically exacerbated by jaw movements made when eating, speaking, yawning, or clenching. Characteristically, TMD pain is neither severe nor continuous, but because of the pain, the movement of the jaw is limited or altered. The pain is deep in nature, and again, is most often related to jaw movements. As such, a patient's willingness or ability to open the mouth may be limited because of pain in the muscles or joints. Some patients also complain of noise from the TM joint when opening or closing the jaw, with or without mouth opening limitation. Nonetheless, ankylosis of the TMJ due to bone destruction such as rheumatoid arthritis is not regarded as a typical symptom of TMD. Meanwhile, the occurrence of joint noise may be accompanied with deflection in the jaw opening and closing path. Limitation or luxation of the jaw without evident pain[9] is occasionally mentioned as a symptom of TMD in addition to joint noise. Such joint noise can be sub-divided into clicking and crepitation, depending on the characteristics of the joint disc displacement, with or without destruction of the condyles, discs, or temporal bones.

The etiology of TMD

Most clinicians and researchers agree that TMD is a multifactorial disease. Therefore, a given TMD cannot be regarded as a "syndrome" because a syndrome is defined as a series of symptoms found in many parts of the body due to one cause. TMD was once thought to be related in a broad sense to rheumatic diseases[11], especially in Europe. For those who were more concerned with muscle problems related to muscle spasm, pain, and tenderness to systemic fibromyalgia or myofascial pain in the head and neck muscles[12-14]. In 1934, Costen related ear pain, tinnitus, dizziness, headache, and hearing impairment to the compression of the auriculotemporal nerve by TMJ posterior displacement resulting from the loss of posterior teeth[1]. In 1948, however, H. Sicher was unable to find evidence of auriculotemporal nerve compression due to condylar posterior displacement in autopsy cases and questioned Costen's mechanical compression hypothesis. Nevertheless, posterior compression was still thought to be related to clicking of the joint and muscle pain without concern-

ing compression of the auriculotemporal nerve.

Masticatory muscle pain was regarded to occur as a consequence of muscle fatigue and muscle spasm. Such fatigue is caused by excessive muscle activity due to bruxism and clenching, which are non-functional jaw movements that can occur for either dental or non-dental reasons.[16]

Occlusal factors such as centric interferences were first related to bruxism and masticatory muscle pain by S. Ramfjord in 1960. He reported on occlusal interferences and muscle pain in bruxers and found that through the adjustment of such interferences, pain and bruxism could be reduced[16]. His report suggested that occlusal interference in the centric and eccentric jaw positions is the primary cause of muscle pain and joint displacement. However, later reports questioned the relationship between dental occlusal interferences and bruxism and TMD. Clinical reports regarding new crown insertions for bruxers found that they were subjected to no more grinding at night in the first 2 to 4 nights[17]. In another study, the positions of the teeth and interocclusal relationship were changed suddenly and vigorously by orthodontic measures, yet bruxers engaged in less bruxing during the first few weeks after such changes[18]. Those findings questioned the importance of occlusal factors in causing bruxism. However, acute occlusal interferences such as those caused by new restorations or orthodontic tooth movement were found to be associated with a higher possibility of masticatory muscle pain[19]. In addition to the so-called centric occlusal interference, balancing side premature contact is often mentioned as an important factor related to the occurrence of TMD[20-22]. Working side interferences or premature contacts caused by ill-fitting restorations may alter the proper jaw movement, but such alterations may often be adapted to if the patients are not bruxers or suffering from emotional stress[23,24].

It is interesting to note that in one epidemiological survey, more than 40% (specifically, 40 to 70%) of a population reported having 1 or more signs of TMD, yet, much less frequent (5-10 %) in population asked for medical or dental treatment[25]. Moreover, most of the members of the population with positive findings were aged between 20 and 50 years old. After 50 years of age, the incidence of TMD symptoms and signs has been reported to decrease with age, and the existing symptoms often becoming less evident[25,26]. These findings are seemingly inconsistent with the fact that the aging process is often associated with a decrease in tooth number and changes in occlusal form. Therefore, occlusal factors and TMD cannot logically be correlated.

Recent reports on facial muscle pain have often mentioned that individuals who report such pain often have mental, emotional, or personality-related problems. However, seldom have any reports directly pointed out the occurrence of orofacial pain caused solely by mental problems – that is, in the absence of any concomitant occlusal factors. "Stressors," i.e., the environmental factors or experiences that result in an individual feeling a sense of pressure, tend to be relieved via either "internal release" or "external release"[27]. Internal release may lead to psychophysiological disorders, such as peristalsis-related problems in the intestines, high blood pressure, asthma, cardiac arrhythmia, or hypertonicity of the craniofacial muscles[28]. "Stress" and "anxiety" are purely psychological phenomena, and yet they demonstrate physiological effects on many parts of the body. If such effects impact the head and neck muscles only, occlusal factors may be related as a "confounding factor," a "triggering factor," or a "perpetuating factor," in spite of not being a "predisposing factor."[29]Therefore, the etiology of a given TMD may be psychological, but its treatment has to be dental occlusion-related; thus, dentists are unavoidably responsible for such treatment.

Recent advances in joint biomechanics, neuromuscular physiology, autoimmune disorders, musculoskeletal disorders, and pain mechanism studies have changed some of our understandings regarding TMD etiology. For example, genetic factors affecting chronic TMD patients may have effects on their reactions to and processing of pain[31,32], and gender differences, such as estrogen-related factors, may be related to the difference in TMD incidence, among other findings[32-34]. Such connections are gene-related, and cannot be explained by occlusal or local dental factors.

In cases of so-called internal derangement of the TMJ, joint noise during jaw movements (with or without pain) is the main complaint. This type of TMJ disorders is now emphasized as an expression of collagen diseases, which in turn are gene-related. Hypermobile joints in some children or teenagers have been found more often in patients with Marfan syndrome, Ehlers Danlos syndrome, and

Down syndrome[35]. Englebert et al. compared children with generalized joint hypermobility (as indicated by Beighton scores) and muscle pain with muscle pain-free children, and found higher skin extensibility, lower bone density, lower systolic and diastolic blood pressure, and higher levels of urinary collagen degradation products (hydroxyproline) in the muscle pain group[36]. This finding emphasized that TMD is a gene-related collagen disease demonstrated in both the joints and muscles of the masticatory system.

The classification of TMD

TMD is classified as a subtype of "Secondary Headache Disorders" in the International Headache Society (IHS) classification definition[37]. The AAOP, meanwhile divides TMD into "articular disorders" and "masticatory muscle disorders"[38] (Table 1). Therefore, any diagnosis of TMD should first determine whether the given TMD involves joint problems or muscle problems. According to Table 1, clinicians can easily classify a patient as having a joint-type TMD or a muscle-type TMD just based on the patient's history and a physical examination. It should be noted that joint problems can indicate muscle disorders as well,

Table 1. Temporomandibular Disorders: (adapted from the guidelines of the American Academy of Orofacial Pain) (de Leeuw, 2008)

I.	Articular disorders
1.	Congenital or developmental
	First and second branchial arch disorders: hemifacial microsomia, Treacher Collins syndrome, bilateral facial microsomia
	Condylar hyperplasia
	Idiopathic condylar resorption (condylysis)
2.	Disc-derangement disorders
	Displacement with reduction
	Displacement without reduction (closed lock)
	Perforation
3.	Degenerative joint disorders
	Inflammatory: capsulitis, synovitis, polyarthritides (rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, Reiter's syndrome, gout)
	Non-inflammatory: osteoarthritis
4.	Trauma
	Contusion
	Intracapsular hemorrahage
	Fracture
5.	TMJ hypermobility
	Joint laxity
	Subluxation
	Dislocation
6.	TMJ hypomobility
	Trismus
	Postradiation therapy fibrosis
	Ankylosis: true ankylosis (bony or fibro-osseous), pseudoankylosis
7.	Infection
8.	Neoplasia
II.	Masticatory muscle disorders
1.	Myofascial pain disorder
2.	Local myalgia
3.	Myositis
4.	Myospasm
5.	Myofibrotic contracture
6.	Neoplasia

Table 2. Taxonomic classification for temporomandibular disorders (adapted from Schiffman et al., 2014[39])

I. Temporomandibular joint disorders		
1. Joint pain		
A. Arthralgia		B. Arthritis
2. Joint disorders		
A. Disc disorders 1). Disc displacement with reduction 2). Disc displacement with reduction with intermittent locking 3). Disc displacement without reduction with limited opening 4). Disc displacement without reduction without limited opening B. Hypomobility disorders other than disc disorders 1). Adhesions/adherence 2). Ankylosis a. Fibrous b. Osseous C. Hypermobility disorders 1). VDislocations a. Subluxation b. Luxation		
3. Joint diseases		
A. Degenerative joint disease 1. Osteoarthrosis 2. Osteoarthitis B. Systemic arthrides C. Condylysis/ idiopathic condylar resorption		D. Osteochodritis dissecans E. Osteonecrosis F. Neoplasm G. Synovial chondromatosis
4. Fractures		
5. Congenital/ developmental disorders		
A. Aplasia	B. Hypoplasia	C. Hyperplasia
II. Masticatory muscle disorders		
1. Muscle pain		
A. Myalgia 1). Local myalgia 2). Myofascial pain 3). Myofascial pain with referral		B. Tendonitis C. Myositis D. Spasm
2. Contracture		
3. Hypertrophy		
4. Neoplasm		
5. Movement disorders		
A. Orofacial dyskinesia		B. Oromandibular dystonia
6. Masticatory muscle pain attributed to systemic/ central pain disorders		
A. Fibromyalgia/ widespread pain		
III. Headache		
1. Headache attributed to TMD		
IV. Associated structures		
1. Coronid hyperplasia		

such as TMJ hypermobility with jaw opening muscle pain, or myofascial pain with jaw motion limitation or condylar compression. In 2014, Schiffman et al. proposed a "Taxonomic Classification for Temporomandibular Disorders" that clearly divided TMD into the following types: I. Temporomandibular joint disorders, II. Masticatory Muscle Disorders, III. Headache (headache attributed to TMD), and IV. Associated structures (coronoid hyperplasia) (Table 2). Again, this article also emphasized that when dealing with so-called TWD patients, the separation of joint problems from muscle problems should be done before any treatment is given.

Additional diagnostic tools

The identification of a joint origin or muscle origin of a given TMD should first be based on careful examination and history taking. Furthermore, image examinations, including examinations of transcranial X-ray, panoramic X-ray, computerized tomography (CT) and magnetic resonance imaging (MRI) images, may help in the differential diagnosis of TMD. MRI is now recognized as the best diagnostic tool for identifying condyle or disc displacement, joint fluid accumulation, and non-osseous ankylosis among other problems. An arthroscopic TMJ examination is a minimally invasive examination procedure, and through a small window, a clinician can see the internal structures of the TMJ more directly and accurately[40]. The power of diagnosis in terms of disc displacement, deformation, adhesion, and condylar surface destruction is high. Moreover, treatments of such problems can also be done with the arthroscope. However, for the purpose of making a diagnosis, arthroscopic examinations have become less important than MRI, mostly because the former is somewhat invasive and carries the possibility of injury[41,42]. An arthrographic technique can be applied to the TMJ with a contrast medium, and this is a good way to demonstrate the disc position and any disc perforation. However, because it is highly technique-dependent and could cause radiation exposure, this technique is no longer popular and has generally been replaced by MRI unless surgical treatment of the TMJ will follow.

The differential diagnosis of TMD for dental healthcare personnel

Except TMJ noise, dentists have to make differential diagnosis between dental pain and orofacial pain other than dental origin. Odontogenic pain includes dental caries, periodontal diseases, pulpitis, osteomyelitis, etc., and non-odontogenic pain includes TMD, soft tissue and bone anomalies, inflammation, and primary and secondary new growths occurring in the head, face, and neck areas. Patients having jaw bone tumors, intracranial tumors, brain base tumors, etc., often exhibit orofacial pain similar to TMD pain. Some masticatory muscle pain with trigger points may also be caused by teeth and result in dental pain without evident dental problems. In general, this type of dental pain is often intermittent in nature[43]. In addition, patients with primary or secondary headache, trigeminal neuralgia, and problems of other body parts like cardiac diseases, viral infections, autonomic nerve disorders, diabetes, and temporal area arteritis, among others, often complain of acute or chronic pain in the orofacial area and are misdiagnosed with a TMD as a result. Patients with fibromyalgia, for example, when occurring in the orofacial area, may exhibit allodynia, muscle pain, and reduced pain-inhibiting effects of heterotopic noxious stimulations[43]. Fibromyalgia patients may also have altered neuromuscular control in the masticatory muscles, as well as complaints of jaw movement limitations or alterations[44,45]. As such, it is not easy to distinguish TMD from masticatory fibromyalgia, although the prevalence of fibromyalgia increases with age (the highest incidences occurring in people aged 60-79 years old)[46], while that of TMD decreases after the age of around 50 years. However, joint noise, or internal derangement of the TMJ, is not likely related to fibromyalgia[47] and should be identified more easily and early.

For dental health providers who also take care of TMD patients often confront dental pain, or orofacial pain combined dental pain earlier than other heath providers. Therefore, careful history taking and physical examination are very important before making a diagnosis of TMD and providing treatments, because in some cases, orofacial pain caused by systemic problems is more life-threatening and urgent than TMD. Such treatment for TMD based on a misdiagnosis may delay the necessary treatment of those patients.

References

1. Costen JB. A syndrome of ear and sinus symptoms dependent upon disturbed function of the temporomandibular joint. Ann Otol Rhinol Laryngol 1934; 43: 1-15.

2. Foged T. Temporomandibular arthrosis. Lancet 1949; 257: 1209-11.
3. Schwartz L. Disorders of the temporomandibular joint. WB Saunders, Philadelphia, London, 1960, pp1-471.
4. Laskin DM. Etiology of the pain-dysfunction syndrome. J Am Dent Assoc 1969; 79: 147-53.
5. Shore, NA. Examination for temporomandibular joint dysfunction. NY State Dent J 1958; 24: 397.
6. Ash MM, Ramfjord SP. Occlusion, 4th ed WB Saunders, Philadelphia, 1995, pp 129-30.
7. Bell WE. Temporomandibular disorders, 3rd ed Year Book Medical Publ, Chicago, 1990, pp 60-1.
8. Gelb H. Clinical management of head, neck and TMJ pain and dysfunction. 2nd ed. WB Saunders, Co. 1985; Chap 3, pp 71-114.
9. McNeill C, Danzig D, Farrar W, Gelb H, Lerman MD, Moffett BC, et al. Craniomandibular (TMJ) disorders-state of the art. J Prosthet Dent 1980; 44: 434-7.
10. Okeson J. Orofacial pain: guidelines for classification, assessment, and management. 3rd ed. Quintessence Publ, Chicago, 1996; pp 119-20.
11. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. Report of the multicenter criteria committee. Arthritis Rheum 1990; 33: 160-72.
12. Travell JG, Simons DG. Myofascial pain and dysfunction: The trigger point manual, Vol 2, Williams & Wilkins, Baltimore, 1992.
13. Mense S. Nociception from skeletal muscle in relation to clinical muscle pain. Pain 1993; 54: 241-89.
14. Mense S, Gerwin RD (ed). Fibromyalgia syndrome: clinical aspect and management in Muscle pain: diagnosis and treatment, Srpinger, Heidelberg, 2010; pp,115-7.
15. Sicher H. Temporomandibular articulation in mandibular overclosure. J Am Dent Assoc 1948; 36: 131-9.
16. Ramfjord SP. Bruxism: A clinical and electromyographic study. J Am Dent Assoc 1961; 62: 21-43.
17. Rugh JD, Barghi N, Drago CJ. Experimental occlusal discrepencies and nocturnal bruxism. J Prosthet Dent 1984; 51: 548-53.
18. Ronnerman A. Temporomandibular disorders in the active phase of orthodontic treatment. J Oral Rebail 1995; 22: 613-8.
19. Ramfjord SP, Ash MM. Occlusion. WB Saunders, Philadelphia, 1971; pp 1-427.
20. Ingervall B, Carlsson GE. Masticatory muscle activity before and after elimination of balancing side interference. J Oral Rehabil 1982; 9: 183-92.
21. Shiau YY, Chang C. An epidemiological study of temporomandibular disorders in university students of Taiwan. Community Dent Oral Epidemiol 1992; 20: 43-7.
22. Minagi S, Watanabe H, Sato T, Ishii A. Effect of balancing-side occlusion on the ipsilateral TMJ dynamics under clenching. J Oral Rehabil 1997; 24: 57-62.
23. Shiau YY, Syu JZ. Effect of working side interferences on mandibular movement in bruxers and non-bruxers. J Oral Rehabil 1995; 22: 145-51.
24. Hannam AG, Wood WW, De Cou RE, Scott JD. The effects of working-side occlusal interferences on muscle activity and associated jaw movement in man. Arch Oral Biol 1981; 26: 387-92.
25. Solberg WK. Epidemiology, incidence and prevalence of temporomandibular disorders: a review. In: The President's Conference on the examination, diagnosis and management of temporomandibular disorders. Am Dent Assoc, Chicago, 1983: 30-9.
26. Levitt SR, McKinney MW. Validating the TMJ scale in a national sample of 10,000 patients: demographic and epidemiologic characteristics. J Orofac Pain 1994; 8: 25-35.
27. Carlson CR, Okeson JP, Falace DA, Nitz AL, et al. Comparison of psychologic and physiologic functioning between patients with masticatory muscle pain and matched controls. J Orofac Pain 1993; 7: 15-22.
28. Okeson JP. Management of temporomandibular disorders and occlusion, 5th ed. Mosby, St Louis, 2003; pp 170-1.
29. Scrivani SJ, Keith DA, Kaban LB. Temporomandibular disorders. New Engl J Med 2008; 359: 2693-705.
30. Nackley AG, Tan KS, Fecho K, Flood P, Diatchenko L, Maixner M. Cathechol-O-methyltransferase inhibition increases pain sensitivity through activation of both beta2- and beta3-adrenergic receptors. Pain 2007; 128: 199-208.
31. Diatchenko L, Anderson AD, Slade GD, Fillingim RB, Shabalina SA, Higgins TJ, et al. Three major haplotypes of the beta-2 adrenrgic receptors define psychological profile, blood pressure, and the risk for development of a common musculoskeletal pain disorders. Am J Med Genet B Neuropsychiatr Genet 2006; 141B: 449-62.
32. Bhalang K, Sigurdsson A, Slade GD, Maixner W. Associations among four modalities of experimental pain in women. J Pain 2005; 6: 604-11.
33. Bragdon EE, Light KC, Costello NL, Sigurdsson A, Bunting S, Bhalang K, et al. Group differences in pain modulation: pain-free women compared to pain-free men and to women with TMD. Pain 2002; 96: 227-37.
34. de Leeuw R, Albuquerque RJ, Andersen AH, Carlson CR. Influence of estrogen on brain activation during stimulation with painful heat. J Maxillofac Surg 2006; 64: 158-66.
35. Murray KJ. Hypermobility disorders in children and adolescents. Best Pract Res Clin Rheumatol 2006; 20: 329-51.
36. Engelbert RH, Bank RA, Sakkers RJ, Helders PJ, Beemer FA, Uiterwaal CS. Pediatric generalized joint hypermobility with and without musculoskeletal complaints: a localized or systemic disorder? Pediatrics 2003; 111: 248-54.
37. Okeson J. The international classification for headache disorders. 2nd ed. Celphalalgia 2004; 24: suppl 1:24-160.
38. de Leeuw R. Orofacial pain: guidelines for assessment, diagnosis and management. 4th ed. Quintessence Publ, Chicago, 2008.
39. 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 applica-

tions: Recommendations of the international RDC/TMD consortium network and orofacial pain special interest group. J Oral Facial Pain Headache 2014; 28: 6-27.

40. Isberg-Holm AM, Westesson PL. Movement of disc and condyle in temporomandibulr joints with clicking. An arthrographic and cineradiographic study on autopsy specimens. Acta Odontol Scand 1982; 40: 151-64.
41. Nitzan DM, Dolwick MF, Heft MW. Arthroscopic lavage and lysis of the temporomandibular joint: a change in perspective. J Oral Maxillofac Surg 1990; 48: 798-802.
42. MaCain JP, Sanders B, Koslin MG, Quinn JH, Peters PB, Indresano AT. Temporomandibular joint arthroscopy: a 6-year multicenter retrospective study of 4831 joints. J Oral Maxillofac Surg 1992; 50: 926-30.(erratum:1992; 50: 1349).
43. Maryon F. Fibrositis (fibromyalgia syndrome) and the dental clinician. Cranio 1991; 9: 63-70.
44. Gui MS, Pedroni CR, Aquino LM, Pimentel MJ, Alves MC, Rossini S, et al. Facial pain associated with fibromyalgia can be marked by abnormal neuromuscular control. A cross-sectional study. Phys Ther 2013; 93: 1092-101.
45. Woda A, L'heveder G, Ouchchane L, Bodere C. Effect of experimental stress in 2 different pain conditions affecting the facial muscles. J Pain 2013; 14: 455-66.
46. Pongratz DE, Sievers M. Fibromyalgia-symptom or diagnosis: A definition of the position. Scan J Rheumatol 2000; 113: 3-7.
47. Balasubramaniam R, Laudenbach JM, Stoopler ET. Fibromyalgia: An update for oral health care providers. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007; 104: 589-602.