

Recommendations by the EACD for Examination, Diagnosis, and Management of Patients with Temporomandibular Disorders and Orofacial Pain by the General Dental Practitioner

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The Council of the European Academy of Craniomandibular Disorders charged the Educational Committee with the task of establishing Guidelines and Recommendations for the examination, diagnosis, and management of patients with temporomandibular disorders and orofacial pain by the general dental practitioner. It was not their purpose to present a thorough and critical review of the vast amount of literature available but to summarize the at-present generally accepted clinical approach. These recommendations are based as much as possible on scientific evidence and on sound clinical judgment in cases where only partial evidence or contradictory data were found.

The authors are members of the Educational Committee of the EACD. They are listed in alphabetical order but contributed equally in the discussions and the final draft of the manuscript. The guidelines were submitted to the General Assembly of the EACD and accepted during the meeting September 28, 2007.

Introduction

This document describes recommendations for the general dental practitioner (GDP) taking care of patients suffering from temporomandibular disorders (TMD) and/or orofacial pain (OFP). They should be considered in assessment, diagnosis, management, and prognosis. The GDP has to decide and justify care to be applied according to pathology of each individual patient. The recommendations are based on current published data. Because the etiological factors of TMDs and the relative efficacy of the different therapeutic modalities for TMDs are not well established yet, the practitioner should be careful in the selection of assessment techniques and in the choice of therapeutic modalities. Irreversible therapeutic methods should not be considered before reversible measures.

The following recommendations do not act as a quality warrant of the care provided by the individual general dental practitioner. In this respect, the competences of the GDP are more directive than these recommendations, which are written as a “patient-centered” rather than “clinician-centered” approach. Assessment, diagnosis, and management are discussed in the following sections. The majority of patients consulting the GDP belong to a different population than those referred to specialized clinics. Referred patient populations are mostly characterized by chronicity, comorbidity, and complexity. Patients consulting the GDP for TMD/OFP are in general less complex. Therefore the GDP has a more important role in diagnosis and management than is normally assumed. The general dental practitioner has to decide when to treat and when to refer. These recommendations were written to help the GDP working in daily practice. TMDs are among many orofacial pain conditions. In this publication they are defined as “a collective term embracing a number of clinical conditions that involve the masticatory musculature, the temporomandibular joints (TMJs) and associated structures, or both” (Okeson, 1995).

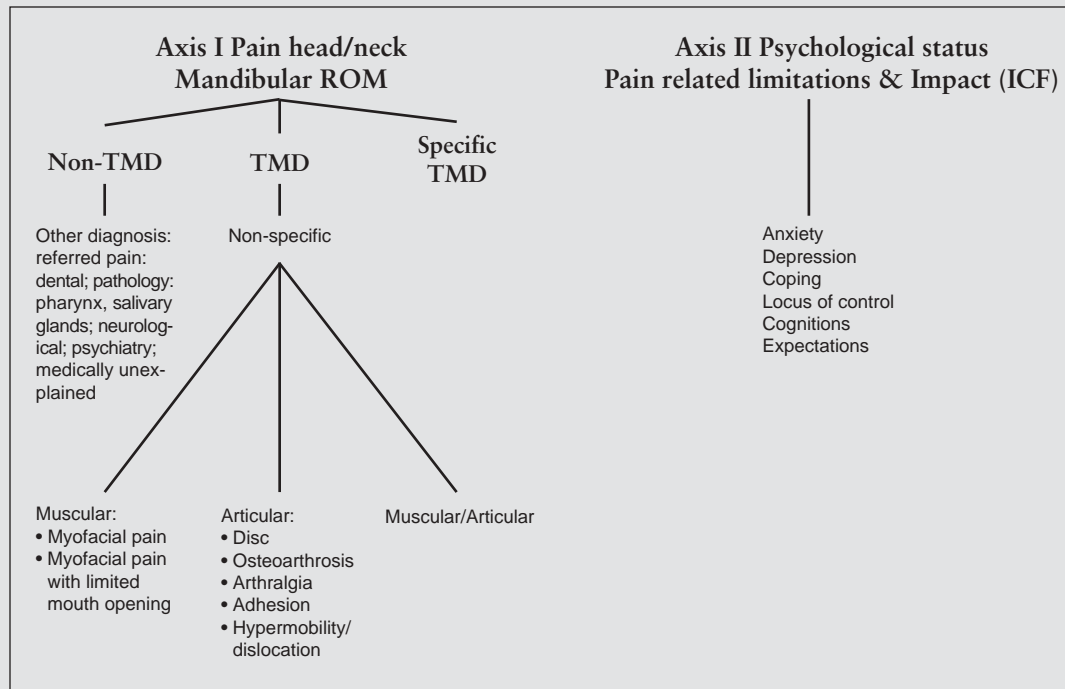


Fig 1 Flowchart of the diagnostic process in patients with orofacial pain and temporomandibular disorders. Axis 1 represents the physical conditions. Non-TMD: other conditions presenting pain in the head and the neck and mandibular range of motion (ROM) limitations. Specific TMD: conditions with a known substratum, eg, neoplasms, growth disturbances, systemic disease. Non-specific TMDs: conditions related to overloading or trauma, surpassing the capacity for adaptation. Generally divided into muscular and articular subgroups.

Axis II represents psychosocial factors, which are increasingly important when chronicity plays a more prominent role. If appropriate, a comprehensive history, taking into account the role as a doctor interested in the background of patients and the impact of the complaints on the activities of daily life, is considered the best first approach. Instruments like SCL 90, MFIQ can be used by those knowledgeable with the interpretation and consequences for management. Referral to a medical psychologist can be considered on the basis of the resulting finding, knowing the limitations of the dental competencies.

I. Screening

In order to detect the presence of a TMD, it is recommended that a routine screening protocol be used. The screening protocol can include the following 4 (mostly validated) questions:

1. Do you have pain when you open your mouth wide or chew once a week or more?
2. Do you have pain in your temples, face, temporomandibular joint or jaws once a week or more? (Nilsson et al, 2006)
3. Have you lately registered that the jaw is locked or that you can't open wide?
4. Do you have often headache more than once a week? A positive answer can be an indication to refer the patient first to a neurologist.

If the patient replies "yes" to one of the 4 questions, a more thorough history taking and assessment may be indicated.

II. Assessment

The main goal of the assessment is to gather information in order to be able to establish a "working diagnosis." This goal is achieved by a thorough history and examination. This can rule out disorders with signs and symptoms similar to TMDs/OFP, such as dental, periodontal, or mucosal disorders, other pain conditions, neoplasms, growth disturbances, and systemic disorders. A flowchart (Fig 1) can help in this phase of the examination.

The clinician must determine:

- The main reason for consulting and the chief complaints
- The general medical, dental, and psychosocial history; this should include questions about general pain patterns and include more specifically

questions about cervical pain and dysfunction (de Wijer et al, 1996), medication, as well as complementary and alternative medicine (De Bar et al, 2003)

- Detailed history of orofacial pain and dysfunction (location, pattern, type, severity, frequency, aggravation, relief, impact on activity daily life)
- Expectations of the patient and the relatives with regard to the complaints
- Therapy already received for the problem, including outcome

Basic documentation includes:

- Assessment of the contributing factors involved and their grading
- Extraoral inspection: asymmetries, posture, scars
- Intraoral inspection and examination, including occlusal characteristics
- Radiographs of the teeth and jaws (panoramic radiograph complemented with peri-apical radiographs and/or bite wings)
- Physical examination of the masticatory system
- An empathic attitude in history taking, in combination with a validated checklist (Axis II evaluation). Such a checklist can help to assess the role of psychosocial factors and inform the patient as to the role of such factors and make the patient decide on a referral to a clinical psychologist or psychotherapist knowledgeable in these conditions (team approach) (Dworkin & LeResche, 1992).

To establish an individual working diagnosis, the following additional investigations and considerations should be taken into account in specific cases and conditions. This recommendation also applies when the patient is referred to a specialist:

- Additional imaging techniques, such as CT and/or MRI, if fractures, tumors and other hard or soft tissue lesions are suspected (Brooks et al, 1997). For each case the most reliable method should be chosen; if in rare cases (eg, claustrophobia) this is not possible, an invasive technique as arthrography can be considered.
- Magnetic resonance imaging to confirm suspected disc displacement is not recommended in the initial assessment phase.
- Arthroscopy, preferably done by a surgeon or specialist in TMDs, if inflammation and/or adhesions are suspected.
- A patient with chronic pain should be referred to a multidisciplinary pain clinic where it is understood that management strategies in chronic TMDs/OFP conditions are different from acute and subacute TMDs/OFP.

- Clinical examination of occlusion: some occlusal characteristics are considered as potential risk factors for development of TMD symptoms (De Boever et al, 2000). Attention should be given to: cross bite (Seligman & Pullinger, 2000), class II occlusion and overjet (Henrikson & Nilner, 2002), and large CO-CR discrepancy (Pullinger & Seligman, 2000). Anterior occlusal wear and its progression in relation to age is to some extent a potential risk factor and should be documented (Seligman & Pullinger, 2002; Carlsson et al, 2002; Pullinger & Seligman, 2006). However, in these models etiology per se has not been studied. There is at present no evidence for preventive strategies in this respect.

There are indications that loss of posterior support may be a contributing factor for TMJ pain (Ciancanglini et al, 1999; Ciancanglini et al, 2003; Sarita et al, 2003; Seedorf et al, 2004). Dental status and the location and number of tooth contacts in maximum intercuspation should be noted.

- In planning occlusal treatment and in the fabrication of occlusal splints, the articulator has a practical clinical value in reducing valuable chair time when inserting the splint. There is no evidence that occlusal analysis of models mounted on an articulator in combination with registration of mandibular movements has diagnostic value for TMD/OFP diagnosis (Türp, 2003).
- Jaw tracking devices have a low additional diagnostic value because of the biological variation in the function of the stomatognathic system, fluctuations in time, and the inherent mechanical factors involved in the clinical use of the instruments (Morneburg and Pröschel, 1998; Bernhardt et al, 1999; Naeije et al, 1999; Kordass, 2002; Gallo et al, 2006). Some tracking devices have today a high reliability. However, the clinical usefulness today is doubtful.
- Clinical assessment of parafunctions (eg, bruxism) as a risk factor for masticatory muscle pain (Huang et al, 2002; Velly et al, 2003) is based on the history and on assessment of occlusal wear, because additional reliable clinical tests are not yet available. Tongue scalloping and cheek ridging can be an indication of oral habits and parafunctions. Another possible indication for bruxism is noncarious cervical lesions called abfractions (Rees & Jagger, 2003). Therefore, attrition and abfractions should be included in the dental assessment. Bruxism has to be differentiated from dental erosion, to be tested through a.o. food diaries and saliva analysis.

Table 1

Common diagnoses	Uncommon TMD diagnoses or systemic diseases	
	TMJs	Musculature
Myofascial pain	Congenital disturbances (hyperplasia, hypoplasia, aplasia)	Fibromyalgia
Disc displacements	Rheumatoid arthritis	Whiplash
Arthralgia, arthritis, arthroses	Psoriatic arthritis	
	Pelvospondylitis (Bechterew)	
	Systemic lupus erythematosus	
	Luxation	
	Ankylosis	
	Neoplasm	

- In clinical conditions in which sleep disorders (snoring, sleep apnea, and bruxism) influence the patient's quality of life, sleep laboratory tests are indicated and should be discussed with the appropriate specialist.
- If the temporomandibular condition is part of a generalized disease, no additional laboratory tests should be prescribed by the dental practitioner, but the patient should be referred via the general medical practitioner to the appropriate specialist (eg, ENT specialist, rheumatologist, neurologist).
- In cases of suspected concomitant neck/shoulder complaints, referral to a physiotherapist is advised (de Wijer et al, 1996).
- If assessment does not establish a working diagnosis, the patient should not be treated but referred.
- The referral should be in writing, preferably using standard referral documents.

III. Diagnosis

Pain has been defined as “an unpleasant sensory and emotional experience associated with actual or potential damage or described in terms of such damage” (IASP, 1979). Orofacial pain can be characterized as nociceptive or neuropathic. Other important differentiations are acute versus chronic pain and benign versus malignant pain. In this document the pain conditions discussed are nociceptive rather than neuropathic. Nociceptive pain can be concomitant with neuropathic pain. It can be difficult to distinguish between the two types of pain condition. The use of a validated list may be useful (Bouhassira et al, 2005). Details and implications are not within the scope of this document. Any clinician should be knowledgeable as to these differences regarding diagnosis and management and regarding the difference between site and source of the pain (Okeson, 1995, 2008).

History taking, physical examination and, where appropriate, imaging should lead to a working diagnosis differentiating between specific and non-specific disorders, localized and generalized forms, myogenous pain, arthrogeous pain and a combination of both and concomitant pain as odontalgia, joint and muscle pain outside the head (Türp et al, 1998). Psychosocial factors and their impact on daily life should be assessed as well. After having excluded specific disorders, the GDP can classify the nonspecific conditions based on clinical criteria indicated in Table 1. A diagnosis has to be established taking into account all individual aspects gathered by the assessment.

Physical complaints such as bodily pains can exist without a definable source. Psychiatric disease may play a role in these cases, necessitating the help of an expert. Beyond these possibilities, pain may exist without any explanation (Fig 1). The dentist (within the dental competencies) is the expert in using diagnostic injections to exclude dental sources for orofacial pain, one of the major pitfalls in diagnosis.

IV. Therapeutic Modalities

Therapy must not start without a (working) diagnosis. If the practitioner cannot arrive at a (working) diagnosis, if the complaints have a mainly neuropathic origin or the pain is chronic, the patient should be referred to a colleague who is knowledgeable in the domain of TMDs/OFP. The clinician needs to find a balance between therapeutic modalities that focus on the active participation of the patient (patient centered) and more passive modalities, such as wearing a stabilization splint. In general, individualized therapy is not based on the etiology of the TMD condition, since it is not well known (Greene, 2001). Management is directed by the presented symptoms, their course and influencing factors. Patient education consisting of explanation of the condition, reassurance,

and advice on use and abuse of the masticatory system in a broad sense are part of the nonactive patient-centered approach.

Because of the clinical results of a conservative, noninvasive approach consisting of a combination of different clinical “tools,” this approach is often indicated. Studies show favorable results with a reversible approach for the myogenous TMDs and for the arthrogenous TMDs also in case of disc displacements without reduction (Mongini et al, 1996; Ekberg & Nilner, 2002; Ekberg et al, 2002; Magnusson et al, 2002).

It has been shown that combined therapeutic approaches in general are more successful than single therapeutic approaches. (Kurita et al, 1997). It is recommended that more complex TMD conditions are managed using combinations of single therapies (Vallon et al, 1998; Turk, 1997; Sherman & Turk, 2001; Gardea et al, 2001; Schiffman & Gross, 2001). Cost-effectiveness studies may direct the use of different therapeutic strategies, because the differences in outcome between therapies are small.

IVa. Patient Education

Information, explanation, and reassurance at the first visit and in later phases of management is extremely important to increase the compliance of the patient. Counseling is effective in lowering symptom severity and the anxiety of the patients (De Boever et al, 1996). Counseling should be oriented towards the specific complaints and should address the cognition of the patient and the relatives. It should go beyond general statements.

Counseling consists of:

- Explaining the pain pathology and dysfunction in the particular patient
- Explaining the cofactors involved (psychosocial and behavioral aspects, general diseases)
- Indicating and explaining the important fluctuation in the symptoms
- Explaining the “burn-out” characteristic of the arthrogenous symptoms. Degenerative TMDs have a favorable long-term prognosis (De Leeuw et al, 1994, 1995) with regard to mandibular function
- Making the patient aware of his responsibilities in the therapeutic process (compliance, motivation, coping)
- Evaluation
- Discussing the management goals with the patient
- Prognosis

IVb. Pharmacological Therapy

The first step in the therapy of patients with pain and dysfunction is pain management, because patients contact when they suffer most. The dental practitioner should be aware of the differences between the pharmacological therapeutic modalities in acute versus chronic pain patients. The patient should receive adequate prescriptions mainly to control pain (around the clock). A follow-up visit is part of this approach. Contact with the family doctor can be helpful in cases of multiple medications. In modern pain control concepts, although not yet well documented, it is advised to prevent pain from becoming chronic also by prescribing pain medication in the early stages (List et al, 2003).

Few controlled studies have been published on the efficacy of different types of drugs in TMD management (Sommer, 2002).

The more complicated and complex drugs indicated for neuropathic pain conditions should be prescribed by the general physician of the patient and/or the dental specialist, especially if laboratory tests are indicated to check for systemic effects (Dionne, 1997). The use of complementary medicine (herbs, homeopathy, etc) cannot be recommended because of the paucity of data and the possibility of harmful side effects (Ernst, 2004; Raphael et al, 2003).

The use of newly developed and recommended pharmacological therapeutic modalities is discouraged until studies prove the efficacy in the management of orofacial pain (eg, botulinum toxin) (Freund et al, 2000).

IVc. Occlusal Appliances

Occlusal appliances (stabilization splint, Michigan splint) may be indicated at the start of therapy in myogenous and arthrogenous TMDs. Their use should always be accompanied by patient education. The splint should cover the whole arch. The splint should be worn only during the night and have a minimal increase of vertical dimension. Cuspid protection is advocated because it is technically easier. The most important aspect is to provide stability to the jaws. The splint should be checked for stability on a regular basis. Although the lack of evidence as to its efficacy is still subject of ongoing debate and research, many clinical studies show that the occlusal appliance is clinically very successful in pain reduction.

Mandibular repositioning with the goal to recapture the disc is not supported by strong evidence; minor repositioning (< 1 mm, short term maximum 6–8 weeks, weekly evaluation) may be helpful in loud painful clicks (proven to be due to anterior disc displacements with reduction) that do not react to other modalities and are causing major limitation of the activities in daily life. The mandibular repositioning splint may reduce the clicking and pain with disc displacement (Davies & Gray, 1997; Santacatterina et al, 1998).

Semi-permanent anterior disc displacement causing intermittent locking of the TMJ, if treated with splints, may need repositioning, based on the same principle. Pivot-type splints are not recommended because they do not provide better clinical results than full-coverage appliances.

The appliance is constructed in hard acrylic. Soft acrylic appliances are sometimes recommended in children (Ingerslev, 1983). If such appliances are used on a long-term basis, the general dental practitioner can do the follow-up of the stabilization appliance at the regular dental checks. The patient should be instructed to visit the GDP in case of any perceived occlusal change, especially if longer periods of wearing a splint are indicated, and to bring the splint along on each dental visit.

IVd. Physiotherapy

The global aims of physiotherapy management are to alleviate patients' pain, reverse the dysfunction, and restore optimal muscle and joint function, posture, and activities of daily living to prevent recurrent episodes. Within this management, patients are provided with precise and relevant exercise and lifestyle strategies to assist them with effective, preventive self-management, including home exercises, self-massage, habit-reversal techniques, relaxation, and oral instruction.

All systems may require active management and physiotherapy embraces the following therapies, including manipulative therapy, exercise therapy, massage therapy, re-education, ergonomic and lifestyle advices, and the application of electro-physical agents and other physical aids as required. The therapy is focused on the relevant items regarding the physical examination process, such as posture, neuromotorcontrol and stress management, and the muscle and joint system in the orofacial, cervico-thoracic spine, and shoulder girdle area. For many conditions, clinical practice guidelines are systematically developed to assist the practitioner. Studies have shown that physiotherapy can be as effective as other therapies (Townsen

et al, 2001; Michelotti et al, 2004, 2005; McNeely et al 2006; Medlicott et al, 2006).

IVe. Behavioral and Psychological Management

It is recommended that behavioral, cognitive behavioral, and psychological therapy be part of the total treatment because of the role of psychosocial factors (Axis II) in the multifactorial etiology of TMDs (Dworkin et al, 2002; Turner et al, 2006). Referral of the patients is recommended for psychological evaluation and, if indicated, for therapy. The dentist must know the limitations of exploring psychosocial factors. Habit reversal techniques using biofeedback proved efficient in lowering the general tension of the patient (Crider & Glaros, 1999). In patients with chronic pain, the management strategy must take into account the coping styles and locus of control.

IVf. Arthrocentesis

Inflammatory diseases of the TMJs should be treated with medication, occlusal appliances, and physiotherapy. In case of unsuccessful outcome at 12–16 weeks, arthrocentesis of the joints may be performed (Emshoff et al, 2000) with a high long-term success rate in cases of internal derangement (Carvajal & Laskin, 2000). However, the same results may be obtained with less invasive methods such as physical therapy (Kropmans et al, 1999). In case of loud and painful clicking of the TMJ, arthrocentesis may be indicated in the initial therapeutic phase (Projectgroep, Gnathologie, 2003).

V. Other Therapeutic Modalities

The following therapeutic modalities may be indicated in selected patients (see below). The GDP should realize that these modalities lead to irreversible changes in some parts of the stomatognathic system.

Va. Occlusal Therapy

After reduction of pain and normalization of the functional movements, gross occlusal interferences (eg, as a result of migration) may be removed to provide the patient with occlusal stability between the jaws.

Very few studies have investigated the therapeutic outcome of occlusal equilibration only. Occlusal adjustment alone should not be used as a single therapeutic modality or at the start of ther-

apy (De Boever et al, 2000). Exceptions may be gross interferences preventing proper tooth contact, not the result of inflammation and/or myogenous TMDs. Although therapeutic outcome may be similar to other noninvasive modalities, and cost-effectiveness is superior to other modalities, the risk of introducing occlusal awareness cannot be excluded.

Recent literature reviews do not support the use of systematic occlusal adjustment (Forssell et al, 1999; Tsukyama et al, 2001; Koh & Robinson, 2003, 2004).

Vb. Prosthetic Reconstructions

Prosthetic reconstruction to replace missing teeth is not useful in the prevention of TMDs. In the management of TMDs it should only be considered in the final phase after remission of the symptoms of pain and dysfunction. In case prosthetic reconstructions are planned from a restorative point of view, the subjective therapeutic need has to be taken into account. Extensive prosthetic rehabilitations are putting stress to the system because of the long treatment sessions and are not always advisable. If prosthetic treatment is considered and planned in TMD patients, it should be kept as simple and as minimally invasive as possible (Plesh & Stohler, 1992; Türp Strub, 1996).

Missing teeth can be replaced in case of pronounced arthrosis the TMJs in generalized or local joint pathology of unknown origin to avoid overload. The scientific basis to substantiate this approach is small (Hagag et al, 2000; De Boever et al, 2000). In case of a developing open bite, a stabilization splint that covers only the non occluding teeth may provide orthopedic stability. The use of composite materials can be taken into considerations as well. Before starting restoration, the origin of the occlusal change, as well as its course, must be established.

Vc. Orthodontic Therapy

Patients should not be treated orthodontically in order to prevent or treat TMDs (Mohlin & Kurol, 2003). Psychosocial and aesthetic reasons are dominating factors indicating orthodontic treatment. Also, patients who have undergone orthodontic treatment are not at a higher risk to develop TMD (Kim et al, 2002; Egermark et al, 2003). Adaptation to morphological changes is higher in younger patients.

If pain symptoms occur during orthodontic treatment, therapy should slow down or halt but

not be interrupted (Henrikson et al, 1999). Because a clinical decision has to be made, the structured decision-making program as described by Collett & Stohler (1994) can be very useful and recommended for daily practice.

After pain and dysfunction subside, orthodontic therapy might be indicated to stabilize the occlusion. Recent studies do not show a correlation between TMDs and crossbites with or without a forced lateral bite (Farella et al, 2007).

Vd. Joint Surgery/Orthognathic Surgery

After relief of pain, patients should be informed that orthognathic surgery may be indicated in cases of pronounced forms of malocclusion. This information should include the effects, benefits, and risks. There are studies indicating that orthognathic surgery results in better chewing ability (van den Braber et al, 2005) and does not lead to an increase in TMD symptoms (De Boever et al, 1994; Egermark et al, 2000; Farella et al, 2007). However, in case of pre-existing TMJ dysfunction, orthognathic surgery may also lead to worsening of the symptoms (Wolford et al, 2003). Management of pain and dysfunction before surgery is mandatory. After surgery, there is a risk for a progressive condylar resorption in women with a mandibular angle > 37 degrees and a pre-existing dorsally migrated condyle (Hoppenreijts et al, 1998).

There is no evidence for the use of hyaluronate injections into the TMJs (Shiz et al, 2003). However, a restricted number of intra-articular injections of corticosteroids by an expert in case of TMJ to inflammation is well-documented and recommended in acute phases (Wenneberg et al, 1991). The effect of intramuscular injections is not well-documented in the literature.

Open joint surgery is indicated in very few cases of failure of interocclusal splint therapy combined with medication, counseling, and physiotherapy failed after two years. Continuing pain or limitation are regarded as the main indication for a failure of nonsurgical therapy (consensus report TMJ symposium, March 22, 1985, Cologne, Germany). Only if the lasting complaints have a major impact in daily functioning, leading to a major handicap and severe disability, open joint surgery can be discussed. The oral surgeon should be convinced that the postoperative results will improve the condition.

Ve. Arthroscopic Surgery

Arthroscopy is done in very rare cases in the management of TMDs and preferably not carried out by the general practitioner. Because of the complexity and the need for extended clinical skills, this procedure should be performed by an experienced surgeon only. In case of adhesions, it may serve to improve mobility of the TMJs (Schiffman et al, 2007).

VI. Children and Adolescents

The prevalence of therapy for TMD and OFP in children and adolescents (Nilsson et al 2005, List et al, 1999) have been found to be around 7%. From puberty girls more often than boys report these kinds of disturbances, but the fluctuations in time (Wänman & Agerberg 1986) make a conservative treatment approach recommendable.

In a prospective study TMD symptoms and signs were registered in three parallel groups, one with Class II malocclusion treated orthodontically, one with Class II malocclusion without orthodontics, and one group with normal occlusion. TMJ clicking increased over time, although it was of less frequency in the normal group. The normal group had a lower frequency overall of TMD. TMD fluctuated substantially over time with no predictable pattern. The large fluctuation over time again leads us to suggest a conservative approach for therapy of TMDs in children and adolescents (Henriksson & Nilner, 2006).

Therapeutic modalities reported in the literature are information, relaxation therapy, occlusal appliances (Wahlund et al, 2003) and they have shown acceptable results. When all teeth except for the third molar are fully erupted at the age of 13, a stabilization appliance can be recommended as a part of the management. Other types of therapeutic modalities (eg, exercises for the lower jaw, biofeedback) have been presented (Skeppar & Nilner, 1993).

Conclusions

In assessment, diagnosis and management of TMDs/OFP, some aspects are not convincingly scientifically proven. In daily practice, this may result in a dilemma between TMD signs and symptoms, and the treatment need and demand (Mohl & Ohrbach, 1992). In general the management should be prudent and well considered (Stohler & Zarb, 1999).

Patients with TMD of myogenous and arthrogeous origin can be successfully managed using conservative noninvasive methods by the general dental practitioner (Sundqvist et al, 2003). However, they should be additionally trained in diagnostics, differential diagnosis, and planning a tailored and patient-centered therapy. Because of the multifactorial etiology, different from patient to patient, different therapeutic approaches should be used in seemingly similar cases. Studies have convincingly shown that a combined therapeutic approach leads to more favorable results than a single approach. It is important that the general practitioner treats these patients because up to 5% of the population is demanding therapy for pain and dysfunction of the orofacial region. The general dental practitioner should also be aware of her/his limitations and refer to TMD specialist or other relevant medical specialist in case of psychological components, neuropathic pain, or pronounced chronicity.

The guidelines for the general practitioner should urge the practitioner to do additional reading and to keep up with the fast evolution of science.

These recommendations should be reviewed and adapted on a regular basis.

References

This list of references is not exhaustive but serves as a guide for further reading by the general practitioner. The authors have given a great effort to base these recommendations on recent evidence, although through the nature of this text and its accomplishment does not exclude publication bias. Of the cited studies not all represent the same level of evidence (Nilner, 2004).

- Al-Ani Mz, Davies SJ, Gray RJM, Sloan P, Glenny AM. Stabilization splint therapy for temporomandibular pain dysfunction syndrome (Cochrane Review). In: Cochrane Library. Issue 1, 2004. Chichester, UK. John Wiley & Sons.
- Bernhardt O, Schwahn B, Meyer G. Craniomandibular disorders—Comparative investigations with clinical examination and electronic axiography. *Ann Anat* 1999;181: 51–53.
- Bouhassira D, Attal N, Alchaar H, et al. Comparison of pain syndromes associated with nervous or somatic lesions and development of a new neuropathic pain diagnostic questionnaire (DN4). *Pain* 2005;114:29–36.
- Brooks SL, Brand JW, Gibbs SJ, Hollender L, Lurie AG, Omnell KA, Westesson PL, White SC. Imaging of the temporomandibular joint: A position paper of the American Academy of Oral and Maxillofacial Radiology. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997;83: 609–618.

- Carjaval WA, Laskin DM. Long-term evaluation of arthrocentesis for the treatment of internal derangements of the temporomandibular joint. *J Oral Maxillofac Surg* 2000; 58:852-855.
- Carlsson GE, Egermark I, Magnusson T. Predictors of signs and symptoms of temporomandibular disorders: A 20-year follow-up study from childhood to adulthood. *Acta Odontol Scand* 2002;60:180-185.
- Ciancaglini R, Gherlone EF, Radaelli G. Association between loss of occlusal support and symptoms of functional disturbances of the masticatory system. *J Oral Rehabil* 1999; 26:248-253.
- Ciancaglini R, Gherlone EF, Radaelli G. Unilateral temporomandibular disorder and asymmetry of occlusal contacts. *J Prosthet Dent* 2003;89:180-185.
- Clark GT, Tsukiyama Y, Baba K, Simmons M. The validity and utility of disease detection methods and of occlusal therapy for temporomandibular disorders. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997;83:101-106.
- Collett T, Stohler CS. The orthodontic/TMD patient: Review of the literature and an introduction to structured clinical decision making. *Aust Orthod J* 1994;13:188-193.
- Crider AB, Glaros AG. A meta-analysis of EMF biofeedback treatment of temporomandibular disorders. *J Orofac Pain* 1999;13:29-37.
- Davies SJ, Gray RJM. The pattern of splint usage in the management of two common temporomandibular disorders. Part III: Long term follow-up in an assessment of splint therapy in the management of disc displacement with reduction and pain dysfunction syndrome. *Brit Dent J* 1997;183:279-283.
- De Bar LL, Vuckovic N, Schneider J, Rittenbaugh C. Use of complementary and alternative medicine for temporomandibular disorders. *J Orofac Pain* 2003;17:224-226.
- De Boever AL, Keeling SD, Hilsenbeck S, Van Sickels JE, Bays RA, Rugh JD. Signs of temporomandibular disorders in patients with horizontal mandibular deficiency. *J Orofac Pain* 1996;10:21-27.
- De Boever JA, Carlsson GE, Klineberg JJ. Need for occlusal therapy and prosthodontic treatment in the management of temporomandibular disorders. Part II: Tooth loss and prosthodontic treatment. *J Oral Rehabil* 2000;27: 647-659.
- De Boever JA, Carlsson GE, Klineberg IJ. Need for occlusal therapy and prosthodontic treatment in the management of temporomandibular disorders. Part I. Occlusal interferences and occlusal adjustment. *J Oral Rehabil* 2000;27: 367-379.
- De Boever JA, Van Wormhoudt K, De Boever EH. Reasons that patients do not return for appointments in the initial phase of treatment of temporomandibular disorders. *J Orofac Pain* 1996;10:66-72.
- De Leeuw R, Boering G, Stegenga B, De Bont LG. Clinical signs of TMJ osteoarthritis and internal derangement 30 years after nonsurgical treatment. *J Orofac Pain* 1994;8:18-24.
- De Leeuw R, Boering G, Stegenga B, De Bont LG. Symptoms temporomandibular joint osteoarthritis and internal derangement 30 years after non-surgical treatment. *Cranio* 1995;13:81-88.
- de Wijer A, Steenks MH, Bosman F, Helders PJ, Faber J. Symptoms of the stomatognathic system in temporomandibular and cervical spine disorders. *J Oral Rehabil* 1996;23:733-741.
- de Wijer A, Steenks MH, de Leeuw JR, Bosman F, Helders PJ. Symptoms of the cervical spine in temporomandibular and cervical spine disorders. *J Oral Rehabil* 1996;23: 742-750.
- Dionne RA. Pharmacologic treatments for temporomandibular disorders. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997;83:134-142.
- Dworkin SF, LeResche L. Research Diagnostic Criteria for Temporomandibular Disorders: Review, criteria, examinations and specifications, critique. *J Craniomandib Disord* 1992;6:501-555.
- Dworkin SF, Turner JA, Mani L, et al. A randomized clinical trial of a tailored comprehensive care treatment program for temporomandibular disorders. *J Orofac Pain* 2002;16:259-276.
- Egermark I, Blomqvist JE, Cromvik U, Isaksson S. Temporomandibular dysfunction in patients treated with orthodontics in combination with orthognathic surgery. *Eur J Orthod* 2000;22:537-544.
- Egermark I, Magnusson T, Carlsson GE. A 20-year follow-up of signs and symptoms of temporomandibular disorders and malocclusions in subjects with and without orthodontic treatment in childhood. *Angle Orthod* 2003;73: 109-115.
- Ekberg E, Nilner M. A 6- and 12-months follow-up of appliance therapy in TMD patients: A follow-up of a controlled trial. *Int J Prosthodont* 2002;15:564-570.
- Ekberg E, Vallon D, Nilner M. Treatment outcome of headache after occlusal appliance therapy in a randomised controlled trial among patients with temporomandibular disorders of mainly arthrogenous origin. *Swed Dent J* 2002;26:115-124.
- Emshoff R, Puffer P, Strobl H, Gassner R. Effect of temporomandibular joint arthrocentesis on synovial fluid mediator level of tumor necrosis factor-alpha: Implications for treatment outcome. *Int J Oral Maxillofac Surg* 2000;29: 176-182.
- Ernst E. Musculoskeletal conditions and complementary/alternative medicine. *Best Pract Res Clin Rheumatol* 2004;18:539-556.
- Farella M, Michelotti A, Oidice G, Milani S, Martina R. Unilateral posterior crossbite is not associated with TMJ clicking in young adolescents. *J Dent Res* 2007;86: 137-141.
- Forsell H, Kalso E, Koskela P, Vehmanen R, Puukka P, Alanen P. Occlusal treatments in temporomandibular disorders: A qualitative systematic review of randomised controlled trials. *Pain* 1999;83:549-560.
- Freund BJ, Schwartz M. Relief of tension-type headache symptoms in subjects with temporomandibular disorders treated with botulinum toxin-A. *Headache* 2002;42:1033-1037.
- Freund B, Schwartz M, Symington JM. Botulinum toxin: New treatment for temporomandibular disorders. *Br J Oral Maxillofac Surg* 2000;38:466-471.
- Gallo LM, Brasi M, Ernst B, Palla S. Relevance of mandibular helical axis analysis in functional and dysfunctional TMJs. *J Biomech* 2006;39:1716-1725.
- Gardea MA, Gatchel RJ, Mishra KD. Long-term efficacy of biobehavioral treatment of temporomandibular disorders. *J Behav Med* 2001;24:341-359.
- Greene CS. The etiology of temporomandibular disorders: Implications for treatment. *J Orofac Pain* 2001;15: 93-105.
- Hagag G, Yoshida L, Miura H. Occlusion, prosthodontic treatment, and temporomandibular disorders: A review. *J Med Dent Sci* 2000;47:61-66.

- Haketa T et al. Utility and validity of a new EMG-based bruxism detection system. *Int J Prosthodont* 2003;16:422–428.
- Henrikson T, Nilner M, Kurol J. Symptoms and signs of temporomandibular disorders before, during and after orthodontic treatment. *Swed Dent J* 1999;23:193–207.
- Henrikson T, Nilner M. Temporomandibular disorders, occlusion and orthodontic treatment. *J Orthod* 2002;30:129–137.
- Hoppenreijts TJ, Freihofer HP, Stoelinga PJ, Tuinzing DB, van 't Hof MA. Condylar remodelling and resorption after Le Fort I and bimaxillary osteotomies in patients with anterior open bite. A clinical and radiologic study. *Int J Oral Maxillofac Surg* 1998;27:81–91.
- Hoppenreijts TJ, Stoelinga PJ, Grace KL, Robben CM. Long term evaluation of patients with progressive condylar resorption following orthognathic surgery. *Int J Oral Maxillofac Surg* 1999;28:411–418. Huang GJ, LeResche L, Critchlow CW, Martin MD, Drangsholt MT. Risk factors for diagnostic subgroups of painful temporomandibular disorders (TMD). *J Dent Res* 2002;81:284–288.
- Hwang SJ, Haers PE, Seifert B, Sailer HF. Non surgical risk factors for condylar resorption after orthognathic surgery . *J Craniomaxillofac Surg* 2004;32:103–111.
- Ingerslev H. Functional disturbances of the masticatory system in schoolchildren. *J Dent Child* 1983;50:446–450.
- Kim MR, Graber TM, Viana MA. Orthodontics and temporomandibular disorder: A meta-analysis. *Am J Orthod Dentofacial Orthop* 2002;121:438–446.
- Koh H, Robinson PG. Occlusal adjustment for treating and preventing temporomandibular joint disorders (Cochrane Review). *The Cochrane Library*, Issue 3 (2003).
- Koh H, Robinson PG. Occlusal adjustment for treating and preventing temporomandibular disorders. *J Oral Rehabil* 2004;31:287–292.
- Kordass B. Computer-assisted instrumental functional diagnostics—State of development, possibilities, and limits. *Int J Comput Dent* 2002;5:249–269.
- Kropmans TJ, Dijkstra PU, Stegenga B, de Bont LG. Therapeutic outcome assessment in permanent temporomandibular joint disc displacement. *J Oral Rehabil* 1999;26:357–363.
- Kurita H, Kurashina K, Kotani A. Clinical effect of full coverage occlusal splint therapy for specific temporomandibular disorder conditions and symptoms. *J Prosthet Dent* 1997;78:506–510.
- LeResche L, Mancl LA, Drangsholt MT, Saunders K, Korff MV. Relationship of pain and symptoms to pubertal development in adolescents. *Pain* 2005;118:201–209.
- List T, Wahlund K, Wenneberg B, Dworkin SF. TMD in children and adolescents: Prevalence of pain, gender differences and perceived treatment need. 1999;13:9–20.
- List T, Wahlund K, Larsson B. Psychosocial functioning and dental factors in adolescents with temporomandibular disorders: A case-control study. *J Orofac Pain* 2001;15:218–227.
- List T, Axelsson S, Leijon G. Pharmacologic interventions in the treatment of temporomandibular disorders, atypical facial pain, and burning mouth syndrome. A qualitative systematic review. *J Orofac Pain* 2003;17:301–310.
- Lobbezoo-Scholte AM, de Wijer A, Steenks MH, Bosman F. Interexaminer reliability of six orthopaedic tests in diagnostic subgroups of craniomandibular disorders. *J Oral Rehabil* 1994;21:273–285.
- Magnusson T, Egermark I, Carlsson GE. Treatment received, treatment demand, and treatment need for temporomandibular disorders in 35-year-old subjects. *Cranio* 2002;20:11–17.
- McNeely ML, Armijo Olivo S, Magee DJ. A systematic review of the effectiveness of physical therapy for temporomandibular disorders. *Phys Ther* 2006;86:710–725.
- McNeill C. *Temporomandibular Disorders: Guidelines for Classification, Assessment and Management*. Chicago: Quintessence, 1993.
- Medlicott MS, Harris SR. A systematic review of the effectiveness of exercise, manual therapy, electrotherapy, relaxation training, and biofeedback in the management of temporomandibular disorder. *Phys Ther* 2006;86:955–973.
- Michelotti A, Steenks MH, Farella M, Parisini F, Cimino R, Martina R. The additional value of a home physical therapy regimen versus patient education only for the treatment of myofascial pain of the jaw muscles: short term results of a randomized clinical trial. *J Orofac Pain* 2004;18:114–125.
- Mohlin B, Kurol J. To what extent do deviations from an ideal occlusion constituted a health risk? *Swed Dent J* 2003;27:1–10.
- Mongini F, Ibertis F, Manfredi A. Long-term results in patients with disk displacement without reduction treated conservatively. *Cranio* 1996;14:301–355.
- Morneburg T, Pröschel P. Differences between traces of adjacent condylar points and their impact on clinical evaluation of condyle motion. *Int J Prosthodont* 1998;11:317–324.
- Naeije M, Huddlestone Slater JJR, Lobbezoo F. Variation in movement traces of the kinematic center of the temporomandibular joint. *J Orofac Pain* 1999;13:121–127.
- Nilner M. Musculoskeletal disorders and the occlusal interface. *Int J Prosthodont* 2004;18:297–299.
- Nilsson I-M, List T, Drangsholt M. Prevalence of temporomandibular pain and subsequent dental treatment in Swedish adolescents. *J Orofac Pain* 2005;19:144–150.
- Nilsson I-M, List T, Drangsholt M. The reliability and validity of self-reported temporomandibular pain in adolescents. *J Orofac Pain* 2006;20:138–144.
- Okeson JP. Occlusion and functional disorders of the masticatory system. *Dent Clin North Am* 1995;39:285–300.
- Okeson JP. The classification of orofacial pains. *Oral Maxillofac Surg Clin North Am* 2008;20:133–144.
- Plesh O, Stohler CS. Prosthetic rehabilitation in temporomandibular disorder and orofacial pain patients. Clinical problem solving. *Dent Clin North Am* 1992;36:581–589.
- Projectgroep Gnathologie. *Ned Tijdschr Tandheelkd* 2003;110:281–287.
- Pullinger AG, Seligman DA. Quantification and validation of predictive values of occlusal variables in temporomandibular disorders using a multifactorial analysis. *J Prosthet Dent* 2000;83:66–75.
- Raphael KG, Klausner JJ, Nayak S, Marbach JJ. Complementary and alternative therapy use by patients with myofascial temporomandibular disorders. *J Orofac Pain* 2003;17:36–41.
- Rees JS, Jagger DC. Abfraction lesions: Myth or reality? *J Esthet Restor Dent* 2003;15:263–271.
- Rosted P. Practical recommendations for the use of acupuncture in the treatment of temporomandibular disorders based on the outcome of published controlled studies. *Oral Dis* 2001;7:109–115.

- Santacatterina A, Paoli M, Peretta R, et al. A comparison between horizontal splint and repositioning splint in the treatment of 'disc dislocation with reduction.' Literature meta-analysis. *J Oral Rehabil* 1998;25:81-88.
- Sarita PT, Kreulen CM, Witter D, Creugers NH. Signs and symptoms associated with TMD in adults with shortened dental arches. *Int J Prosthodont* 2003;16:265-270.
- Schiffman A, Gross MD. Diagnostic targeting of temporomandibular disorders. *J Oral Rehabil* 2001;28:1056.
- Schiffman EL, Look JO, Hodges JS, et al. Randomized effectiveness study of four therapeutic strategies for TMJ closed lock. *J Dent Res* 2007;86:58-63.
- Schwartz M, Freund B. Treatment of temporomandibular disorders with botulinum toxin. *Clin J Pain* 2002;18:S198-S203.
- Seedorf H, Seetzen F, Scholz A, Sadat-Khonsari M R, Kirsch I, Jüde H D. Impact of posterior occlusal support on the condylar position. *J Oral Rehabil* 2004;31:759-763.
- Seligman DA, Pullinger AG. Analysis of occlusal variables dental attrition and age for distinguishing healthy controls from female patients with intracapsular temporomandibular disorders. *J Prosthet Dent* 2000;83:76-82.
- Seligman DA, Pullinger AG. Dental attrition models predicting temporomandibular joint disease or masticatory muscle pain versus asymptomatic controls. *J Oral Rehabil* 2006;33:789-799.
- Sherman JJ, Turk DC. Nonpharmacologic approaches to the management of myofascial temporomandibular disorders. *Curr Pain Headache Rep* 2001;5:421-431.
- Shi Z, Guo C, Awad M. Hyaluronate for temporomandibular joint disorders (Cochrane Review). *The Cochrane Library*, Issue 3 (2003).
- Skeppar J, Nilner M. Treatment of craniomandibular disorders in children and young adults. *J Orofac Pain* 1993;7:362-369.
- Sommer C. Pharmacotheapie of orofacialer Schmerz. *Schmerz* 2002;16:381-388.
- Steenks MH, de Wijer A. Diagnosis and classification of temporomandibular dysfunction by the general dental practitioner. *Ned Tijdschr Tandheelkd* 1996;103:243
- Sundqvist B, Magnusson T, Wenneberg B. Comparison between predicted and actual treatment outcome in patients with temporomandibular disorders treated by TMD-trained general dental practitioners. *Swed Dent J* 2003;27:131-141.
- Townsen D, Nicholson RA, Buenaver L, Bush F, Gramling S. Use of a habit reversal treatment for temporomandibular pain in a minimal therapist contact format. *J Behav Ther Exp Psychiatry* 2001;32:221-239.
- Tsukiyama Y, Baba K, Clark GT. An evidence-based assessment of occlusal adjustment as a treatment for temporomandibular disorders. *J Prosthet Dent* 2001;86:57-66.
- Tullberg M, Tsarapatsani P, Huggare J, Kopp S. Long-term follow-up of early treatment of unilateral forced posterior cross-bite with regard to temporomandibular disorders and associated symptoms. *Acta Odontol Scand* 2001;59:280-284.
- Turk DC. Psychosocial and behavioral assessments of patients with temporomandibular disorders: Diagnosis and treatment implications. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997;83:134-142.
- Turner JA, Mancl L, Aaron LA. Short and long-term efficacy of brief cognitive-behavioral therapy for patients with chronic temporomandibular disorder pain: A randomized, controlled trial. *Pain* 2006;121:181-194.
- Türp JC, Strub JR. Prosthetic rehabilitation in patients with temporomandibular disorders. *J Prosthet Dent* 1996;76:418-423.
- Türp JC, Kowalski CJ, O'Leary N, Stohler C. Pain maps from facial pain patients indicate a broad pain geography. *J Dent Res* 1998;77:1465-1472.
- Türp J. Ist die instrumentelle Funktionsanalyse eine empfehlenswerte Massnahme zur Diagnostik kranio-mandibulärer Funktionsstörungen. *Dtsch Zahnärztl Z* 2003;58:477-483.
- Vallon D, Akerman S, Nilner M, Petersson A. Long-term follow-up of intra-articular injections into the temporomandibular joint in patients with rheumatoid arthritis. *Swed Dent J* 2002;26:149-158.
- Vallon D, Nilner M, Soderfeldt B. Treatment outcome in patients with craniomandibular disorders of muscular origin: A 7-year follow-up. *J Orofac Pain* 1998;12:210-218.
- Van den Braber W, van der Bilt A, van der Glas HW, Bosman F, Rosenberg A, Koole R. The influence of orthognathic surgery on masticatory performance in retrognathic patients. *J Oral Rehabil* 2005;32:237-241.
- Van der Meulen MJ, de Leeuw JR. The use of questionnaire in TMD [in Dutch]. *Ned Tijdschr Tandheelkunde* 1996;103:271.
- Velly AM, Gornitsky M, Philippe P. Contributing factors to myofascial pain: A case control study. *Pain* 2003;104:491-499.
- Wahlund K, List T, Larsson B. Treatment of temporomandibular disorders among adolescents: A comparison between occlusal appliances, relaxation training and brief information. *Acta Odontol Scand* 2003;61:203-221.
- Wänman A, Agerberg G. Two year longitudinal study of signs of mandibular dysfunction in adolescents. *Acta Odontol Scand* 1986;44:333-342.
- Wenneberg B, Kopp S, Grondahl HG. Long-term effect of intra-articular injections of a glucocorticosteroid in to the TMJ: A clinical and radiographic 8 year follow-up. *J Craniomandib Disord* 1991;5:11-18.
- Wolford LM, Reich-Fischel O, Mehra P. Changes in temporomandibular joint dysfunction after orthognathic surgery. *J Oral Maxillofacial Surg* 2003;61:655-660.

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