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REVIEW ARTICLE

Prosthodontic Management of Temporomandibular Disorders

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Abstract Temporomandibular disorders (TMD) are examined from a biopsychosocial or illness perspective. It is considered that TMD share features with many common chronic pain conditions. Functional disturbances of the masticatory system can be as complicated as the system itself. Although numerous treatments have been advocated, the complex nature of TMD requires a multidisciplinary team. Effective treatment selection begins with a thorough understanding of the disorder & its etiology. However, the multifactorial nature of this malady places some aspects of the disease beyond the traditional education of a Prosthodontist. The management goals for the Prosthodontist as a member of a TMD team are patient comfort, occlusal stability & the complex restoration of the teeth.

Keywords Temporomandibular disorders · Pharmacotherapy · Occlusal therapy · Orthopaedic therapy

Introduction

Management of chronic pain conditions is among the most difficult problems confronting clinicians. These conditions often found in the area of the head and neck, account for approximately 40 % of all cases seen in major pain clinics. Temporomandibular disorders (TMD) are recognized as the most common nontooth-related chronic orofacial pain conditions that confront dentists and other healthcare providers [1].

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Temporomandibular Disorders

Temporomandibular disorders (TMDs) are a collective term that embraces a number of clinical conditions that involve the masticatory musculature and/or temporomandibular (TM) joints and associated structures [1]. They are considered a sub classification of musculoskeletal disorders. The various clinical conditions are characterized by pain in the preauricular area, TM joint, or muscles of mastication; limitation or deviation in mandibular range of motion; and TM joint sounds (clicking, popping, and crepitus) during mandibular function [2]. Common patient complaints include headache, neck ache, face ache, and earache [3]. Other unexplained associated complaints include tinnitus, ear fullness, and perceived hearing loss. Controversy exists because of the limited knowledge regarding the etiology and natural history or course of TMD. Some contributing etiologic factors arc only risk factors, others are causal in nature, and others result from, or are purely coincidental to, the problem. These factors are classified as

1. Predisposing.
2. Initiating (precipitating).
3. Perpetuating to emphasize their role in the progression of TMD.

A. Predisposing Factors Include

Structural, metabolic, and/or psychologic conditions that adversely affect the masticatory system sufficiently to increase the risk of developing TMD. It is difficult to establish any significant cause and effect correlations because of the many variables involved, some of which clinically are difficult, if not impossible, to exclude. However, it has been reported that an extreme anterior open bite,

overjet greater than 6–7 mm discrepancy between the retruded contact position and five or more missing posterior teeth, and unilateral maxillary posterior lingual crossbite in children may be associated with TMD [4]. It should be pointed out, however, that the first three occlusal findings may be the effect of a TMD, not the cause.

B. Initiating Factors

Those leads to the onset of symptoms are primarily related to trauma or repetitive adverse loading of the masticatory system [3]. Overt trauma producing injury to the head, neck, or jaw can result from an impact injury, possibly a flexion–extension injury, and an injury while eating, yawning, or even from prolonged mouth opening during long dental appointments. A second form of trauma is associated with the sustained and repetitious adverse loading of the masticatory system as a result of parafunction [5]. However, a demonstrated direct cause and effect relationship is still lacking between Para function and TMD.

C. Perpetuating Factors

Such as Para function, hormonal factors, or psychosocial factors, maybe associated with any predisposing or initiating factor and can sustain the patient's disorder, complicating management of it.

Assessment

The collection of baseline records and indicated diagnostic tests is fundamental to the proper management of TMD. The extent to which any or all of the elements of evaluation are pursued depends upon the magnitude of the presenting complaints and the potential for the problem progressing physically or psychosocially. Screening for TMD is recommended as an essential part of all routine dental and/or orofacial pain examinations (Tables 1, 2). If significant findings are identified and recorded, a comprehensive history and examination should be conducted (Tables 3, 4).

The comprehensive history parallels the traditional medical history and review of systems and consists of the chief complaint(s), history of the present illness, medical history, dental history, and personal history (social and family). The comprehensive physical examination consists of a general inspection of the head and neck, including a visual inspection and palpation; a comprehensive orthopaedic evaluation of the TM joint and cursory evaluation of the cervical spine; a masticatory and cervical muscle evaluation; cursory evaluation of the cranial nerves; and an intraoral evaluation including an occlusal analysis [6].

Table 1 Recommended screening questionnaire for TMD

1. Do you have difficulty or pain, or both, when opening your mouth, as for instance, when yawning?
2. Does you jaw get "stuck", "locked", or "go out"?
3. Do you have difficulty or pain, or both, when chewing, talking, or using your jaws?
4. Are you aware of noises in the jaw joints?
5. Do you have pain in or about the ears, temples, or cheeks?
6. Does your bite feel uncomfortable or unusual?
7. Do you have frequent headaches?
8. Have you had a recent injury to your head, neck, or jaw?
9. Have you previously been treated for a jaw joint problem? If so, when?

McNeill et al. [13]

Diagnostic Classification of TMDs

Temporomandibular joint disorders[1]

Congenital or developmental disorders
- Aplasia
– Hypoplasia
– Hyperplasia
– Neoplasia

Disk derangement disorders
- Disk displacement with reduction
- Disk displacement without reduction

Joint dislocation

Inflammatory conditions
- Capsulitis/synovitis
- Polyarthritides

Noninflammatory (Osteoarthrosis)
- Osteoarthritis: primary
- Osteoarthritis: secondary

Ankylosis
– Fibrous
– Bony

Fracture (Condylar process)

Management

The majority of TMD patients achieve good relief of symptoms with a conservative model of non-invasive management. TMDs are similar to other musculoskeletal and rheumatologic disorders; and because little is known about the natural course of TMD or which signs and symptoms will progress to more serious conditions, a special effort should be made to avoid aggressive, irreversible therapy [2, 8].

A multidisciplinary model that includes patient education and self-care, cognitive behavioural intervention,

[1] Adapted from American Academy of Orofacial Pain and McNeill [7], Okeson [3].

Table 2 Recommended screening examination procedures for TMD

1. Measure range of motion of the mandible on opening and right and left laterotrusion.
2. Palpate for preauricular TMJ tenderness.
3. Palpate for TMJ crepitus.
4. Palpate for TMJ clicking.
5. Palpate for tenderness in the masseter and temporalis muscles.
6. Note excessive occlusal wear, excessive tooth mobility, fremitus, or migration in the absence of periodontal disease, and soft tissue alterations, for example, buccal mucosal ridging, lateral tongue scalloping.
7. Inspect symmetry and alignment of the face, jaws, and dental arches.

McNeill et al. [15]

Table 3 Comprehensive history format for TMD patients

CHIEF COMPLAINT
HISTORY OF PRESENT ILLNESS
Date and event of onset.
Location of signs and symptoms.
Character, intensity, duration, frequency of signs and symptoms.
Remissions or change over time.
Modifying factors (alleviate, precipitate, or aggravate).
Previous treatment results.
MEDICAL HISTORY
Current or pre-existing relevant physical disorders or disease (specifically Systemic arthritides or other musculoskeletal/rheumatologic conditions).
Previous treatments, surgeries and/or hospitalizations.
Trauma (specifically to head, face, or neck).
Medications (prescriptions, non-prescription, alcohol, and other substances of abuse).
Allergies.
DENTAL HISTORY
Current or pre-existing relevant physical disorders or disease.
Previous treatments, including patient's attitude toward treatment.
History of trauma to the jaw, teeth, or supporting tissues (including iatrogenic trauma).
Parafunctional history, both diurnal and nocturnal.
PERSONAL HISTORY
Social, behavioural, and psychological.
Occupational, recreational, and family.
Litigation, disability, or secondary gain issue.

Adapted from American Academy of Orofacial Pain and McNeill [7], Okeson [3]

pharmacotherapy, physical therapy, and orthopaedic appliance therapy (interocclusal splints) is endorsed for the management of nearly all TMD patients. The management goals are similar to those of other orthopaedic conditions,

Table 4 Comprehensive TMD physical examination procedures

GENERAL INSPECTION OF THE HEAD AND NECK
Note unusual asymmetry, size, shape, colour, consistency, posture and involuntary movement or tenderness.
EVALUATION OF THE TM JOINT AND CERVICAL SPINE
Palpate the TM joint preauricularly and intrameatally.
Measure range of motion, quality of movement, and association with pain.
Auscultate and/or palpate for joint noises in all movements.
Guide mandible movement, noting pain, end feel, and joint noise.
MASTICATORY AND CERVICAL MUSCLE EVALUATION
Note tenderness, swelling, enlargement, and unusual texture.
NEUROVASCULAR EVALUATION
Vascular compression of temporalis and carotid arteries.
Cranial nerve sensory and motor signs and symptoms.
INTRAORAL EVALUATION
Hard and soft tissue conditions or disease.
Occlusal analysis both static and dynamic.

Adapted from American Academy of Orofacial Pain and McNeill [7], Okeson [3]

namely, reduction of pain, reduction of adverse loading, improvement of function, and restoration of normal, daily activities. The emphasis should be on conservative therapy that facilitates the musculoskeletal system's natural healing capacity and treatment that involves the patient in the physical and behavioural management of their own problem. Although individual clinicians are successful in diagnosing the more simple TMD problems, a team approach is often required for managing complex chronic TMD problems, in particular for evaluating psychological disorders that may be present.

Patient Education and Self-care

The success of a self-care program is often enough to control an uncomplicated TMD problem. Instruction in a self-care routine should include the following: rest of the masticatory system through voluntary reduction of mandibular function, habit awareness and modification, and a home physiotherapeutic program. An explanation of the advantages of resting the affected muscular and articular structures is helpful. A home physiotherapeutic programme of moist heat and/or ice to the affected areas, massage of the affected muscles, and gentle range of motion exercises can reduce pain and increase range of motion.

Cognitive Behavioural Intervention

Cognitive behavioural intervention is an important part of the overall biopsychosocial treatment programme for TMD

patients. Although simple habits will often reduce when the patient is made aware of them, changing persistent habits may require comprehensive stress management and counselling programs. Behavioural strategies involving a combination of EMG biofeedback, relaxation techniques, and self-directed lifestyle changes are more effective than any single behavioural treatment procedure. In depth psychological evaluation and treatment by a mental health professional is recommended for patients with long standing pain who have experienced multiple treatment failures.

Pharmacotherapy

The indicated classes of pharmacologic agents include analgesics, anti inflammatory agents, corticosteroids, anxiolytics, muscle relaxants, and low-dose antidepressants. The non-opiate analgesics are effective for mild to moderate acute pain associated with TMD pain, and the opioid narcotics should only be used short-term for controlling acute severe pain. Nonsteroidal, anti-inflammatory drugs (NSAIDs) are effective analgesics and anti-inflammatory agents and are prescribed for painful articular disorders. Care must be taken to evaluate for gastrointestinal irritation and bleeding, which is a major risk of this class of medications. Intra-articular TM joint injection of corticosteroids has been recommended on a limited basis in cases of severe joint pain when other conservative treatment has been unsuccessful. The benzodiazepines are classified as sedative-hypnotic drugs and are most commonly prescribed for their antianxiety effects. These drugs act as depressants, and they should only be used short-term only for acute muscle pain and sleep disturbances associated with anxiety. Muscle relaxants, with the possible exception of cyclobenzaprine hydrochloride (Flexeril), derive their therapeutic action from their sedative effect only, but can be useful for acute muscle pain [9]. Flexeril, which is similar chemically to the antidepressants, is the drug of choice by most rheumatologists for generalized chronic muscle pain. The tertiary tricyclic antidepressants have been shown to have pain modification properties at therapeutic dosages much lower than those used for antidepressant effects and are prescribed for chronic pain patients who have neuropathic pain, chronic muscle pain, and sleep disturbance. They may also have potential in treatment of nocturnal bruxism.

Orthopaedic Appliance Therapy

Orthopaedic appliances, also referred to as intraoral appliances, occlusal splints, orthotics, night guards, or bruxism appliances, have a reported 70–90 % rate of clinical success [10]. Whereas the treatment effect is somewhat predictable, the explanation of the efficacy of the treatment response is less understood. Complications include major irreversible changes in the interocclusal and/or interarch relationships that occur as a result of long-term use of all appliances, particularly with the use of partial arch coverage appliances. Although there are a large variety of appliances, two major types of appliances are commonly used for TMD, namely, stabilization appliances and anterior positioning appliances. Stabilization appliances are designed to provide stabilization of the joint, redistribution of forces at the tooth and/or joint level, relaxation of the elevator muscles (at least short term), and/or protection of the teeth from the effects of bruxism. Anterior positioning appliances, also termed mandibular orthopaedic repositioning appliances (MORAs), are indicated for acute joint pain, painful joint noise and closed-lock, and associated secondary muscle symptoms from articular inflammation and pain [11]. Anterior positioning appliances reportedly reduce or change the location of stress in the joint by subtly altering the structural relationships. The mandibular advancement should be no more than 1–2 mm to minimize subsequent irreversible changes in the occlusion. Once joint pain is reduced, the appliance should be adjusted to allow positioning of the mandible as close as possible to the original intercuspal position. Appliances are usually worn only during sleep except for episodes of acute pain when they may be worn full time [12]. Eventually, with both stabilization and anterior positioning appliances, intermittent use at night during periods of increased stressful life events should suffice, if the appliance is needed at all.

Occlusal Therapy

There are many dental conditions that require treatment of the occlusion, that is, lack of intra-inter-arch tooth stability, tooth mobility, fremitus, tooth or restoration fracture, tooth sensitivity, compromised function, and/or a compromised periodontal health requiring a redistribution of forces to minimize the effects of adverse loading [13]. Although dental treatment per se may be necessary for patients with TMD, it is believed to be necessary infrequently for the purpose of treating a TMD. However, if occlusal therapy is deemed necessary to complete treatment of a patient with TMD, the treatment should only be completed after the patient's pain has been significantly relieved and the range of motion substantially improved. The maxillomandibular relationship, neuromuscular activity, and psychosocial status of the patient must be as stable as possible before proceeding with treatment. Proper treatment sequencing is essential, including pre-treatment with an interocclusal appliance, ancillary dental treatment, appropriately timed

appointments, and prolonged provisional treatment and cementation [12]. The cardinal rule should be to proceed carefully, using the least invasive procedure possible. Treatment of the occlusion should be considered on an individual basis, on the basis of the specific structural and physiologic needs of the patient's masticatory tissue systems instead of preconceived stereotyped occlusal concepts based on absolute and specific morphologic ideals [13]. Usually, it is wise to maintain the functional equilibrium established by the TMD management program, especially when the intercuspal position (ICP) and the vertical dimension of the occlusion (VDO) are acceptable. The occlusal scheme must be integrated with and conform to the remaining tissues of the masticatory system at the time of treatment. This newly established functional equilibrium may be the most optimum physiologic relationship for that particular masticatory system even though the morphologic relationship may not be ideal. It is paramount for the clinician to appreciate that, even in health; morphologic variation is the rule, not the exception. To impose occlusal changes on the basis of the clinician's concept of an "ideal" structural and/or functional relationship for that patient is inappropriate. Instead, treatment of the occlusion should be based on the specific health, comfort, and esthetic needs of that individual patient. On the other hand, if a functional equilibrium has not been established, or if the ICP and/or VDO are unacceptable or need to be altered to perform necessary dental treatment, the occlusion may need to be re-established. When an occlusal scheme has to be re-established, a treatment reference position must be established, namely centric relation, to allow the clinician to design treatment from a known starting point and to evaluate the progress and the outcome of the treatment on the basis of that starting point. The specific treatment objectives that are desired from an optimum structural and functional reestablishment standpoint for all patients including TMD patients, are as follows: (1) maximum symmetrical distribution of intercuspal contacts in the predetermined jaw relationship; (2) axial or near axial loading of the teeth; (3) an acceptable occlusal plane; (4) guidance contacts that allow freedom during closing, incursive and excursive gliding mandibular movements without deflection of the mandible or teeth; and (5) an acceptable vertical dimension of occlusion and interocclusal resting range [14].

Surgery

Temporomandibular surgery is the indicated treatment for a very small percentage of TMD patients and only those with specific TMD articular disorders. Surgical management may vary from closed surgical procedures (arthrocentesis and arthroscopy) or open surgical procedures (arthrotomy) to subcondylar osteotomies (condylotomy). The promising effectiveness of arthrocentesis, lavage through import and export needles with and without steroid injection and subsequent mobilization, is rapidly replacing arthroscopic procedures. The success of arthrocentesis and arthroscopy is related to the reduction of pain and increase in range of motion; however, neither procedure predictably, if at all, anatomically repositions the disk [9]. Open joint surgical procedures may range from discoplasty, disk repositioning and repair, discectomy (meniscectomy) with or without replacement, to arthroplasty including high condylectomy. Because of the long-term complications with alloplastic prostheses, such as Proplast-Teflon, their use is contraindicated. A preoperative and postoperative nonsurgical management should be integrated with the surgical treatment into an overall multidisciplinary treatment approach.

Summary

Dentists must learn to correctly diagnosis and properly treat acute orofacial pain conditions with practical, cost-effective, and evidence based approaches. Acute pain management is necessary to prevent an acute condition from becoming a chronic pain disorder in the future.

Moreover the dental profession should embrace a biopsychosocial model of chronic orofacial pain and TMD management following the medical model for chronic musculoskeletal pain management. Proper acute and chronic pain management is required to prevent the pain from becoming entrenched in the patient's life, with the development of deleterious histochemical changes in central nervous system pain pathways. Patients then may present with frustrating complications sometimes resulting in additional inappropriate treatment, long-term medications, and an ongoing dependency on the health care system. This complex chronic pain patient population often has serious disabilities and must be managed by a well trained, multidisciplinary or interdisciplinary team of health professionals.

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