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Review

Etiology and Clinical Management of Temporomandibular Disorders

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Abstract

Temporomandibular joints (TMJ) disorders are a group of morphological and functionally abnormal degenerative musculoskeletal problems. Limited or divergent movement, painful joint sounds, articular, muscular, or neural pain involving the joint are the hallmarks of the joint's pathology. Temporomandibular disorders (TMD) have a broad spectrum. Various biological, environmental, social, and psychosomatic stimuli comprise the complex etiology of TMD. Mechanically induced remodeling, while progressive and regressive, is a physiological development initially. Osteoarthritis arises when the joint's rebuilding capability has been exceeded. The TMJ exhibits typical osteoarthritic changes, such as flattening of fossae, reduced pronunciation of articular eminence, reduced condyle proportions, and thicker disk. Decreased adaptability in the articular tissues or severe or recurrent physical stress on the joint's tissues can also cause degenerative remodeling, that is noted in pathologic TMJs. It has been determined that non-invasive treatment options should be investigated first for patients looking to manage their temporomandibular disorders symptoms. However, there is a demand for more intrusive treatments because to the temporomandibular joint's complexity and the incapacitating nature of advanced-stage disease. Enhanced scope of movement, diminished synovitis, and the prevention of additional degeneration of joint surfaces are the foremost goals of the approaches used in managing TMD.

Keywords: *temporomandibular joints, temporomandibular disorders, degenerative disorders*

Introduction

Bilateral, diarthrodial temporomandibular joints make up the temporomandibular articulation (TMJs). Movement of this joint is predominantly controlled by the masticatory muscles. The TMJ and the structures attached to it are crucial for controlling mandibular range of motion (MROM) and distributing pressures brought on by activities like eating, swallowing, and speaking. A limited or divergent MROM, painful joint sounds, articular, muscular, or neural pain in the head and neck region are the hallmarks of joint pathology (1). TMJ disorders are a group of morphological and functionally abnormal degenerative musculoskeletal problems (2, 3). In addition to abnormalities of the related muscle, TMD also includes abnormalities of the intra-articular discal location and/or structure (4). TMD is a significant contributor to nondental discomfort in the orofacial area. TMD is more common in people between the ages of 20 and 40; it affects women twice as frequently as males and results in severe financial hardship due to lost wages. Mild discomfort to crippling pain, as well as limits in jaw function, are all possible symptoms. TMDs have a broad spectrum. Myofascial pain disorder, disk derangement disorders, osteoarthritis, and autoimmune diseases are the most prevalent syndromes (5). The majority of TMD patients have "internal derangement," (ID) or pathology or mispositioning of the TMJ disk (6). It is hypothesized that arthritis or arthrosis of the joint as a result of progressive mechanical wear and tear, in the presence or absence of other sources of inflammation, appears to be the major pathology.

Methodology

This study is based on a comprehensive literature search conducted on September 28, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about the etiology and clinical management of temporomandibular disorders. There were no restrictions on date, language, participant age, or type of publication.

Discussion

Various biological, environmental, social, emotional, and cognitive stimuli comprise the complex etiology of TMD. Other pain disorders (including chronic headaches), fibromyalgia, autoimmune disorders, sleep apnea, and mental illness are also factors that are frequently linked to TMD (7). Younger females who smoke have a higher risk of TMD than older females (8).

Etiopathogenesis

A crucial adaptation process required for proper stress distribution and operation of the load-bearing joints is remodeling. It has been proven that mechanically induced remodeling, while progressive and regressive, is a physiological development initially. Osteoarthritis arises when the joint's rebuilding capability has been exceeded (9). The TMJ exhibits typical osteoarthritic changes, such as flattening of fossae, reduced pronunciation of articular eminence, reduced condyle proportions, and thicker disk (9). Decreased adaptability in the articulating structures or excessive or persistent physical stress on the articulating tissues can also cause degenerative remodeling, which is observed in pathologic TMJs (4). These degenerative alterations have been linked to internal TMJ disk derangement, which is crucial to our comprehension of the pathophysiology of TMD. Even though the relationship between internal derangement and osteoarthritis is simultaneous or successive evolution is not entirely understood, it has been shown that they are related. In the aforementioned investigation of individuals with one-sided craniofacial pain referring to or within the TMJ while examination, activity, and supported or unsupported mandible motion, a significant association between the imaging diagnosis of internal derangement and joint osteoarthritis was discovered (10). Given the degenerative processes that are most frequently observed, such as disintegration of the joint interface, proceeded by leveling, it is believed that internal derangement is more likely to occur before osteoarthritis than the reverse (11). There is a distinct link between the displacement of the TMJ disk and the onset of osteoarthritis, even though studies have not yet established a cause-and-effect relationship (12). Treatment approaches must take into account all potential outcomes while progression is still poorly understood. A multistep approach for categorizing the progression of internal derangement on the basis of physical assessment and imaging criteria is as follows (11). Clinical signs of Stage I comprise pain-free clicks with free-ranging mandible motion earlier when opening and later at closure. When the disk returns to its "normal"

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anatomic position, imaging observations show a slight forward displacing of the disk and passive discordance. The osseous component seems normal. Stage II manifestations constitute craniofacial pain, sporadic locking-in, and intermittently occurring pain with clicks. Imaging shows slight forward displacing and distorting of disk, however, like in the first stage, the disk repositions to its "normal" location at maximum openness. The osseous outlines once more seem natural. Stage III, on the contrary, is characterized by persistent craniofacial pain as locking-in escalates and mandible's motion is constrained. The disk is plainly anteriorly shifted to its "normal" anatomical position when scanned. There is also evidence of moderate disk thickening. Stage III begins with the disk diminishing at maximum opening, but as the stage goes on, it stops (ID-non-reducing). The disk in this instance deforms as a result of the condyle pressing down and forward on it at the point of maximal displacement (terminal translation). Yet, the osseous outlines continue to look normal. The shapes start to alter in Stage IV. Chronic discomfort and restricted mandibular motion are examples of clinical signs. The misplaced disk is noticeably enlarged during imaging and does not become thinner with maximal expansion. The condylar cartilage and articular eminence possess irregularly shaped structures, that may be visualized through imaging. Stage V, the most evolved stage, shows more marked progression but shares the previous stage's diagnostic and imaging findings. Chronic pain, crepitus, and greatly reduced range of motion are all symptoms of Stage V degeneration in patients. Imaging reveals degenerative alterations as well as severe compression and thickness of the anteriorly displaced, non-reducing disk. These modifications thicken and remodel the underlying bone as well as break down the disk and joint cartilage interfaces (11). Clinical data show that a variety of variables may contribute to the development of TMD and related degenerative alterations. Each TMD case must therefore be handled differently. A few examples of such causes are traumatic injury, parafunctional habits, instability of occlusion, operational overload, and elevated joint wear (4, 13-16). These factors might be isolated or connected. However, because consistent direct cause and effect links haven't been shown, the respective functions of each of these putative components are up for debate. Due to the variety of TMD symptoms, patient evaluation frequently necessitates a physical examination in addition to other imaging modalities. As was already established, there is a population of people who have unilateral or bilateral disk displacement (joint sounds present or absent) and limited osseous alteration, but who have not yet developed clinically significant TMD (17, 18). Because of this, it may be required to use a variety of diagnostic techniques, such as clinical and radiographic testing, to determine the stage of degeneration in patients who have TMD-like symptoms. In order to diagnose and arrange treatment for a patient, patient evaluation and several radiology techniques may aid in determining the patient's phase of degeneration.

Clinical management

It has been determined that non-invasive treatment options should be investigated first for patients looking to manage their TMD symptoms. However, there is a demand for more intrusive treatments because to the TMJ's complexity and the incapacitating nature of advanced-stage disease. Increased MROM, reduced joint and muscular pain and inflammation, and the prevention of additional degenerative change in articulating tissues, including direct or indirect joint damage, are the main objectives of the approaches (4) that have been outlined below.

Non-invasive, non-pharmaceutical interventions

The primary TMD therapy that is advised is patient education. Jaw rest, a soft foods, warm wet compresses, and passive stretches are all supportive treatments (19, 20). As a consequence of muscular contractures, muscle exhaustion, and decreased synovial fluid output, TMJ fixation has not been proved to be beneficial and may make symptoms worse (21). The non-invasive techniques used most frequently are occlusal devices and/or modifications, pharmaceuticals, and physiotherapy (22). Electrotherapy, exercise, and physiotherapy are utilized to treat joint and masticatory muscle pain and increase range of motion (23). By bringing the patient's attention to their posture, food, and stress-related behaviors, physical therapists can supplement these treatments with behavioral adjustments. Transcutaneous electric nerve stimulation (TENS), ultrasound, and laser are examples of electrophysical techniques (20). These techniques are used to lessen inflammation, stimulate circulation, and encourage muscular relaxation. Exercise methods are frequently combined with manual interventions, which have shown promise in increasing mobility and diminishing pain. The masticatory and cervical spine muscles can be strengthened and made more mobile using such workout methods (21). These methods also have the capacity to "re-teach" and "rehabilitate" the

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muscles. This finding is made with particular attention to individuals who display stress-linked behaviors (22).

Physiotherapy

Physical therapy may be used to reduce TMD complaints, though the evidence for this is inconclusive (22). The aim of strategies is to increase muscular strength, coordination, relaxation, and MROM. They can be active or passive (e.g., releasing scissor with fingers, using medical equipment) (22). Even though there isn't any proof to back up their usage, specialized physiotherapy methods including ultrasound, iontophoresis, electrotherapy, or low-level laser therapy have been utilized to treat TMD (24).

Acupuncture

Myofacial TMD is frequently being treated with acupuncture. The average amount of appointments is six to eight, and they last about a quarter to half an hour each on average (25). Acupuncture may be a suitable supplementary therapy for individuals with painful TMD symptoms who need short-term pain relief, according to literature (25, 26).

Biofeedback

When compared to standard care, researchers recommend using biofeedback and cognitive treatment program for treating both short-term and long-term pain among individuals with active TMD (27). Patients should undergo counseling on lifestyle modifications such as stress management, good sleep habits, getting rid of parafunctional practices including bruxism, and avoiding excessive mandible motion during a yawn or while using a toothbrush or floss.

Occlusal splints

Occlusal splints and occlusal modifications, which are both non-invasive, help to balance the occlusion and TMJs (28). A third, crucial component of the joint system is the occlusion, or bite position, which dental professionals frequently address. To achieve the most stable and least TMJ-damaging bite position, modifications and splints may be utilized. By providing stability, splints and adjustments ultimately aim to reduce pain in the joint and masticatory muscles. Splints can also be used to reduce bruxism, which has been linked to occlusal problems, myofascial pain, strained muscles of mastication muscular, tiredness, and fibrosis, in addition to enamel attrition and other problems (29). The joint, articular disk, and teeth are hypothesized to be subjected to degenerative stresses that can be lessened or prevented by the use of occlusal splints (30). Some patients with severe bruxism and nighttime clenching may find these splints helpful. Published studies have produced contradictory findings about the best occlusal appliance to treat TMD problems (31, 32). Occlusal modifications, such as refining enamel surfaces to enhance dentition, are ineffective in treating or preventing TMD (33).

Pharmaceutical interventions

The majority of therapeutic strategies for TMD are grounded on professional assessment. To alleviate the TMD-related underlying discomfort, various drug classes are utilized. NSAIDS (Non-steroidal anti-inflammatory drugs) are first choice of medications that are commonly taken for up to two weeks to treat acute pain (34, 35). Early NSAID therapy is beneficial for individuals with suspected initial disk displacement, synovial membrane inflammation, and osteoarthritis. Despite the wide variety of NSAIDS that are readily available, only naproxen (Naprosyn) has demonstrated effectiveness in reducing pain. If there is proof that TMD has a muscular component, muscle relaxers may be administered in addition to NSAIDS (36). The most popular antidepressant drugs for the treatment of chronic TMD pain are amitriptyline, desipramine, doxepin, and nortriptyline. Although benzodiazepines are also utilized, their usage is often restricted to the first two to four weeks of management (34, 37). Anticonvulsants with a prolonged half-life, such as gabapentin, clonazepam, and diazepam may be more beneficial. Opioids are not advised and, if prescribed, should only be used temporarily in cases of extreme pain in individuals for whom non-opiate therapy has failed.

Tramadol, topical drugs like capsaicin, lidocaine, and diclofenac (38), and more recent antidepressants are among the pharmaceuticals that have little to no effect on TMD (39).

Minimally invasive interventions

Arthrocentesis, arthroscopy, and injections of corticosteroids and sodium hyaluronate are minimally invasive treatments for TMD issues. Osteoarthritis symptoms are treated with steroid and high-molecular weight sodium hyaluronate injections in the upper joint area. According to the condition's pathogenesis, these administrations could be more effective in the early phases of deterioration, when inflammation first starts to aggravate tissue breakdown (4) (40). Arthrocentesis and

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arthroscopic surgery require entry into the articular capsule for lubrication of articulating sites and reduction of inflammation, akin to intra-articular injections. A sterile needle is used during arthrocentesis to remove fluid from the TMJ (41). After drainage, a sterile solution is used to flush the TMJ of detritus and cytokines (41). The surgeon may use mandibular manipulations during the surgery to try and regain some range of movement (42). The surgeon may be able to remove intra-articular adhesions that might be limiting disk reduction in internal derangement patients using arthroscopic surgery, a somewhat more intrusive method (43). Arthroscopy has advantages in TMD stage diagnosis and osteoarthritis detection due to joint visibility after operation.

Only a few research have looked into the efficiency of onabotulinumtoxina (Botox) in the treatment of TMD (44). The treatment of uncomfortable myofacial symptoms has showed encouraging preliminary outcomes in modest randomized controlled trials. 54–56 Onabotulinumtoxina has been used to treat myofascial pain, but a recent study showed conflicting proof to back its use (45). Only a single of the four studies showed that this method was beneficial.

Referral to oral and maxillofacial surgery for invasive therapies

A consult with an oral and maxillofacial surgeon is advised if the patient has a past of injury or a fracture in relation to the joint apparatus, extreme pain and functional impairment from an internal derangement that does not improve with conservative treatments, or pain that has no known cause and lasts for longer than quarter to half year (1, 46, 47). Surgical intervention is rarely necessary for the treatment of TMD and is often only used to repair articular or anatomical irregularities. Arthrocentesis, arthroscopy, diskectomy, condylotomy, and complete joint replacement are some of the operative procedures. Despite being intrusive, surgical procedures have been effective in reducing TMD complaints and enhancing MROM (48). Patients with inadequate dental health, dental decay, malocclusal relationships, or tooth wear tendencies which could be causing TMD problems should be referred to a dentist.

Conclusion

TMD shares similarities with musculoskeletal conditions that affect other regions of the body, and conventionally, comparable therapy modalities can be applied. Dentists must rule out conditions that resemble TMD, recognize non-TMD conditions that could exacerbate the person's TMD complaints, and provide treatments that would offer the patient effective, long-term, and cost-efficient symptom alleviation.

Disclosure

Conflict of interest

There is no conflict of interest

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Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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