Temporomandibular disorders, a review of current diagnosis and treatment

Disturbi temporomandibolari, una revisione delle attuali diagnosi e dei trattamenti

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ABSTRACT

OBJECTIVES

The term temporomandibular disorders (TMD) includes several conditions characterized by signs and symptoms involving the temporomandibular joint (TMJ), masticatory muscles, or both. The aim of this narrative review is to discuss the current evidence for the diagnosis and treatment of this group of disorders.

MATERIALS AND METHODS

Computer retrieval was performed with Medline, PubMed, Embase, Scopus. Terms used for the search were "Temporomandibular Joint Disorders" [Mesh]) AND "Facial Pain" [Mesh], restricted to english language, reviews and clinical trials.

RESULTS AND DISCUSSION

Out of 328 papers retrieved, 47 were selected and categorized according to the following classes: etiology, controversial causes, clinical findings, differential diagnosis, treatment. Three clinical entities resulted from the search and were discussed: articular disorders, muscular disorders, and chronic pain.

CONCLUSIONS

The available evidence suggests that an accurate diagnosis based on history and clinical evaluation is the gold standard in managing TMD. The treatment should be conservative, reversible and non-invasive, whenever possible.

RIASSUNTO

OBIETTIVI

Il termine disturbi temporomandibolari (DTM) include varie condizioni caratterizzate da segni e sintomi che coinvolgono l'articolazione temporomandibolare (ATM), I muscoli masticatori o entrambi. Lo scopo della presente revisione della letteratura è discutere le attuali evidenze riguardanti la diagnosi e il trattamento di questo gruppo di disturbi.

MATERIALI E METODI

È stata eseguita una ricerca sui database elettronici Medline, PubMed, Embase, Scopus. I termini utilizzati per la ricerca sono stati: "Temporomandibular Joint Disorders" [Mesh] e "Facial Pain" [Mesh]. La ricerca è stata limitata a: lingua inglese, revisioni e studi clinici.

RISULTATI E DISCUSSIONE

Di 328 articoli recuperati, 47 sono stati selezionati e suddivisi in categorie secondo le seguenti classi: eziologia, cause controverse, dati clinici, diagnosi differenziale, trattamento. Tre entità cliniche sono emerse da tale ricerca e sono state discusse: disturbi articolari, disturbi muscolari e dolore cronico.

CONCLUSIONI

I dati disponibili suggeriscono che una diagnosi accurata basata su anamnesi e valutazione clinica è il gold standard nella gestione dei TMD. Il trattamento dovrebbe essere conservativo, reversibile e non invasivo, ogni qualvolta possibile.

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KEY WORDS
- *Temporomandibular disorders*
- *Orofacial pain*
- *Musculoskeletal disorders*
- *Bruxism*
- *Temporomandibular joint*

PAROLE CHIAVE
- Disturbi temporomandibolari
- Dolore orofacciale
- Disturbi muscoloscheletrici
- Bruxismo
- Articolazione temporomandibolare

1. INTRODUCTION

Temporomandibular disorders (TMD) (M26-60 to M26-63 according to ICD) are the second most common musculoskeletal conditions (after chronic low back pain) resulting in pain and disability.

Classification

TMD are differentially diagnosed among other orofacial pains (OFP), according to one out of four current classification systems for OFP[1,2]:

1. International Association for the Study of Pain Classification (IASP 1994);
2. International Classification of Headache Disorders Classification (ICHD-3 2013);
3. American Academy of Orofacial Pain Classification (AAOP 2013);
4. Diagnostic Criteria for Temporomandibular Disorders Classification (DC/TMD, 2014).

When not otherwise specified, this article will refer to the AAOP classification system.

General considerations

Temporomandibular disorders (TMDs) are a set of musculoskeletal disorders affecting the temporomandibular joint (TMJ), the masticatory muscles, or both. TMDs comprise many diverse diagnoses with similar signs and symptoms affecting the masticatory system, which can be acute, recurrent, or chronic. TMDs are rarely life threatening, but can impact heavily on an individual's quality of life. Studies show that about 3-7% of the population need treatment.

TMDs occur disproportionately in women of childbearing age in a *ratio* of 4:1 to 6:1, and the role of estrogens seems to show an association. The prevalence drops off dramatically for both men and women after age 55[3-5].

2. MATERIALS AND METHODS

Electronic databases search was performed with Medline, PubMed, Embase, Scopus. Terms used for the search were "Temporomandibular Joint Disorders" [Mesh]) AND "Facial Pain" [Mesh], restricted to english language, reviews and clinical trials. Papers were retrieved in full text, evaluated by the two authors independently, and selected after discussion. Inclusion criteria were: evidence-based methodology of assessment and evaluation of findings. Papers claiming the efficacy of devices/diagnostic tools/therapeutical methods, carrying no evidence based research were excluded.

3. RESULTS AND DISCUSSION

Out of 328 papers retrieved, 47 were selected and categorized according to the following classes: etiology, controversial causes, clinical findings, differential diagnosis, treatment. Three clinical entities resulted from the search and were discussed: articular disorders, muscular disorders, and chronic pain.

Etiology

The cause of TMD is variable and uncertain, and it is thought to be multifactorial in most cases. Genetic factors have recently been implicated[6,7] . Most factors are not proven causal factors, but they are associated with TMDs. Predisposing factors increase the risk of TMDs (structural, metabolic, genetic and psychological conditions). Initiating (precipitating) factors are trauma, both direct (e.g., blows to the jaw), indirect (e.g., whiplash injuries) or repetitive adverse loading like microtrauma, and sometimes stress. Microtrauma is caused by clenching and grinding of the teeth. Stress can also be a predisposing factor owing to the disruption of restorative sleep and the increase of nocturnal bruxism.

Perpetuating (aggravating) factors that sustain a TMD are stress again, poor coping skills, persistent harmful habits such as clenching and grinding, and poor posture. Nonrestorative sleep also may be a major factor in the perpetuation of chronic jaw pain[8-10].

Controversial causes

Bruxism

Bruxism, or grinding the teeth during sleep, has been thought to be a predisposing, precipitating, and perpetuating factor of TMDs. Bruxism can involve excessive activation of the masticatory muscles and excessive loading of TMJs,

which can be a factor in the recovery of some patients, whereas in others bruxism does not seem to be a factor. In studies, bruxism has not been clearly demonstrated as a cause of TMD. While many individuals who severely grind their teeth do not have any signs or symptoms of TMD, some others may show signs of myofascial pain, arthralgia and joint pathology as disc displacement and joint noises. Although the evidence at present is inconclusive and does not provide information according to the type of bruxism (bruxism sleep and wakefulness), it is possible to suggest that bruxism would be associated with TMD[11-13].

Dental and occlusal origins are not generally accepted, and the scientific evidence does not support their causal relationship. Experimental occlusal interferences have been placed with no evidence of TMD symptoms. There is no evidence of a higher incidence of TMD with any type of malocclusion, and significant proportions of the population have occlusal discrepancies without any TMD pain[14,15].

Whiplash

Whiplash has been thought to be a precipitating factor in the development of TMD. There is very little evidence that a noncontact injury can cause damage to the TMJ. However, many patients claim muscle and joint pain after a whiplash injury. The pain may be referred from the strained sternocleidomastoid muscle, which often refers pain to the ear, or it may be due to injuries to other cervical muscles and ligaments[16].

Disc displacement

Disc displacement has been considered a pathologic condition, but many studies have shown that from 30% to 50% of populations have reducing discs. Most of these individuals have no history of TMJ pain or dysfunction. Disc displacement may be a normal biological variation. Clicking joints are not necessarily painful or pathologic. Studies reporting on the long-term follow-up of patients with disc displacement show the majority are asymptomatic 30 years later[17].

Clinical findings

Symptoms and signs

The most common TMD complaints are jaw, face, and head pain of moderate intensity. Limited opening, catching or sticking, and locking of the mandible are also common functional complaints. Patients often have complaints of joint noises, such as clicking, popping, and grating when the mandible is opened or closed. Patients also have perceived complaints of global headache and neck and shoulder pain that are not related to jaw function. Some patients present with unexplained complaints of tinnitus, ear fullness, hearing loss, and dizziness. Complaints of abnormal tooth wear, tooth sensitivity, and teeth not meeting correctly are often expressed[18].

Imaging studies

Magnetic resonance imaging (MRI) reveals hard bony tissue as well as soft tissue abnormalities. Computed tomography (CT) scans are useful in showing degenerative changes of the hard tissues. Imaging should be reserved for patients whose abnormal pain, dysfunction, or both does not respond to conservative short-term treatments such as non-steroidal anti-inflammatory drugs (NSAIDs) and physical therapy. Imaging is also warranted in patients who have a sudden change in the bite or asymmetry of the mandible[19,20].

THE MOST COMMON **TMD** COMPLAINTS ARE **JAW**, **FACE**, AND **HEAD PAIN** OF MODERATE INTENSITY. LIMITED OPENING, CATCHING OR STICKING, AND LOCKING OF THE MANDIBLE ARE **ALSO** COMMON **FUNCTIONAL COMPLAINTS**

Differential diagnosis

Temporomandibular disorders are divided into articular disorders and muscle disorders. The diagnosis is largely based on the specific system(s) that is affected. However, many patients have both muscle and articular disorders[2].

Treatment

The management of TMDs is based on the elimination of pain and the restoration of function and normal activities of daily living. Each specific diagnosis has its own set of management goals based on addressing the problems that affect that pa-

tient. Most management plans use conservative, non-invasive treatments; in less than 5% of cases, surgery is used[21,22].

The key elements of any conservative management plan are self-care, medication, and physical therapy. Acupuncture is often helpful, as are biofeedback and orthotic splint therapy[23-26].

Treatment indications can be found in **table I**[21-39].

Self-care

Patients with TMD can be more successfully treated by healthcare practitioners who educate patients about their disorder and involve them in their own treatment. Self-care is an essential part of patient treatment. It should be designed to meet each patient's treatment objectives. Self-care should be thoroughly explained to patients in language meaningful to them, and it should be reinforced at each visit. This self-care results in better patient compliance and understanding and in better outcomes[16]. The following list contains 20 self-care tips that have been effective in helping patients manage their TMD[24-27]:

- the rest of the muscles and joints allow healing;
- soft food enables muscles and joints to heal;
- not chewing gum lessens muscle fatigue and joint pain;
- relax your facial muscles: "Lips relaxed, teeth apart";
- no clenching; it irritates joints and muscles;
- yawning against pressure prevents locking open and jaw pain;
- moist heat for 20 minutes promotes healing and relaxation;
- ice is for severe pain and new injuries (less than 72 hours);
- heat and ice - 5 seconds of heat, 5 seconds of ice - for pain relief;
- good posture; avoid head-forward position;
- sleeping position: side lying, with good pillow support;
- jaw exercise: open and close against finger pressure;
- exercise: 20-30 minutes at least 3 times a week;
- acupressure massage between thumb and forefinger;
- over-the-counter medications: ibuprofen or aspirin;
- yoga and meditation for stress reduction;
- massage promotes healing and relaxation;
- an athletic mouthguard can give temporary relief;
- avoid long dental appointments;
- do not cradle the telephone; it aggravates the neck and jaw.

Medication

The most common medications for TMD are:

- NSAIDs;
- muscle relaxants such as cyclobenzaprine;
- low doses (10-50 mg) of tricyclic antidepressants such as amitriptyline, desipramine, or nortriptyline.

Table I Treatment indications for articular disorders

Articular disorder	Self-care	NSAIDs	Physical therapy	Splint	Acupuncture	Arthrocentesis	Surgery
TMJ synovitis	X	X	X	X	X	X	
Disc displacement with reduction	X	X	X	X	X	X	
Acute disc without reduction	X	X	X	X	X	X	
Chronic disc displacement without reduction	X	X	X	X	X	X	
Osteoarthritis	X	X	X	X	X	X	
Polyarthritis	X	X	X	X	X	X	
Condylar dislocation	X	X	X				
Fibrous ankylosis			X			X	X
Bony ankylosis			X			X	X
Condylar fracture			X				X
Neoplasia			X				X

In patients with TMJ synovitis who have a poor response to NSAIDs, a course of an oral steroid such as methylprednisolone for 6 days can be effective.

When pain becomes chronic after three to six months, and is moderate to severe and does not respond to other treatments; central sensitization should be considered and drugs such as tricyclic antidepressants, and anti-seizure medications such as gabapentin can be used. Opioid analgesics should only be used as a last resort. Short-acting opioids such as hydrocodone should be avoided in favor of longer-acting codeine or oxycodone. Newer opioids such as tramadol have shown some promise[28-31].

Physical therapy

Physical therapy has been shown to be helpful for many patients with TMD pain and dysfunction[32,33]. Heat and ice have beneficial effects on reducing pain in some patients. Jaw exercises can be prescribed for increasing mobility, decreasing hypermobility, strengthening and coordinating muscles, and improving muscle endurance. Massage can be helpful because it promotes increased blood flow through the tissue in addition to inducing muscle relaxation. The evaluation of patient posture is important, and patients should be taught proper posture. A forward-head position can exacerbate neck pain and a tense jaw posture can increase jaw and muscle pain.

TENS

Transcutaneous electrical nerve stimulation (TENS) can be helpful in controlling pain. Joint manipulation can help improve joint mobility in cases of TMJ disc displacement without reduction[34].

Acupuncture

Acupuncture has been used for the treatment of TMDs, as well as for other musculoskeletal pains. The National Institutes of Health (NIH), in their consensus statement on acupuncture in 1997, stated that acupuncture shows promising results for postoperative dental pain, and in other situations (such as myofascial pain), acupuncture may be useful as an adjunct treatment or an acceptable alternative treatment. A number of studies of acupuncture and chronic pain found positive results in 41% of them and concluded that there is limited evidence that acupuncture is more effective than no treatment for chronic pain[35,36].

Injection of local anesthesia

The injection of trigger points in painful muscles with a local anesthetic has been used for over 40 years and is still a popular treatment. Studies have shown that dry needling works just as well, and the difference between dry needling and acupuncture is minimal to none[37].

Splint therapy

Splints (orthotics) are removable appliances, usually made of acrylic plastic, which fit over the teeth of either the mandible or the maxilla. Splints are the most often prescribed treatment for TMD; more than 3 million splints are made each year[38,39].

Despite the extensive use of oral splints in the treatment of TMD and bruxism, their mechanisms of action remain controversial. Oral splints should be used as an adjunct for pain management rather than a definitive treatment.

Treatment with intraoral splints has been shown to have varying levels of efficacy for the treatment of TMD and bruxism. Splints reduce the role of occlusal factors, reduce loading on the joints, and have a strong placebo effect. Splints can reduce tooth damage in patients who grind their teeth and can increase awareness of these detrimental oral habits. Not all patients get relief and some experience a worsening of symptoms with splints. There are possible complications to wearing splints, such as irreversible changes in occlusion that will necessitate either orthodontics or surgery to correct. Therefore, splints should be worn for a short to moderate time period and should be regularly monitored. Nighttime wear is typical and full-time use is contraindicated.

Arthrocentesis

Arthrocentesis is the insertion of one or more needles into the superior joint space and irrigation with saline, with or without corticosteroids. It has been reported to be effective in cases of synovitis and limited opening due to anterior displaced disc without reduction[40].

Arthroscopy

Arthroscopy is the insertion of a cannula with fiberoptics that allows visualization of the joint space. Another cannula is then inserted with microtools that allow for debridement, the removal of adhesions, and biopsies[41].

Surgery

Surgery is reserved for those few patients (less than 5%) who do not respond to conservative treatment and in whom an identifiable structural defect can be corrected by surgery. These patients should undergo comprehensive nonsurgical rehabilitation, and surgery should be considered only after all the contributing factors have been addressed and controlled. Many of the pain symptoms come from the muscular

components of TMD, so these muscle diagnoses must be addressed and controlled. Failure to address these issues will likewise result in failed surgical treatment. Pre- and postoperative physical therapy is important for the successful outcome of any surgery. The less invasive surgical techniques seem to be just as efficacious as the more invasive open joint procedures, so arthrocentesis and arthroscopy should be considered as a first step[42,43].

Articular disorders

The TMJ is a paired synovial joint that is capable of both gliding and hinge movements. It articulates the mandibular condyle and the squamous portion of the temporal bone, with the articular disc of dense fibrous connective tissue interposed between the two bones. Unlike most other synovial joints, the TMJ is lined with dense fibrous connective tissue. Treatment indications can be found in **table I**[21-42].

TMJ synovitis

This disorder is an inflammation of the synovial lining of the TMJ; it is characterized by localized pain that is increased by the functioning and loading of the joint. Sometimes patients complain about posterior teeth not meeting on the same side, presumably because of swelling in the joint.

Patients often present with a history of pain in the preauricular region, which is aggravated by chewing or other mandibular movement. Pain on palpation over the lateral pole of the condyle is evident. Pain is elicited on loading of the TMJ, or on distraction or compression. Range of motion is often limited (<35 mm). No radiographic changes are found; however, evidence of joint effusion is seen on MRI.

UNLIKE MOST OTHER SYNOVIAL JOINTS, THE **TMJ** IS LINED WITH DENSE **FIBROUS CONNECTIVE TISSUE**

Disc displacement disorders - Disc displacement with reduction

Disc displacement with reduction is characterized by a clicking jaw joint; an audible or palpable click is heard or felt on opening the mandible and in lateral movements of the mandible. This condition is most often painless and requires no treatment. Up to 50% of people have been shown to have displaced discs, and most do not have any pain or dysfunction. When pain accompanies the click, it is most often the result of inflammation in the joint owing to the condyle pressing on the retrodiscal tissues, synovitis, or capsulitis. Symptomatic clicking, in which there is pain on clicking and pain on loading, needs to be treated. MRI shows the anterior position of the disc in a closed position and in a normal position on opening. X-rays may show a decreased joint space, but this is not diagnostic of a displaced disc.

Acute disc displacement

Acute disc displacement without reduction (closed lock) is characterized by a marked limitation in opening (<35 mm). It is also distinguished by a deflection of the mandible to the affected side on opening. It occurs with a sudden onset and can be painless or painful. No clicking is felt or heard, although the patient usually has a history of clicking at one time. The disc is usually anterior to the condyle and blocks the translation of the condyle, preventing normal opening and causing the mandible to deflect to the affected side. MRI shows the disc anterior to the condyle in the closed position, and it remains anterior on opening. Radiographs can show a decreased joint space that might be an indication of a displaced disc.

Chronic disc displacement

Chronic disc displacement without reduction (closed lock) is a long-standing condition characterized by a slightly limited opening (<40 mm) that usually improves after the initial onset. The patient has no clicking, either felt or heard, although he or she usually has a history of a previously clicking joint. Pain is not usually a complaint, and patients may or may not present with it. The mandible deflects to the affected side on opening. The disc is anterior to the condyle and is either pushed further anterior on opening or is folded on itself. MRI shows the disc far anterior, often folded on itself, and pushed further forward on opening.

Osteoarthritis

Osteoarthritis is a noninflammatory arthritic condition that is characterized by deterioration and abrasion of the articular tissues. It is accompanied by remodeling of the underlying subchondral bone. Joint pain is present with function, and crepitus is often heard over the affected joint. Joint stiffness, often worse on

awakening or at the beginning of a meal, can be a problem, and the patient may have a limited range of motion. Radiographic evidence of degeneration of the condyles can be seen. Synovitis often is present and accounts for pain, when present. The long-term prognosis is good because osteoarthritis tends to be self-limiting as the joint remodels.

Polyarthritis

Systemic polyarthritis disorders can affect the TMJ as well as other joints in the body. Various systemic diseases such as rheumatoid arthritis, juvenile rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, infectious arthritis, Reiter syndrome, gout, and Lyme disease can involve the TMJ. A common finding is pain to palpation over the TMJ. Pain is usually elicited with function, and the patient may experience a limited range of motion. Crepitus can be heard over the affected joint, and degeneration of the condyles may be seen on X-rays.

Condylar dislocation

Condylar dislocation is characterized by a patient who is unable to close his or her mouth. The patient's mouth is fully open upon presentation, and he or she is usually in great distress, with pain and anxiety. This condition occurs after yawning, after eating an apple or other food that requires wide opening, or with prolonged opening, as during a dental appointment. The condyle remains positioned anterior to eminence. There can be joint pain at the time of dislocation and for up to several days afterward. There is usually a history of a self-reducing dislocation.

The condyle can be reduced by manually pushing the mandible both downward and backward into the fossa. This reduction can often be done in the office by placing gloved hands, with the thumbs outside the patient's teeth, on the lateral border of the mandible and distracting the mandible in a downward direction, placing the condyles back into the fossa. If the muscles have gone into spasm, it may be necessary to administer a muscle relaxant such as diazepam; in more severe cases, the patient may need to be placed under general anesthesia before enough muscle relaxation can take place to reduce the condyles. Postoperative pain is managed with NSAIDs, and physical therapy is indicated. Self-care can assist in preventing recurrences.

TREATMENT MODALITIES SHOULD BE **CONSERVATIVE**, **REVERSIBLE** AND **NON-INVASIVE**, WHENEVER POSSIBLE, AND THEY MUST BE TAILORED TO THE PSYCHOSOCIAL *STATUS* OF THE PATIENT

Fibrous ankylosis

Fibrous ankylosis is restricted mandibular movement with deviation to the affected side on opening. This condition results from fibrous adhesions that attach the condyle to the disc and the disc to the articular fossa. It may be caused by bleeding in the joint, but the exact mechanism is not known. A history of trauma to the TMJ usually exists. There is a marked limited opening, usually <20 mm, but the condition is not painful. The mandible deflects to the affected side on opening, and there is a marked limited lateral movement of the mandible to the contralateral side. Radiographs show an absence of condylar translation, but they do show a joint space.

Bony ankylosis

Bony ankylosis is the union of the bones of the mandibular condyle and the temporal fossa by proliferation of bone cells, which results in the complete immobility of the joint. It is usually secondary to trauma and probably due to bleeding in the joint. A history of trauma to the TMJ usually exists. There is a marked limited opening, usually <10 mm, although the condition is generally not painful. The mandible deflects to the affected side on opening, and there is a marked limited lateral movement of the mandible to the contralateral side. CT scanning or MRI shows a connection between bony articulating surfaces; X-rays show an absence of condylar translation and bone proliferation in the joint space.

Condylar fracture

Fractures can occur in any of the bony components of the TMJ; however, fracture of the mandibular condyle is the most common. It is often caused by a

direct trauma to the jaw, usually by a blow to the chin. This condition is marked by a limited opening (<25 mm), swelling over the affected joint, and pain with function. There is often bleeding in the joint, and sequelae can include adhesions, ankylosis, and joint degeneration. The mandible deflects to the affected side, and the fracture is evident on an X-ray.

Condylar fractures are managed with immobilization, a soft diet, and physical therapy to regain the range of motion. Open joint surgery is required to reduce the fracture only in rare cases[44,45].

Neoplasms

Neoplasms of the TMJ can be benign, malignant, or metastatic. One percent of malignant breast tumors metastasize to the mandible.

Benign neoplasms

Benign TMJ neoplasms include osteomas, osteoblastomas, chondromas, benign giant cell tumors, ossifying fibromas, fibrous dysplasias, myxomas, and synovial chondromatosis.

Malignant neoplasms

Malignant TMJ neoplasms are rare and include chondrosarcomas, fibrosarcomas, and synovial sarcomas.

Metastatic neoplasms

Metastatic TMJ neoplasms are more common than primary tumors; 1% of malignant neoplasms metastasize to the jaws. Squamous cell carcinomas of the maxillofacial region and nasopharyngeal tumors are the tumors that most commonly extend into the TMJ. Neoplasms from the parotid gland, such as adenocystic carcinomas and mucoepidermoid carcinomas, have been reported to involve the TMJ. These neoplasms often present with swelling and pain. Pain is elicited on palpation and with function. There can be an open bite on the affected side where the back teeth do not meet. Imaging shows a lesion.

Congenital disorders

Aplasia, hypoplasia and hyperplasia can be inherited. They are commonly associated with other congenital anomalies, such as Moebius syndrome[46,47].

Muscle disorders

The muscles of mastication are the masseter, temporalis, medial pterygoid, and lateral pterygoid muscles. In addition to neoplasms, which are rarely seen, more common muscle disorders may result in pain, redness, swelling, cramping, and contracture. Treatment indications can be found in **table II**[21-39].

Myofascial pain

Myofascial pain is characterized by a regional, dull, aching muscle pain, usually of mild to moderate intensity. The pain is aggravated by mandibular function when the muscles of mastication are involved. TMJ pain may result in painful masticatory muscles due to the reflex splinting of these muscles. Often, localized tender areas (i.e., trigger points) in the muscle or tendon exist. When the muscle is palpated, the trigger points that elicit pain often refer the pain to distant areas. This referred pain is often felt as a headache, and myofascial pain has been associated with tension-type headaches; it is also associated with ear symptoms, tinnitus, vertigo, and toothache. Patients may also present with a sensation of muscle stiffness or tightness and a sensation of their teeth not meeting correctly. Inactivating the trigger points with a local anesthetic injection, acupuncture, or a vapocoolant spray and muscle stretch often relieves the larger area of referred pain. The pathogenesis is now thought to be due to changes in the central nervous system that are responsible for hyperalgesia of the muscles.

Myositis

Myositis is characterized by moderate to severe pain, redness, and swelling associated with tissue injury. This condition

Table II Treatment indications for muscular disorders

Muscular disorder	Self-care	NSAIDs	Physical therapy	Muscle relaxant medication	Splint	Acupuncture	Surgery
Myofascial pain	X	X	X	X	X	X	
Myositis	X	X	X	X	X	X	
Myospasm	X	X	X	X	X	X	
Muscle contracture	X		X		X	X	
Neoplasia			X				X
Fibromyalgia	X		X	X		X	

can result from direct trauma or infection, often secondary to oral surgery or an intramuscular injection. Pain is usually continuous in a localized muscle area following injury or infection, and diffuse tenderness is present over the entire muscle. Pain increases with movement, and a moderate to severe limitation of opening due to pain and swelling is common. A limited range of mandibular motion is often present. Elevated serum levels indicative of inflammation, infection, or both may be present.

Myospasm (trismus)

Myospasm, or muscle cramp, is characterized by a continuous involuntary muscle contraction with severe pain. The patient experiences an acute onset of pain at rest as well as with function. Myospasm is not a common finding in TMDs; when it does occur, it usually resolves within hours.

Contracture

Muscle contracture is the painless shortening of a muscle, usually secondary to a period of limited range of motion. It is characterized by an unyielding firmness on passive stretch and is usually associated with minimal or no pain unless the muscle is forced to lengthen. Muscle contracture can occur after wiring the jaws following fracture, after jaw surgery, after a prolonged infection, or with an anterior displaced disc without reduction that grossly limits the range of motion for a long period. The muscle undergoes fibrotic changes and becomes hard.

Fibromyalgia

Fibromyalgia is a generalized whole body muscle pain mostly affecting women between 25 and 50 years of age. It is often accompanied by fatigue, irritable bowel syndrome, muscle stiffness, and sleeping difficulties. The diagnosis is based on the presence of pain to palpation in 11 out of 18 predefined sites and pain in 3 of the 4 quadrants of the body[10]. Because problems with the masticatory and cervical muscles are typically painful, fibromyalgia is often misdiagnosed as myofascial pain. Studies have shown that up to 20% of patients with TMD are really fibromyalgia patients.

Neoplasms of the masticatory muscles

Neoplasms of the masticatory muscles are very rare. They can be malignant or benign, are associated with swelling, and may or may not present with pain, although pain usually accompanies swelling. There is a positive finding of tumor with imaging, and both imaging and biopsy help confirm the diagnosis.

Chronic pain

Chronic pain is pain lasting more than three months and that becomes part of the patient's daily routine and is resistant to medical treatment because of neuroplastic changes throughout the CNS. What seems to be true in patients with chronic pain is persistent central sensitization and an increased possibility of comorbid conditions. Psychosocial factors also play a significant role in chronic pain **(fig. 1)**.

The etiology is complex and still not clearly understood, but several biological and psychosocial risk factors for TMD have been identified. Several studies indicate that patients with TMD improve with a combination of non-invasive therapies, including behavior therapy, pharmacotherapy, physical therapy, and occlusal appliances.

TMD's that are chronic may be related to a group of other disorders, such as fibromyalgia, irritable bowel syndrome, and burning mouth syndrome. Some authors have called these conditions Central Sensitization Syndrome[28-31].

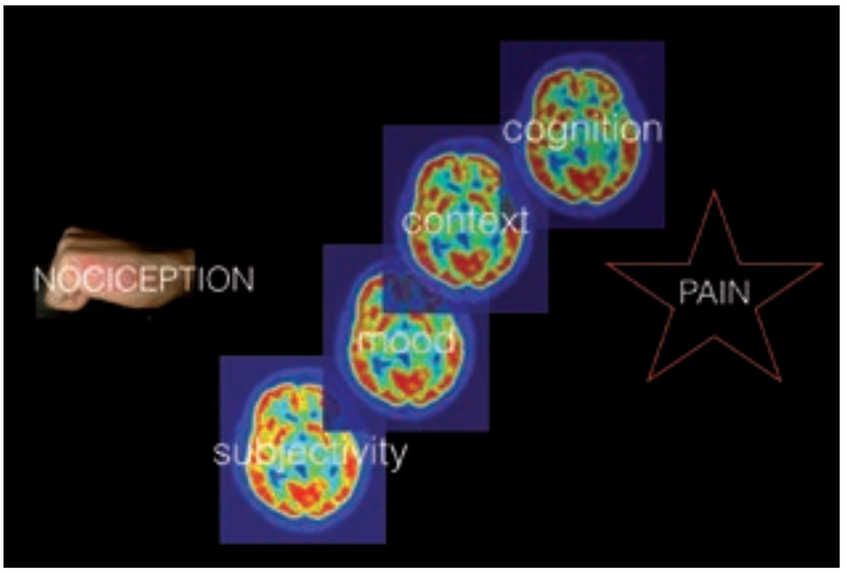

Fig. 1 Multidimensional aspects of pain (after Mackey, 2016). From nociception to pain: cognition (attention, distraction, hypervigilance, catastrophizing, re-appraisal, hypnotic suggestion); context (beliefs, expectations, placebo, motivation); mood (depression, catastrophizing, emotional context); subjectivity (genetics, gender, history of injury, atrophy)

4. CONCLUSIONS

This article reviews the controversial topic of temporomandibular disorders, a field where many ancient beliefs by dental profession were not confirmed when challenged with the current evidence-based medical and dental literature. Pain research and re-evaluation of natural history of this group of musculoskeletal disorders has led to an evolution both of diagnostic and therapeutical approach.

History and clinical findings, confirmed with appropriate imaging when indicated, appear to be the gold standard for an accurate diagnosis, and it is proven superior to any instrumental device.

Treatment modalities, according to a medical model, or perspective, should be conservative, reversible and non-invasive, whenever possible, and they must be tailored to the psychosocial status of the patient. Many of these treatments are available and can be administered in a multidisciplinary setting. Dental professionals must be aware of the risks of chronicity that each pain condition carries with, and should focus pain treatment as the main goal of their interventions. ■

CONFLICT OF INTEREST

The authors confirm that are no known conflicts of interest associated with this publication.

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Long Abstract

INTRODUCTION

Temporomandibular Disorders (TMD) are the second most common musculoskeletal conditions resulting in pain and disability. TMDs are a set of musculoskeletal disorders affecting the temporomandibular joint (TMJ), the masticatory muscles, or both. TMDs comprise many conditions with similar signs and symptoms affecting the masticatory system, which can be acute, recurrent, or chronic. TMDs are rarely life threatening, however, can impact heavily on individuals quality of life. The aim of this narrative review is to discuss the current evidence for the diagnosis and treatment of this group of disorders.

MATERIALS AND METHODS

Electronic databases search was performed with Medline, PubMed, Embase, Scopus. Terms used for the search were "Temporomandibular Joint Disorders" [Mesh]) AND "Facial Pain" [Mesh], restricted to english language, reviews and clinical trials.

RESULTS

Out of 328 papers retrieved, 47 were selected and categorized according to the following classes: etiology, controversial causes, clinical findings, differential diagnosis, treatment. Three clinical entities resulted from the search and were discussed: articular disorders (synovitis, disc displacement disorders, osteoarthritis, polyarthritic disorders, condylar dislocations, fibrous ankylosis, bony ankylosis, condylar fracture, neoplasia and congenital disorders), muscle disorders (myofascial pain, myositis, myospasm, contracture, fibromyalgia, neoplasms) and chronic pain. The cause of TMD is variable and uncertain, and it is thought to be multifactorial in most cases. The management of TMDs is based on the elimination of pain and the restoration of function and normal activities of daily life. Each specific diagnosis has its own treatment protocols, however they should be conservative and noninvasive treatments. The most common medications for TMD are: NSAIDs; muscle relaxants such as cyclobenzaprine; low doses (10-50 mg) of tricyclic antidepressants such as amitriptyline, desipramine, or nortriptyline. Other treatments are physical therapy, TENS, acupuncture, injection of trigger points, splint therapy, arthrocentesis, arthroscopy and finally surgery.

CONCLUSIONS

This article reviews the controversial topic of temporomandibular disorders. The available evidence suggests that an accurate diagnosis based on history and clinical evaluation is the gold standard in managing TMD. The treatment should be conservative, reversible and non-invasive, whenever possible.

CLINICAL SIGNIFICANCE

Dental professionals must be aware of the risks of chronicity of each pain conditions, and should consider pain treatment as the main goal of their interventions. Treatment protocols should be conservative, reversible and non-invasive, whenever possible, and they should be tailored to the psychosocial *status* of the patient.