CHAPTER
17

CHAPTER OUTLINE

Clinical Examination of the Orofacial Region in Patients with Headache

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In the guidelines of the American Academy of Orofacial Pain (AAOP), the term *temporomandibular disorders* (TMD) is defined as a collective term embracing a number of clinical problems that involve the masticatory muscles, temporomandibular joint and associated structures, or both (Okeson, 1996). In the general population TMDs are common clinical conditions. TMD is characterized by combinations of signs and symptoms in the locomotor system of the jaw, such as pain on mandibular movements, limitation and deviation in the range of motion of the mandible, and joint noises (Okeson, 1996). Because of the overlap of signs and symptoms in TMD, some cervical spine disorders, and tension-type headache, clinicians must evaluate the masticatory system in patients with persistent neck and head complaints in order to evaluate the condition of the masticatory system (Wijer de, 1995). Treatment directed toward functional disturbances of the masticatory system has a beneficial effect on mandibular dysfunction, and many patients who suffer from additional recurrent headaches experience a reduction of the frequency and severity of their headaches after this treatment (Magnusson & Carlsson, 1980). This chapter describes the clinical examination of the masticatory system, discusses some aspects of the overlap between TMD and cervical spine disorders, and presents a case report. After reading this chapter, the clinician should realize the necessity to include the masticatory system in the examination protocol in

patients with headache. The examination protocol and the choices to be made are described, as well as the protocol's implementation in daily practice.

A nationwide survey of oral conditions, treatment needs, and attitudes toward dental health care was carried out in the Netherlands. The TMD study, using the Helkimo Index to rate the severity of the condition, found that 21.5% of the Dutch population reported dysfunction. Fifteen percent perceived a need for treatment, and 44.4% clinically had signs and symptoms of TMD (Kanter de et al., 1992, 1993). The actual level of treatment need for TMD has been analyzed and has been estimated as 3% of the population. The disorder is more prevalent in women in the age group between 20 and 40 years. This aspect is discussed extensively in the scientific literature, and the possible link between its pathogenesis and the female hormonal axis is described (Isselee et al., 2002; LeResche et al., 1997; Wijnhoven et al., 2007). Generally speaking, the etiologic concepts related to nonspecific TMD can be divided into functional theories (neuromuscular), structural theories (occlusive-anatomic), or psychophysiologic theories. Some well-described models are the trauma theory (Zarb et al., 1995), internal derangement theory (Farrar, 1978), osteoarthritic theory (Stegenga et al., 1989), and psychophysiologic theory (Laskin, 1969; Dworkin, 1994). Epidemiologic, neuromuscular, and neurophysiologic studies have been inconclusive regarding the theoretical concept of the etiology of TMD (Ververs et al., 2004; Suvinen et al., 2005).

In the scientific literature, the subclassification of TMD is well established: arthrogenous, myogenous, and combined temporomandibular joint (TMJ) and muscle problems (Lobbezoo-Scholte 1993; Steenks et al., 2007). There is general agreement that patients with TMD should be screened for biomedical (axis I) and psychosocial (axis II) dysfunctions (Dworkin & LeResche, 1992; Turner & Dworkin, 2004), for example, by utilizing methods described and endorsed by the International RDC/TMD Consortium (www.rdc-tmdinternational.org), AAOP (www.aaop.org), or European Academy of Craniomandibular Disorders (EACD; www.eacmd.org).

Suggestions for how to manage patients' orofacial pain or TMD in clinical settings can be found in the consensus guidelines of the professional organizations (AAOP, EACD) or, for example, the University Consensus Statement of the Netherlands (Projectgroep Musculoskelettale, 2003). The RDC/TMD states that for research purposes, criteria are offered to allow standardization and replication of research into the most common forms of muscle- and joint-related TMD. The aim to have a better insight into the characteristics of the group of patients included in a study is important and should make comparison of study results possible.

TMD, like lumbar and cervical spine problems, is classified as *specific* (signs and symptoms of TMD accompanying a specific disease, such as rheumatoid arthritis, fracture, cranial neuralgias, or Ehlers-Danlos syndrome) or *nonspecific* (arthrogenous, myogenous, and combination; signs and symptoms of TMD without a specific disease) (**Figure 17.1**) (Steenks, 2007). Specific conditions are caused by a well-known pathophysiologic mechanism or by disorder in anatomic structures, such as tumor, fracture, infection, or nerve root compression. Specific conditions are classified within the International Classification of Diseases (ICD) system of the World Health Organization (e.g., juvenile rheumatoid arthritis with signs and symptoms of TMD). Non-specific locomotor problems are complaints for which no apparent specific cause can be found that offers an explanation for the symptoms, which means that the clarification of the condition, as far as we know now, is not related to a well-known pathophysiologic condition or pathology. In a patient classified as having nonspecific arthrogenous TMD, anterior disc displacement with reduction, the pathophysiologic condition seems to be clear; however, the alleged malposition of the disc is frequently present in healthy control subjects without further signs and symptoms of TMD or complaints. Many diseases are known to mimic TMD: dental or neurologic pathology, tumors, growth disturbances, and systemic diseases. Therefore, therapists working in this domain need to have knowledge of the probability of finding specific pathology in certain patient groups. Epidemiologic data (prevalence, incidence) and pathophysiologic knowledge will help the clinician judge the situation of each patient. When specific pathology is excluded, the condition is classified as nonspecific TMD.

It is important to include a comprehensive history, taking into account yellow flags (indicating psychosocial factors/axis II RDC/TMD) as well. When a patient has pain, it is also crucial to differentiate whether the condition is acute, subacute, or chronic; classify the type of the pain as neuropathic, inflammatory, or nociceptive; determine whether their symptoms are being caused by a known condition with a normal or abnormal presentation; determine which contextual factors or illness-impacting disorders (e.g., coping style, locus of control, emotional and social factors) are present; and deter-

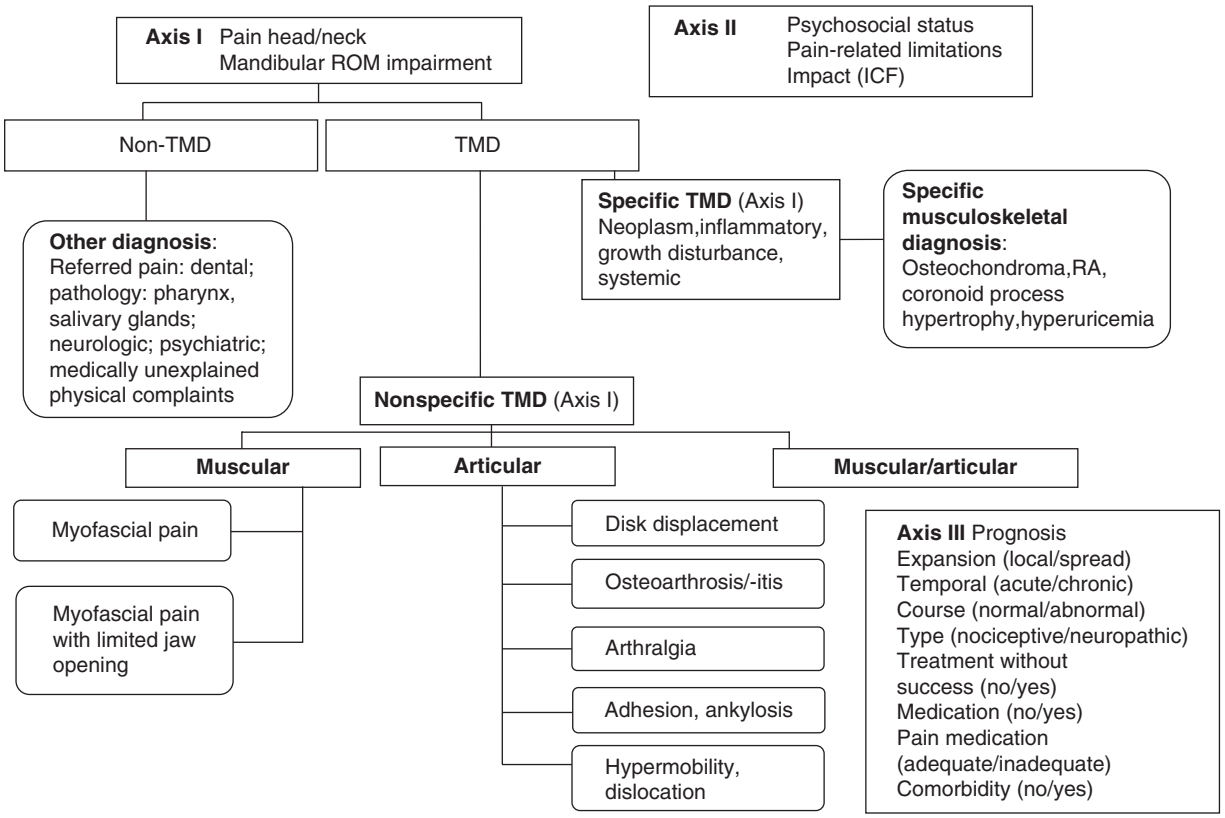

Figure 17.1 Flowchart of the Diagnostic Process in Suspected Painful Temporomandibular Disorders (TMD). Axis I represents the physical conditions. Non-TMD: Other conditions presenting with pain in the head and the neck and limitations of mandibular range of motion. Specific TMD: Conditions with a known substratum (e.g., neoplasms, growth disturbances, systemic disease). Nonspecific TMD: Conditions related to overloading or trauma surpassing the adaptation capacity. Generally divided into muscular and articular subgroups. Axis II represents psychosocial factors, which are increasingly important when chronicity plays a more prominent role. Axis III summarizes additional clinical considerations related to prognosis, such as pain characteristics, medication, and results of previous treatment. ROM, range of motion; RA, rheumatoid arthritis; ICF, International Classification of Functioning, Disability and Health of the World Health Organization

mine what the consequences of these factors are for the level of functioning and disability. Other goals related to clinical history taking are to meet the patient; to clarify the reason for the visit and the main complaint; to determine signs and symptoms and their consequences on the ICF levels; to discuss the patient's beliefs about the condition and its consequences; and to tune one's hypotheses with the patient's ideas, exchange expectations, and discuss evaluation and treatment plans. Readers are referred to Chapter 13 for a discussion of the clinical reasoning during the clinical interview.

In the medical literature, *diagnosis* usually refers to a disease classification that contains knowledge about the signs, symptoms, test results, and underlying pathology. In physical therapy, the ICF model of functioning and disability is used (Steiner et al., 2002). This model is a biopsychosocial model designed to provide a coherent view of various dimensions of health at biological, individual, and social levels. The traditional biomedical paradigm has its roots in the Cartesian division between mind and body and considers disease primarily as a failure within the soma. Currently, in clinical studies, authors include mental and social aspects in their definition of health.

TEMPOROMANDIBULAR DISORDERS AND CERVICAL SPINE DISORDERS

In physical therapy, postural abnormalities (forward head posture) and hypermobility are thought to be related to TMD, and therefore are discussed as treatment indications. TMJ or orofacial pain in this construct is the

result of muscle imbalance or poor posture. In the literature, however, there is no consensus on the exact role of posture in the development or perpetuation of TMD (Wijer de & Steenks, 1995; Olivo et al., 2006). Most of the studies are clinical observations and show several methodologic shortcomings. Forward head posture and rounded shoulders are frequently noticed in patient populations as well as in healthy people. In a conference statement in Milan in 1997, the EACD SIDO (Società Italiana di Ortodonzia), and SIMFER (Società Italiana di Medicina fisica e riabilitazione) declared that a correlation between occlusal and postural pathophysiology under functional and morphologic aspects has yet to be scientifically shown. In the light of that fact, the proposal of reversible or irreversible therapy for the treatment of postural problems is not justified. Likewise, the proposal of physical or rehabilitative therapy for the treatment of occlusal problems is not justified.

Conflicting results were found in studies that have been performed to analyze the association between TMJ disorders and general joint hypermobility. At this moment the scientific evidence regarding the association between temporomandibular disorders and generalized hypermobility is scarce and conflicting. It is still not clear whether general joint hypermobility is associated with TMD (Dijkstra et al., 2002). Coster et al. (2005) found a positive relationship between generalized joint hypermobility due to inherited autosomal dominant connective tissue disease (Marfan syndrome and Ehlers-Danlos syndrome) and TMD. In their hypermobile population (n = 42), multiple TMD group diagnoses were found in 69% of the subjects; the greater proportion presented with both myofascial pain and disc displacement associated with unilateral or bilateral TMJ arthralgia. Recurrent TMJ dislocations for several seconds were a frequent finding in symptomatic patients compared with asymptomatic individuals, but their contribution to TMD development remains elusive.

Many authors agree that, in addition to complaints concerning the masticatory system, signs and symptoms related to cervical spine disorders (CSDs) are also observed and reported. In TMD patients, the location of pain may range from the suboccipital area or the sternocleidomastoid area to the temporal area or the cheek and angle of the jaw, with the most frequently cited pain location being the preauricular area, temple, and cheek (Leeuw de et al., 1994). CSDs are common chronic conditions affecting the cervical region and related structures with or without radiation of pain to the shoulder, arm, interscapular region, and/or head. Like TMD patients, who may show signs and symptoms related to CSD, CSD patients may also show signs and symptoms related to TMD (Wijer de et al., 1996a, 1996b, 1996c). Many authors have indicated the existence of neuroanatomic and biomechanical relationships, and suggest that a dysfunction of the cervical spine may be the cause of signs and symptoms in the orofacial region (Sessle, 1999; Sjaastad, 1992; Wijer de & Steenks, 1995).

We assessed the prevalence of signs and symptoms related to CSD and TMD in order to determine whether CSD patients and subgroups of TMD patients differ with regard to specific signs, symptoms, and accompanying signs and symptoms (correlates) of TMD and CSD, and psychosocial factors or general health. In the diagnostic procedure, we use a standardized multidimensional self-administered questionnaire, Screen, (Leeuw de, 1993) and a functional examination of the stomatognathic system and the cervical spine (Lobbezoo-Scholte, 1993; Wijer de, 1995). In these Utrecht studies, the patient groups did not differ regarding correlates, with an exception of ear symptoms (more prevalent in TMD patients), as measured by the questionnaire. The mouth opening of CSD patients did not differ from that of the Dutch population and was in accordance with that of other studies with healthy controls. TMD patients with myogenous problems reported oral habits (i.e., grinding, clenching, or nail biting) more often than CSD patients, although no objective differences in oral habits between CSD and TMD patients were found. In spite of the biomechanical and anatomic relationship between the cervical spine and the stomatognathic system, the results of the studies show that CSD patients have signs and symptoms of TMD comparable to those of the adult Dutch population (Kanter de, 1990). Thus, the function of the masticatory system should be evaluated in patients with neck complaints in order to rule out the possible involvement of the masticatory system. Active and passive opening and palpation of the stomatognathic system can be used to discriminate between TMD and CSD patients (Wijer de, 1995). In contrast, orthopaedic tests of the cervical spine were of less importance in discriminating between patients with TMD and CSD (Wijer de et al., 1996b, 1996c).

EVIDENCE-BASED PRACTICE

There has been a progressive increase of controlled studies and systematic reviews in physical therapy. At this moment, clinical guidelines are part of the quality

system for physiotherapists as well. More than 20 guidelines for physiotherapy practice are available in the Netherlands (www.kngf.nl), with up-to-date information regarding the most effective diagnostic procedures and treatments in some particular conditions. In orofacial pain, two systematic reviews have been published (Medlicott & Harris, 2006, McNeely et al., 2006).

Evidence-based medicine, including evidence-based patient information, is currently part of daily practice, and the World Confederation for Physical Therapy promotes evidence-based practice worldwide in order to improve the care of patients, to use evidence from the highest available authorities to inform physiotherapists by balancing known benefits and risks, to make decisions more transparent, and to integrate patient preferences into decision making. The issue today is how much of what is firmly evidence based is actually applied in the front lines of patient care.

PHYSICAL EXAMINATION

Diagnosis of a TMD can be simple or very complex. A well-known example of a simple diagnosis is a local preauricular pain caused by a functional painful anterior disc displacement with reduction, where a relatively small amount of data from the history and clinical and radiologic examination provides enough information to arrive at a diagnosis. A patient with subacute nociceptive, myofascial, unilateral pain localized in the masseter muscle, due to a sudden overload and temporary biomechanical stressors, with a normal course and no contextual factors (no red or yellow flags) can be simple as well.

However, when a patient presents with a persistent chronic pain in the temporal region or at the side of the face, with an abnormal course, treatment failure, and contextual factors (axis II, yellow flags), the diagnostic process is more complicated. In these cases, the clinician is strongly advised to follow a more or less fixed pattern of steps in order to arrive at the correct diagnosis. A quick diagnosis can be incorrect, and the clinician must be aware of pitfalls in diagnostic processes. This is also the case in the diagnostic process of apparently simple cases. The simultaneous existence of diseases can cause diagnostic confusion. Each therapist must be aware of the symptom overlap in this area due to different causes. The most prevalent cause of orofacial pain is dentoalveolar. Therefore, it is advisable to work in close cooperation with the dental profession, especially when physical therapists have direct access. Nondental nociceptive pain caused by musculoskeletal conditions must not be mistaken for inflammation (sinusitis, otitis, parotis) or neurovascular syndromes (trigeminal or glossopharyngeal neuralgia, postherpetic pain, arteritis temporalis, headache such as migraine, central sensitization).

Clinical History

Examples of knowledge organization used in clinical reasoning include illness scripts and pattern recognition. In making use of illness scripts or pattern recognition, the clinician recognizes certain features of a case almost instantly (Edwards et al., 2004). Lobbezoo-Scholte et al. (1995) and Leeuw et al. (1994) subdivided the TMD group of patients. Their studies give insight regarding the subgroup characteristics. In contrast with the forward reasoning of illness scripts, hypothetic-deductive reasoning moves from a generalization (multiple hypotheses) toward a specific conclusion. These two cognitively oriented methods are often referred to as *diagnostic reasoning*. The RDC criteria for research in TMD are also meant to increase the standardized classification criteria for defining clinical subtypes of TMD. In this system, both clinical TMD conditions (axis I) with muscle disorders, disc displacements and arthralgia, and inflammation or infection and psychosocial conditions (axis II) with pain-related disability and psychological status should be included. The AAOP classification is especially meant for daily practice.

Screen, a multidimensional standardized questionnaire, contains questions about five dimensions: (a) quantitative and qualitative aspects of pain in the head, neck, and shoulders, and factors influencing pain; (b) symptoms of TMD, such as pain, joint sounds, limited range of motion, and locking or luxation; (c) accompanying signs and symptoms of TMD; (d) psychosocial factors such as nervousness, depression, anxiety, and life events; and (e) general health factors, monitored by questions about symptoms in joints other than the TMJ (widespread pain), the limbs, circulatory system, digestive tract, and respiratory system (Steenks & Wijer de, 1989, 1991, 1996; Leeuw de et al., 1994). Screen is filled out before the first visit, and the result is studied before the consultation. At the start of the first visit, the clinician begins with history taking, checking the information of the referring clinician, including the patient's demand, reason for the visit and main complaint, prescribed medication, comorbidity, and the presence of

relevant biopsychosocial factors that can influence the natural course of the disease.

Several other questionnaires can support the clinician as tools for judging the psychosocial aspects, such as the 4DKL, SCL-90, Fear-Avoidance Beliefs Questionnaire (FABQ), and Tampa Scale for Kinesiofobia. Personal factors, including lifestyle (e.g., sleeping habits, activities, eating, alcoholic beverages, drugs) and parafunctional and occupational habits (e.g., oral habits: clenching, grinding, nail biting, thumb sucking, or gum chewing), that may contribute to the origin or perpetuation of the problem will be evaluated with the patient. The therapist makes a survey of the actual health problem of the patient and determines prognostic factors and risk factors for treatment, called axis III by Steenks (Steenks et al., 2007) (Figure 17.1). On indication, the therapist includes other questionnaires, such as for patient-specific complaints, the Neck Disability Index, and headache or coping style. The Dutch Physiotherapy Association for TMD and Orofacial Pain has developed a toolkit with relevant information regarding diagnostic aids (www.NVFT.nl).

The history will guide the functional examination. This chapter focuses on the temporomandibular area. In general, the physiotherapist will judge the necessity of including the upper quarter (cervical spine, shoulder girdle, neurologic tests, and segmental tissue related to the face and head).

Intraoral and Extraoral Inspection and Orthopaedic Tests

Extraoral inspection or examination includes head, neck, and shoulder position, lymph nodes, skin condition, facial asymmetry, parafunctional habits, facial expression (mimic), oral behavior (tongue position in rest and while swallowing, speech), and breathing pattern (see Chapter 8).

The intraoral evaluation should focus on dental status, occlusal characteristics, restorations, hygiene, periodontal status, soft tissues (gingiva, tongue, floor of mouth, oropharynx), changes in occlusion, angle classification (I, II, III), overbite, wear facets, and guidance (canine, group) (**Figures 17.2, 17.3**). Orthopaedic tests commonly used to examine the function of the masticatory system are active and passive range of motion, palpation, traction and translation, and compression and resistance tests. During the tests, attention should be given to the presence, intensity, and location of pain; joint sounds, such as clicking and crepitating; and other signs, such as restriction of movement and abnormal end-feel.

Figure 17.2 Evaluation of the Occlusal Status

Figure 17.3 Examination of Wear Facets

On active mouth opening, the range of motion is measured in millimeters with a ruler interincisally (**Figure 17.4**), corrected for the overbite (**Figure 17.5**).

Figure 17.4 Assessment of Active Mouth Opening Range of Motion

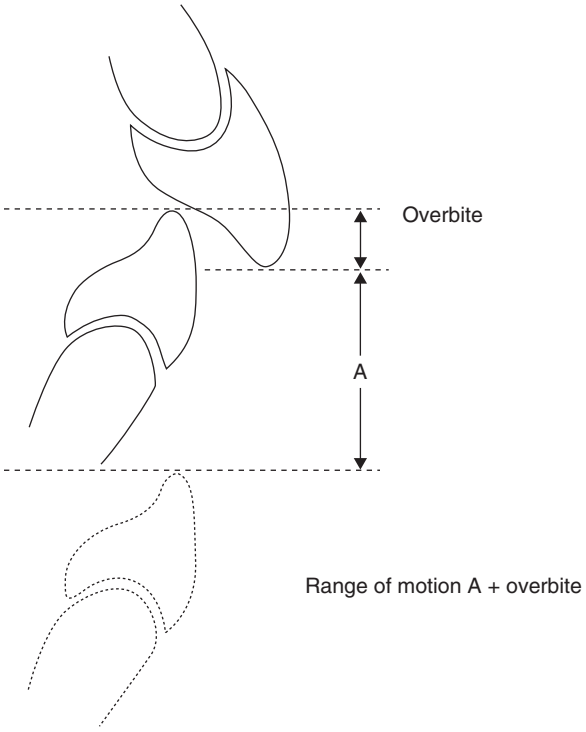

Figure 17.5 Overbite Correction for Active Mouth Opening Assessment

Horizontal movements are assessed by asking the patient to move the mandible in a lateral or anterior direction (protrusion). The distance of midline displacement in lateral movement is measured in millimeters and corrected for discrepancies in the starting position. In protrusion, the measurement will take place at the mesioincisal ridge of the right upper and lower central incisors, and the forward displacement of the mandible will be corrected for the overjet (**Figure 17.6**). Normal jaw opening is usually considered to be about three finger widths at the knuckles of the patient's dominant hand. Normal range of motion in opening in the healthy population is between 50 and 60 mm. **Table 17.1** presents the distribution of range of motion on active and passive mouth opening in TMD and CSD patients. The average active opening in our TMD patient group was 50 mm (7.5 mm, SD); on passive opening, 53 mm (7 mm, SD). The horizontal movements had an average score of 10 mm (2 mm, SD). Ten percent of the TMD patients had a mouth opening of less than 40 mm. A mouth opening of less than 40 mm is usually considered as limited, and less than 35 mm is considered inconvenient (e.g., for taking a bite or chewing). TMD patients reported a limited mouth opening more frequently (44% to 72% depending on the subgroup classification) than CSD patients (4%). In healthy individuals we expect the horizontal movements to be between 7 and 12 mm (protrusion includes overjet). In patients, pain, limited jaw function, midline deviation on opening, protrusion, differences in mandible left and right excursions, a discrepancy between active and passive movements, and a discrepancy between horizontal and vertical movement can be predictive for TMD as well.

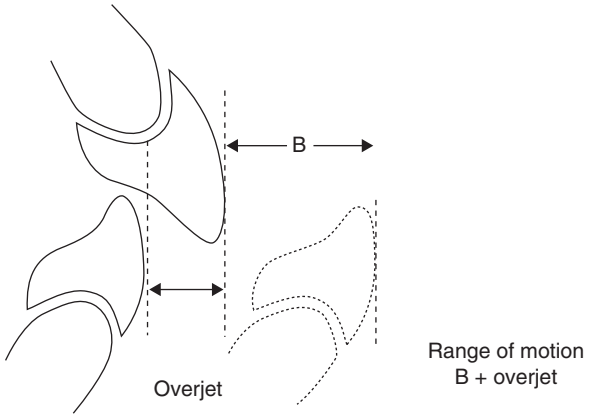

Figure 17.6 Evaluation of the Overjet

In passive movements the patient is asked to open the mouth. Then, a gentle pressure is exerted on the lower and upper incisors until the anatomic limit is reached (**Figure 17.7**). The end-feel distance—the difference (normally 2–3 mm) between the range of passive opening and active mouth opening—is measured, and signs and symptoms are documented.

Table 17.1 Range of Active and Passive Motion, Horizontal Overlap (Overjet) and Vertical Overlap (Overbite) in Patients with Temporomandibular Disorders and Patients with Cervical Spinal Disorders

	TMD (n = 111)			*CSD (n = 103)*		
Variables	**μ**	**SD**	**Range**	**μ**	**SD**	**Range**
Open active + overbite	50.0	7.5	31–65	53.7	7.8	38–80
Open passive + overbite	53.2	7.0	34–67	55.8	7.6	39–82
Laterotrusion right active	9.9	2.1	2–14	10.3	2.0	5–15
Laterotrusion left active	10.0	1.9	5–15	10.3	1.9	5–15
Protrusion active + overjet	10.2	2.0	6–14	10.6	1.9	7–18
Horizontal overlap (overjet)	4.1	2.0	1–11	4.2	1.7	1–11
Vertical overlap (overbite)	3.9	1.7	1–9	3.7	1.6	1–8

TMD, temporomandibular disorders; CSD, cervical spine disorders; μ, mean; SD, standard deviation.

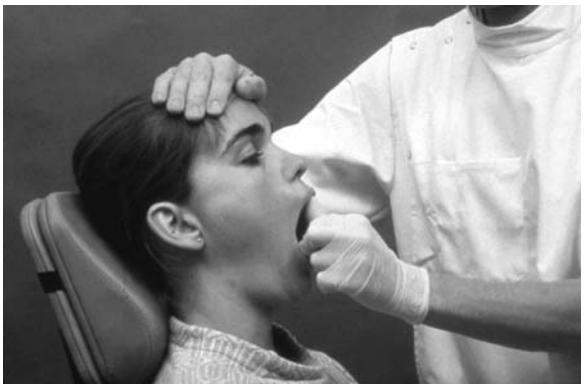

Figure 17.7 Application of Pressure on the Lower and Upper Incisors with the Mouth Open

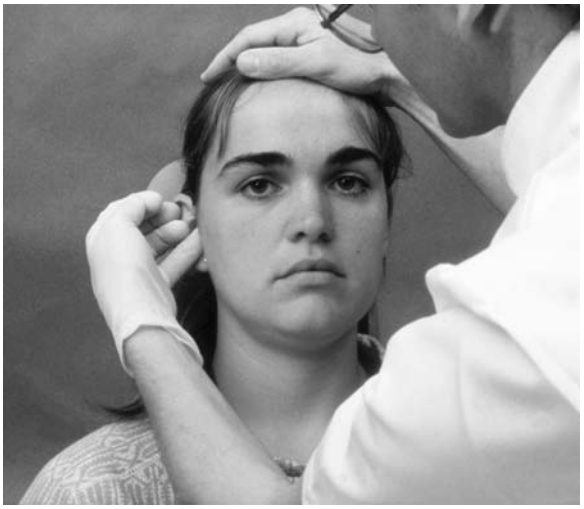

Figure 17.8 Palpation of the Temporomandibular Joint

The TMJ is palpated laterally slightly anterior to the tragus and posteriorly via the external meatus (**Figure 17.8**), with the mouth open or closed, with the mouth closed, and during opening and closing movements. The clinician should also palpate the masseter (**Figure 17.9**) and temporalis (**Figure 17.10**) muscles (including the insertion on the coronoid process intraorally) and the attachment of the medial pterygoid muscle extraorally. Palpation gives an impression about pain, muscle tone, structural changes, contrast between contraction and relaxation, and other provoked signs and symptoms (e.g., feeling of stiffness, dizziness, ear tingling).

The results of the active and passive movement test will give the clinician a first impression about the condition and the possible subgroup classification. Palpation will help to support this idea. It is important to realize that local pain can be the result of sensitization, with the cause being elsewhere (dental, throat, peripheral or central). The close interaction of some structures can be confusing as well. After history taking, inspection, functional examination, and information from the panoramic radiograph (**Figure 17.11**), it should be clear whether nonspecific TMD is present, and its subclassification can be established. The decision regarding the kind of radiographic evaluation will depend on the aims

Figure 17.9 Palpation of the Masseter Muscle

Figure 17.10 Palpation of the Temporalis Muscle

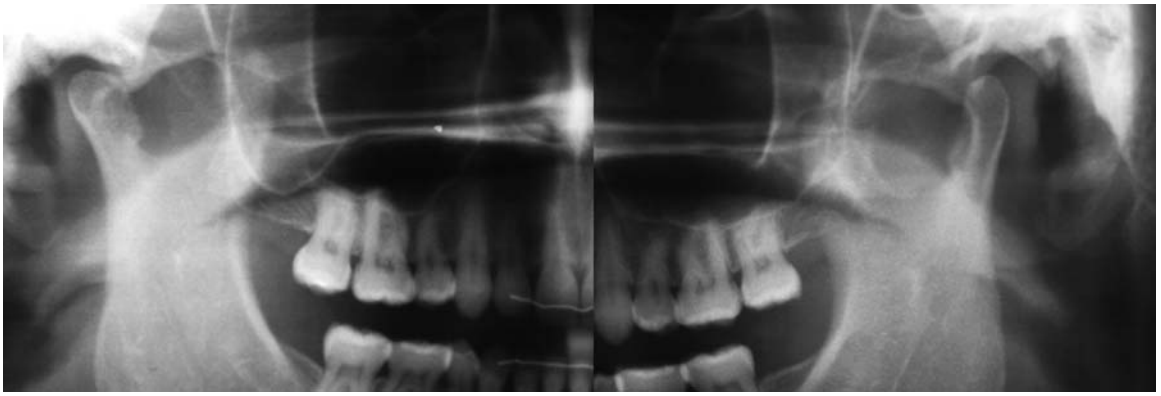

Figure 17.11 Panoramic Radiographs

and whether the imaging will influence the clinical course or treatment options. In the case of a specific TMD, magnetic resonance imaging and computed tomography can be indicated to obtain additional diagnostic information and weigh the treatment options.

On indication (e.g., closed lock), the clinician can get an impression of the joint function and local loading capacity by traction, translation, and compression techniques. For muscle loading, resistance tests can be helpful. Traction and translation tests will evaluate the passive accessory movement (joint play) and are executed with a thumb of the examiner placed on the occlusal surfaces of the molars (traction in caudal direction and translation in ventrodorsal direction) (**Figure 17.12**). The position of the thumb is changed to the lingual part of the molars for the mediolateral direction (**Figure 17.13**). Compression can be performed by a force in dorsocranial and ventrocranial directions, with the fixing hand providing a counterforce (**Figure 17.14**). Resistance tests are a static pain test with the mandible kept stationary and a gradually increasing force applied in each direction (**Figure 17.15**). Some masticatory and other relevant muscles cannot be directly palpated; an example is the lateral pterygoid muscle. These muscles are not incorporated in the examination protocol.

Measurement Properties

A basic requirement for a proper diagnosis is the reliability of the diagnostic procedure. The intra- and interexaminer reliability of the orthopaedic tests has been described extensively (Carlsson et al., 1980; Kopp & Wenneberg, 1983; Dworkin et al., 1990; Lobbezoo-Scholte et al., 1993; Steenks et al., 1996). The reliability of active and passive opening in all subgroups was high. The reliability scores for joint play tests were moderate (pain) to poor (end-feel). Physical

Figure 17.12 Traction in Caudal Direction and Translation in Ventrodorsal Direction

Figure 17.13 Translation in Mediolateral Direction

Figure 17.14 Compression in Dorsocranial or Ventrocranial Direction

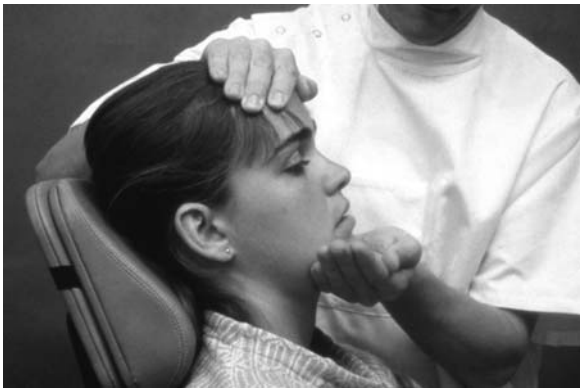

Figure 17.15 Resistance Test with the Mandible Stationary

therapists did not perform better than dentists (Vermeiren et al., 1995). The reliability scores for palpation were moderate.

Because the diagnostic process is based on combination of tests, and in some tests only a few signs and symptoms occur, multitest scores can be composed. The multitest scores for the combination of tests for the three main symptoms of TMD (i.e., pain, joint noises, and restriction of movement) are presented in **Table 17.2**. Multitest seores of combinations of tests are relevant because the establishment of the diagnosis is not based on single findings, but on multiple diagnostic tests (Haas, 1991a, 1991b). Because it is possible for two observers to disagree on the presence of pain in separate tests yet agree completely on the presence of pain during function, it seems that the presence or absence of musculoskeletal pain can be derived more accurately from the combination of five tests (active, passive, palpation, joint play, and resistance). Movement restriction and the presence or absence of joint noises are determined to be reliable when based on active movements. Pain is obviously a symptom with high intrinsic variability and many possible influences, making it difficult to obtain a high interrater reliability score. The reliability of the combination of the active movements, passive opening, and palpation tests is satisfactory.

We determined the diagnostic value of the different orthopaedic tests to get an impression of the validity of the diagnostic procedure (**Table 17.3**). A functional examination consisting of active movements, passive opening, and palpation provided valuable diagnostic information (Lobbezoo-Scholte et al., 1993). Additional tests (compression, traction/translation, resistance)

Table 17.2 Interexaminer Reliability of the Multitest Scores for Combinations of Tests for the Three Main Symptoms of Temporomandibular Disorder

Multitest Score Categories	Agreement (%)	K	Presence of Signs and Symptoms (%)
	Pain		
During active movements	65	0.3	49
During additional tests (passive opening, joint play, compression, static pain)	69	0.4	59
During function (active movements and/or additional tests)	89	0.7	69
During function and palpation	96	0.8	91
	Noise		
During active movements	80	0.6	55
During additional tests	68	0.3	32
During function	77	0.5	60
	Restriction of movement		
During active movements	92	0.6	10
During active movements and/or joint play tests	75	0.4	29

Modified from Lobbezoo-Scholte, 1993.

Table 17.3 Percentage of Subjects Correctly Classified by the Different Tests and Combination of Tests Selected by Stepwise Logistic Regression and Odds Ratio of the Myogenous Group Versus the Arthrogenous Group

	% Corrected Classified	% Corrected Classified M	% Corrected Classified A	OR
Active movements	78.6	84	74	15.36
Palpation	70.0	45	90	7.65
Combination of active movements and palpation	83.1	87	80	26.75
Passive opening	73.4	54	89	9.16
Joint play test	66.5	80	56	5.11
Compression	58.4	9	97	3.18
Static pain test	71.8	45	92	8.77
Combination of four tests	77.3	65	86	11.68
Combination of six tests	87.5	87	88	48.49

Modified from Lobbezoo-Scholte, 1993.

might be indicated if the subclassification is difficult (e.g., restricted mouth opening having an arthrogenous or myogenous origin); for example, disc displacement without reduction can be classified with a combination of active range of motion, passive opening, palpation, and translation tests. Our study showed that active movement was the most powerful test for distinguishing the different subgroups of patients, and passive opening and palpation were additionally useful for distinguishing between patients and control subjects and between the subgroups of arthrogenous and myogenous patients. Orthopaedic tests of the masticatory system can be used in patients with overlap of signs and symptoms to discriminate between CSD and TMD. In contrast, logistic regression analyses showed that orthopaedic tests of the cervical spine were of minor importance in discriminating between patients with TMD and CSD (Wijer de et al., 1996b, 1996c).

Conclusion

Because of the neurophysiologic and biomechanical interactions between the cervical spine and the stomatognathic system, overlap of signs and symptoms occurs. In TMD, patients will frequently perceive pain in the cervical area. CSD patients usually have signs and symptoms of TMD comparable with the epidemiologic data of the healthy population. This supports the idea that TMD can give rise to neck pain (sensitization). The physiotherapist must evaluate the masticatory system in patients with persistent head and neck pain.

CASE REPORT

Mrs. S.B., 31 years of age, visited our clinic with the following information from the oral surgeon. This patient had been seen in his office for more than 5 months with intermittent locking signs (closed lock) of the left TMJ (10 to 12 periods a day for a few minutes). She has had a history of clicking of the left joint for more than 4 years, related to diving. There has been a local pain in the preauricular area on the left side for more than 1 year. Besides the oral surgeon, S.B. also visited a dental specialist in orofacial pain and a physiotherapist for exercises. Splint therapy for more than 3 months was not successful. Because the response to treatment was inadequate, the patient had been referred.

Intake Questionnaire (Screen)

The main complaint is periodically closed lock of the left jaw, with pain and limited function. Question: What intervention will help restore normal jaw function and thereby eliminate locking and pain? The clinician can formulate the following question: Is an intervention available that will help restore normal jaw function in a diagnosed TMD patient already treated by counseling, exercises, and splinting?

The pain drawing in Screen shows a local pain in the preauricular area that is greater on the left than the right side. The intensity of the left-side preauricular pain is on average 4.5/10 cm (VAS), but can change between 4 and 8/10 cm. After exacerbation, the extra pain lasts for 15 to 30 minutes and decreases within 1 hour to the level of 2 to 3/10. The complaint has been present for more than 1 year; the frequency of pain and locking is increasing with time. There are no sleeping problems. The jaw frequently produces joint sounds during movements. There is pain on wide mouth opening and very inconvenient signs and symptoms of closed lock (mouth opening 20 mm). In the early morning, a stiff and tired feeling in the cheek area exists. She is aware of clenching but denies grinding activities. Other functional habits are nail biting and lip sucking. There is a reduction in functions such as biting an apple, eating soft, hard, and tough food, yawning, singing, and kissing. She has the impression that the occlusion has changed, and she had to change the mouthpiece for diving. There is no neck pain according to the questionnaire.

She experiences headache once a month related to the hormonal cycle, with vomiting and sharp pain. She works 22 hours a week as an office manager, can handle her work without problems, and has a good working environment without complaints. She is satisfied with her work and social life (mother with one child) and has no signs of depression, anxiety, or somatization. She avoids singing in the choir and long conversations at work. In the family history no problems are known.

Intraoral and Extraoral Inspection

There no signs or symptoms of red flags, and no signs of forward head posture. Attrition is 13/43 (Figure 17.3). There is facial asymmetry (right side of the face more prominent) and intraoral signs of clenching activities. No signs or symptoms related to a Sunday face, speech problems, forward deviation on opening, or change in position of the tongue or jaw exist. There are no deviating occlusal characteristics.

Mandibular Range of Motion: Active

- *Opening:* 50 mm + 3 mm overbite; deviation on mouth opening of 5 mm to the left within 20 mm range of motion, clicking sound (left TMJ, moderate) on 20 mm opening. *Repetition:* local preauricular pain increases. Pain is rated a 6 on a numeric rating scale (NRS) of 0–10 (0 no pain at all; 10 the most pain imaginable).
- Closing not affected, normal intercuspal position.
- *Horizontal left:* 9 mm.
- *Horizontal right:* 6 mm, slight pain (NRS 4), click in the end position.
- *Protrusion:* 6 + 2 mm overjet (slight deviation to the left of 3 mm).

Mandibular Range of Motion: Passive

- *Opening:* 51 mm + 3 mm overbite; preauricular pain on wide opening, NRS 5 on the left and

NRS 2 on the right, with deviation to the left and clicking.
- *Horizontal movements:* 9 to 10 mm, no pain provocation anterior and to the left side. To the right side, clicking and pain in end position (NRS 4).

Palpation

- The temporalis muscle did not show hypertonus; no pain on palpation, no palpable changes. The coronoid process showed local pain, with NRS 7 on the left side.
- Masseter muscle: deep as well as superficial part was painful on the left (NRS 3, local pain).
- Attachments medial pterygoid muscle (NRS 3, local pain) on the left side.

Conclusions

The oral surgeon referred a patient with an arthrogenous type of TMD on the left side due to an intermittent disc displacement without reduction. Muscle reactions were also noticed. Because the treatment result was negative, an arthrocentesis or intra-articular injection is considered. After the intake, we reached the following conclusion: a chronic orofacial, nonspecific pain in a 31-year-old woman with a clicking joint for more than 4 years, with clicking of the TMJ starting after the patient attended diving school. There are no red (medical comorbidity) or yellow flags (psychosocial), and the character of the pain is nociceptive from the locomotor system (the TMJ or muscles). The time table shows an increasing frequency of locking and more periods of increased local preauricular pain. The objective part of the clinical examination reveals a moderate severity, and the subjective part reveals a moderate to high severity with periods of loss of control that trouble the patient. In such a period with no control, she fears to move. The way in which she copes with her complaints is adequate most of the time; only in an acute stage during a closed lock does she become insecure. She avoids singing and long conversations. The intraoral stabilization splint reduces the complaints during the evening and night so she can sleep, but the splint does not influence the complaints during the day.

Intervention

A physiotherapeutic intervention was successful and consisted of counseling with the help of video film, with information regarding the function of the TMJ, joint sounds due to disc displacement, closed lock, and normal tongue position. Massage techniques (control hypertonus, tender points, structural changes, muscle contraction or stretching pain) were used by the physiotherapist on the masseter and temporalis, including deep friction (2–4 minutes) on the attachment coronoid process. Auto massage instruction (homework, twice a day) was provided. Further, habit reversal techniques were taught, whereby the patient monitors the habits and related signs and symptoms (clenching, nail biting, lip sucking, and mouthpiece use when diving), and the circumstances in which they occur, with instructions to exercise behavior opposite to the dysfunctional behavior. Mobilization techniques of the joint with traction and translation techniques, starting with oscillation and followed by manipulation, were also applied.

Homework exercise on opening without repetitive clicking was as described by Yoda et al. (2003): 1

> Open the mouth maximally with opening-click, close the mouth along the protrusive border movement path, contact the teeth at the protruded position, retrude to a contact position just before the click happens, open the mouth maximally again without the opening click and repeat this exercise for three [to] five minutes, three times a day.

In case of closed lock, a manipulation technique described by Minagi et al. (1991) was used: Place the thumb on the left side of the mandible and the fingers on the zygoma right side. Make a lateral excursion to the right side (nonaffected side) and open the mouth maximally through lateral right border path. Reciprocal clicking on the affected side occurs in the patient's case, and she could manage her closed lock in this way. The treatment was applied once a week for 4 weeks. 2

The postintervention evaluation revealed a pain-free active function and passive opening of the mandible, a decrease in frequency of the locks, less intense clicking, and more control in mandibular function. There was no need for further treatment, and the long-term follow-up (interview by phone after 6 months and 1 year) shows a good result on the level of impairment and function and no treatment demand.

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