Diagnostic methods and devices for temporomandibular disorder

Metode dan perangkat untuk diagnostik gangguan temporomandibula

[1]Winnie Munte, [1]Devina Angga, [2]Ricca Chairunnisa
[1]Prosthodontics Specialist Study Program
[2]Department of Prosthodontic
Faculty of Dentistry Universitas Sumatera Utara
Medan, Indonesia
Corresponding author: **Winnie Munte,** E-mail: **winnie.munte@gmail.com**

ABSTRACT

Temporomandibular disorder (TMD) is the most common non-dental pain in the maxillofacial region. The diagnosis and management of TMD, remains a challenge for clinicians to this day, despite extensive clinical research into the topic. DC/TMD Protocol emerged in 1992 as Research Diagnostic Criteria for Temporomandibular Disorder (RDC/TMD). A dual-axis system of DC/TMD protocol composed of physical diagnoses (axis I) and psychosocial profiles (axis II), to diagnose TMD based on research results that is the most widely accepted and standardized tool for assessment and classification of TMD, with sensitivity and specificity established for the most common diagnoses of TMD. Other diagnostic tests also can provide additional information that may help verify or challenge the established clinical diagnosis. There are many different types of radiographic techniques that can be used to gain additional insight into the health and function of the TMJ. The fourth techniques are panoramic, cone beam computed tomography (CBCT), magnetic resonance image (MRI), and bone scintigraphy. Ultrasound images of the joints and surrounding tissues also can help to diagnose TMD. Another diagnostic tool to evaluate muscle function is electromyograph. Its efficiency is directly and objectively to detect electrical potential. These diagnostic methods and devices are commonly used by clinicians to diagnose TMD easily with determining specific tools.

Keywords: temporomandibular joint, temporomandibular disorder, research diagnostic criteria for temporomandibular disorder, radiographic technique

ABSTRAK

Gangguan temporomandibular (GTM) adalah nyeri non-gigi yang paling umum di daerah maksilofasial. Diagnosis dan manajemen GTM, tetap menjadi tantangan bagi dokter hingga hari ini, meskipun penelitian klinis ekstensif tentang topik tersebut. Protokol DC/TMD muncul pada tahun 1992 sebagai *Research Diagnostic Criteria for Temporomandibular Disorder* (RDC/TMD). Sistem dual-axis protokol DC/TMD yang terdiri atas diagnosis fisik (aksis-I) dan profil psikososial (aksis-II), untuk mendiagnosis GTM berdasarkan hasil penelitian yang merupakan peranti yang paling banyak diterima dan terstandarisasi untuk penilaian dan klasifikasi TMD, dengan sensitivitas dan spesifisitas yang ditetapkan untuk diagnosis GTM yang paling umum. Tes diagnostik lainnya juga dapat memberikan informasi tambahan yang dapat membantu memverifikasi atau menantang diagnosis klinis yang telah ditetapkan. Ada banyak jenis teknik radiografi yang dapat digunakan untuk mendapatkan wawasan tambahan tentang kesehatan dan fungsi sendi temporomandibula. Keempat teknik tersebut adalah panoramik, *cone beam computed tomography*, *magnetic resonance image*, dan skintigrafi tulang. Gambar ultrasound dari sendi dan jaringan di sekitarnya juga dapat membantu mendiagnosis GTM. Alat diagnostik lain untuk mengevaluasi fungsi otot adalah elektromiograf. Efisiensinya secara langsung dan objektif untuk mendeteksi potensi listrik. Metode dan perangkat diagnostik ini biasanya digunakan oleh dokter untuk mendiagnosis GTM dengan mudah dengan menentukan alat tertentu.

Kata kunci: sendi temporomandibula, gangguan temporomandibula, research diagnostic criteria for temporomandibular disorder, teknik radiografi

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INTRODUCTION

Temporomandibular disorder (TMD) is the most common non-dental point in the maxillofacial region. The diagnosis and management of TMD, remains a challenge for clinicians to this day, despite extensive clinical research into the topic. This is because TMD is a broad term comprising of different conditions with complex etiologies, with symptoms that are often sporadic and recurrent. Interestingly, some signs and symptoms resolve spontaneously even without treatment, whereas others persist for years despite all treatment options have been exhausted.[1]

TMD affect anywhere between 5-15% of adults in the population, yet it's related symptoms have been reported to be present in up to 50% of adults. Interestingly, there is evidence that the prevalence of TMD appears to be on the rise in recent years. A recent systematic review and meta-analysis in 2021 concluded that the prevalence of TMD was 31% for adults and 11% for children and adolescence.[1]

At the initial consultation, clinician should be able to recognize and identify the condition or potential occurrence of TMD. This is due to the condition could diminish quality at the time of performing or even after the completion of the planned dental treatment. Moreover, TMD may even be caused by the result of the den-

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tal treatment. In addition, a TMD problem may become the reason for the consultation, but it is not realized by the patient himself.[2]

TMD is characterized by clinical signs of pain or malfunction occurring jointly or separately, namely 1) pain in the temporomandibular joint (TMJ), 2) articular sounds, 3) pain in the muscles of mastication, 4) anomalies in mandibular movements, 5) signs and symptoms that may be associated with orofacial pain and or cervicoscapular problems.[2]

TMD may occurs when there has been changes in the position of mandible, can be excessively and no longer able to adapt, resulting in an imbalance of masticatory structure and/or the central nervous system.[2]

Symptom of TMD may be caused by structural anomalies of the TMJ, it should be noted that not all those with structural abnormalities suffer from the same level of clinical symptoms. Besides from physical causes, the association between biopsychosocial factors and TMD has been described. People in the population with risk for developing symptomatic TMD, also share a certain psychological profile and dysfunction. Higher levels of depression and somatization are associated with TMD of arthrogenous and myogenous origins. Especially, those with pre-existing TMD, symptoms may be worsen during stressful time. For example, recent studies have suggested that during the periods of lockdown and social isolation due to the ongoing Covid-19 pandemic, an impact was found on the prevalence of depressive symptoms, stress, as well as pain related to TMD.[1]

Psychological variables are closely tied to the development of TMD has been confirmed by the orofacial pain: prospective evaluation and risk assessment (OPPERA) study, which found that TMD onset was strongly associated with somatic symptoms, while previous life events, perceived stress and negative affect were also associated with the incidence of TMD.[1]

In this article, it will be discussed about diagnostic methods and devices for temporomandibular disorder

DIAGNOSTIC METHODS

Clinician must follow the standards, accompanied by photography and radiography when making a diagnosis of TMD.[2] First step is making an exclusion analysis, ruling out non-TMD pathoses whose prognoses could be far more serious; second imperative in TMD diagnosis is to adopt a global, bio-psychosocial viewpoint (combination of biological conditions, psychosocial dimensions, and structural conditions); third approach is done by therapeutic approaches, to relief the symptoms with conservative, reversible techniques that are as non-invasive as possible (Fig.1)

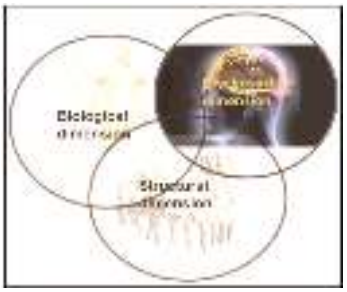

Figure 1 Etiopathological model of TMD in three dimensions (Source: Laplanche O, Ehrmann E, Pedeutour P, Duminil G. TMD clinical diagnostic classification (temporomandibular disorders). J Dentofac Anom Orthod 2012; 12: 1-26).

Table 1 Signs of TMD [2]

Clinical signs and symptoms of TMD
Anomalies of mandibular movement
Articular noises
Pain
Accessory symptoms potentially associated with TMD

Table 2 Measurement of mandibular movement[2]

Measurement of anomalies of mandibular movement	Mouth opening in mm
Normal mouth opening	35 – 45
Limitation of normal mouth opening	< 35
Exaggeration of mouth opening	>50

Table 3 Mandibular movement pattern [2]

Qualitative alterations in mandibular movement	Trajectory
Mandibular deviation	Bayonet opening
Mandibular deflection	Deviated rectangular opening

Laplanche et al[2] listed the principal past and current signs of TMD encountered either clinically or in the intake interview (Table 1). Anomalies of mandibular movement covers limitation of movement of the mandible, which is frequently related to a TMJ problem, and lack of control of mandibular translation and rotary movement because of acquired or systemic ligamentous laxity (Table 2 and Table 3).[2]

Articular sounds[2]

There are two articular sounds, namely 1) clicking. This sound occur most frequently when the condyle moves over the posterior glenoid of the disc during the translational actions of opening, propulsion, and contralateral excursion. This sound can also occur because of friction between ligaments or as the condyle passes in front of the articular eminence of the temporal bone in a kind of subluxation from hypertranslation; 2) crepitation that is usually evoked by some change in the articular surfaces that disrupt their 'gliding' contact.

Pain[2]

Pain can be highly variable, occurring spontan-

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eously or being triggered by mastication or palpation. Furthermore, it can be localized or referred to a distant region. Pain can be acute (suggesting to articular malfunction) or dull pain (suggesting an origin in muscular malfunction).

Symptoms potentially associated with TMD[2]

Commonly found symptoms that cannot be considered as reliable elements for establishing a positive diagnosis of TMD include 1) otic complaints such as tinnitus, sensation of blockage, and sensations of exaggerated or diminished hearing; 2) ocular disturbance such as peri or retro-orbital discomfort, and problems of accommodation; 3) cephalic discomfort derived from tension of the frontal, temporal, and suboccipital musculature; 4) neurovegetative manifestations of edema, rhinorrhea, and excessive lacrimation.[2]

DIAGNOSTIC DEVICES

Research Diagnostic Criteria for Temporomandibular Disorder (RDC/TMD) emerged in 1992 as an effort to diagnose TMD based on research results. The core principles used in this diagnostic approach include 1) biopsychosocial model to assess and classify disease and illness; 2) epidemiologic data for discerning distribution of signs and symptoms by sex and age and for identifying population norms from which disease could be better defined; 3) a dual-axis system composed of physical diagnoses (axis I) and psychosocial profiles (axis II); 4) strict operational definitions of terms, including precise specifications for the clinical examination as well as the classification of findings, and protocols for required reliability and validity studies; and 5) recognition that the initial effort required future data to be generated as the evidence basis for inevitable revisions.[3]

This RDC/TMD then underwent several revisions and improvements, so finally changed to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). DC/TMD is still developed, and Axis III is envisioned as a parallel construction to axes I and II. Axis III would present conceptual issues embedded in the "bio" part of the term "biopsychosocial" other than those biologic aspects present in axis I. While axis I alone would continue to carry the physical diagnoses of TMD, axis III would represent the underlying pathobiologic processes contributing to the TMD phenotype (genetics, epigenetics, and neuroscience genetics, epigenetics, and neuroscience).[3]

Researchers revealed that once Axis III is established, a physical diagnosis of Axis I was no longer necessary for chronic pain disorders. Furthermore, axis I is a special case of the "bio" in biopsychosocial, and it is likely that treatment targeted to that "bio" level will be revealed by further conceptual breakthroughs in formulating phenotypes from axis II domain while perhaps enabling etiology to emerge from axis III domain.[3]

In the past, classification of TMD was often confusing, with many different terminologies referring to similar entities. Today, the DC/TMD is the most widely accepted and standardized tool for assessment and classification of TMD, with sensitivity and specificity established for the most common diagnoses of TMD. Recognizing that TMD contains a structural as well as a biopsychosocial component, the DC/TMD consists of two axes in its assessment. Axis-I contains a protocol for a prescribed physical examination to arrive at specific physical diagnoses of TMD with regards to the joint and musculature, while Axis-II contains several instruments to assess the psychological state of the patient.[1]

DC/TMD Axis I

Axis I is a diagnostic protocol for disorders involving generalized pain and intra-articular abnormalities. Axis I provides standardized evaluation of subjective symptoms, from the examination method to the use of specific diagnostic criteria to interpret clinical findings. This clinical examination requires a patient history in the form of a questionnaire and a structured clinical examination.[4]

Ascertaining that the pain experienced in the clinical examination is familiar to the patient has proved to be very important for excluding irrelevant pain. Likewise, the questionnaire's timeframe "in the last 30 days" emphasizes a more clinically relevant pain that is both important to the individual and a reason why the patient is seeking care. Including these concepts in the provocation of pain; for example, through jaw movements and palpation–provides criteria to minimize false-positive findings.[4]

Clinical assessments evaluate pain localization, jaw movement limitations (lateral, protruding, and mouth opening), movement pain, TMJ noises, and pain upon palpation of the masticatory muscles and TMJ.[4] There are 12 most common diagnoses of TMD descricribed in Axis-I of the DC/TMD, which are divided into painful and non-painful conditions (Table 4).[1]

Note that in many cases, multiple diagnoses are present at any timepoint in a single patient, and that diagnoses may change as the disease progresses or resolves. The classification of TMD also include those that are less common, but clinically important diseases. These include fractures of the TMJ, manifestations of systemic diseases, as well as rare conditions such as neoplasms and developmental disorders (Table 5).[1]

DC/TMD Axis II

Chronic pain can affect cognitive, emotional, sen-

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Table 4 Common diagnoses of TMD and their clinical findings.[1]

Painful conditions	Clinical findings
Myalgia	Familiar pain in the masseter or temporalis upon palpation or mouth opening
Local Myalgia	Familiar pain in the masseter or temporalis localized to the site of palpation
Myofascial pain	Pain in the masseter or temporalis spreading beyond the site of palpation but within the confines of the muscle
Myofascial pain with referral	Pain in the masseter or temporalis beyond the confines of the muscle being palpated
Arthralgia	Familiar pain in the TMJ upon palpation or during function
Headache attributed to TMD	Headache in the temple upon palpation of the temporalis muscle or during function
Non-painful conditions	
Disc displacement with reduction	Clicking in the TMJ upon function
Disc displacement with reduction with intermittent locking	Clicking in the TMJ with reported episodes of limited mouth opening
Disc displacement without reduction with limited opening	Limited mouth opening affecting function, with maximum assisted opening <40mm
Disc displacement without reduction without limited opening	Limited mouth opening affecting function, with maximum assisted opening of ≥ 40mm
Degenerative joint disease	Crepitus of the TMJ upon function
Subluxation	History of jaw locking in an open mouth position, cannot close without a self-maneuver

Table 5 Some less common diagnoses of TMD. [1]

I. TMJ
A. Joint pain 1. Arthritis B. Joint disorders 1. Hypomobility disorders other than disc disorders a. Adhesions/Adherence b. Ankylosis (Fibrous or Osseous) 2. TMJ dislocations C. Joint diseases 1. Systemic arthritides 2. Condylysis /Idiopathic condylar resorption 3. Osteonecrosis 4. Neoplasm D. Fractures E. Congenital/ Developmental disorder 1. Aplasia 2. Hypoplasia 3. Hyperplasia
II. MASTICATORY MUSCLES
A. Muscle Pain 1. Tendonitis 2. Myositis 3. Spasm B. Contractue C. Hypertropy D. Neoplasm E. Movement Disorder 1. Orofasial Dyskinesia 2. Oromandibular Dystonia F. Masticatory muscle pain related to central/systemic pain disorder 1. Fibromyalgia/widespread pain
III. ASSOCIATED STRUCTURES
A. Coronoid hyperplasia

sory and behavioral reactions. These things can be worsen and make the pain persistent. Therefore, it is important to have an assessment of the patient's psychosocial to be considered in the treatment plan and evaluation of the prognosis. Axis II is used in this assessment and is accompanied by a guide to interpretation. Axis II is divided into two options, rapid examination (for general practitioners) and comprehensive examination (for specialists). [4]

The used-tools will be indicated by specialist clinicians or researchers to get a more comprehensive evaluation of physchosocial functioning which will be described in table 6.[5]

ADDITIONAL DIAGNOSTIC TESTS

Other diagnostic tests can provide additional information that may help verify or challenge the established clinical diagnosis. It should always be remembered that these additional tests are only used to obtain additional information and not to establish a diagnosis.[6]

There are many different types of radiographic techniques that can be used to gain additional insight into the health and function of TMJ. When pain symptoms arise from the joint and it is possible that it is accompanied by a pathological condition, a TMJ radiograph should be performed. This will provide information regarding (1) the morphological characteristics of the bony components of the joint and (2) the specific functional relationship between the condyle and the fossa.[6]

Radiographs of the TMJ are complicated by several anatomical and technical circumstances that preclude clear and unobstructed visualization of the joint. Specific techniques have been developed to help evaluate the TMJ. The three techniques are panoramic, cone beam computed tomography (CBCT) and magnetic resonance image (MRI). A fourth technique that may be helpful in certain conditions is bone scintigraphy.[6]

Panoramic radiograph[6]

Panoramic radiographs can provide screening of

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Table 6 Axis II measurement recommendation protocol [5]

Domain	Instrument	No. of items	Screening	Comprehensive
Pain Intensity	Graded Chronic Pain Scale (GCPS)	3	✓	✓
Pain Location	Pain drawing	1	✓	✓
Physical Function	Graded Chronic Pain Scale (GCPS)	4	✓	✓
Limitation	Jaw Functional Limitation Scale – short form (JFLS)	8	✓	✓
	Jaw Functional Limitation 4Scale – long form (JFLS)	20		
Distress	Patient Health Questionnaire-4 (PHQ-4)	4	✓	✓
Depression	Patient Health Questi21onnaire-9 (PHQ-9)	9		✓
Anxiety	Generalized Anxiety Disorder - 7 (GAD-7)	7		✓
Physical symptoms	Patient Health Questionnaire-15 (PHQ-15)	15		✓
parafunction	Oral Behaviors Checklist (OBC)	21	✓	✓

of the condyles (Fig.2). This is a good screening image, as its use results in minimum superimposition of structures over the condyle. Although the bony structure of the condyle is generally well evaluated, panoramic views have some limitations. With this technique, the condyle is the only structure that is well visualized. The articular fossa is often partially if not completely closed.

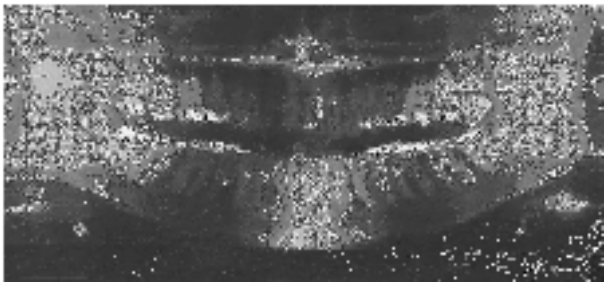

Figure 2 Panoramic radiograph

Cone beam computed tomography (CBCT). [6]

Tomography uses controlled movement of the X-ray tube head and film to obtain radiographs of the desired structure that intentionally obscures other structures. The advantage of CBCT is that images are more accurate and detailed than panoramic radiographs for identifying bony abnormalities or changes (Fig.3)

Figure 3 CBCT of normal condyles

Since this is a true sagittal view, one can better evaluate the position of the condylar in the fossae more accurately than a panograph. Another advantage of CBCT is that data is stored on a computer and can be reconstructed in three dimensions for a more focused visualization.

The disadvantage of CBCT is that the patient is exposed to higher radiation levels compared to panoramic radiographs. However, the dose is much less than that of computed tomography (CT) and the exact dose depends on the volume of field required and the type of CBCT used.

Magnetic resonance imaging (MRI)[6]

MRI has become the gold standard for evaluating the soft tissues of the TMJ, especially the disc position. Soft tissue visualization on MRI is better than CT scan, and has the great advantage of not introducing radiation into the patient that could cause tissue damaged. So far, MRI has shown no harmful effects. The disadvantage of MRI is that the unit is quite expensive and is not available in traditional dental settings. Another disadvantage is that it is usually a static image, although Cine MRI has only recently begun to provide information about disc and joint movement (Fig.4).

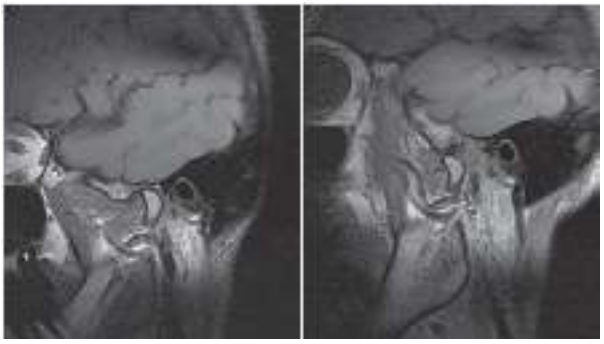

Figure 4 Normal TMJ with disc properly placed between the condyle and fossa.

Bone scintigraphy (bone scan). [6]

Standard radiographs may reveal that the morphology of the condyles has changed but cannot be helpful in determining whether the process is active (osteoarthritis) or inactive (osteoarthrosis). A bone scan is obtained by injecting a radiolabeled material into bloodstream which is then concentrated in areas of rapid bone turnover. After the material has moved to an area of increased bone activity, emission images are taken. A similar technique uses computed tomography (SPECT) single photon emission to identify areas of increased

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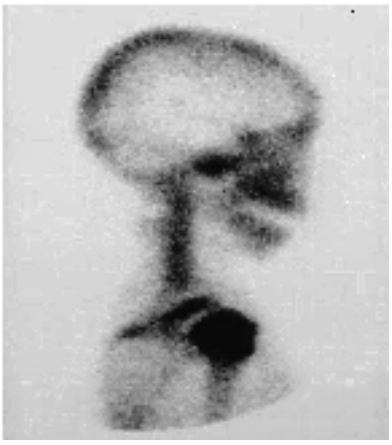

Figure 5 Bone scan of head and neck

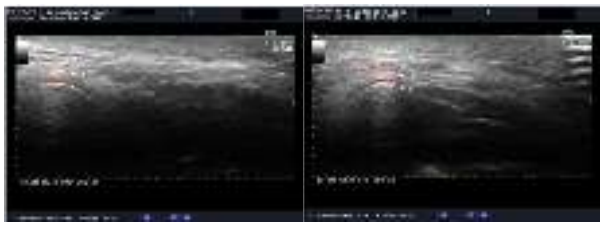

Figure 6A TMJ, coronal view, mouth open (arrow 1, TMJ capsule; 2, articular disc 3, condyle); **B** TMJ, coronal view, mouth closed (**1** TMJ capsule; **2** articular disc; **3** condyle)

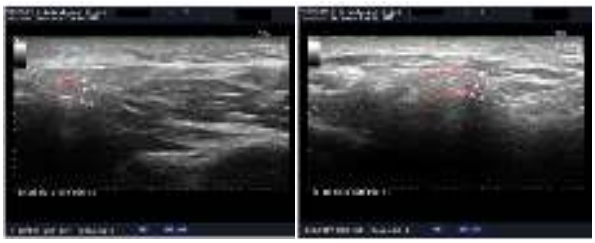

Figure 7A TMJ, axial view, mouth open (**1** TMJ capsule; **2** articular disc; **3** condyle); **B** TMJ, axial view, mouth closed (**1** TMJ capsule; **2** articular disc; **3** condyle)

activity in bone. This technique cannot distinguish between bone remodeling and degeneration. Therefore, the information must be combined with clinical findings in order to have meaning.

Ultrasound overview[7, 8]

Ultrasound images of the joints and surrounding tissues can help diagnosing TMD. This technique is cheap, non-invasive and fast. During an ultrasound examination of the TMJ, the patient is asked to be in a position with the mouth open and closed. Ultrasound results in a healthy patient (Fig.6), the probe is positioned perpendicular to the zygomatic position with the mouth open and closed alternately. In Fig.7, the probe is positioned parallel to the zygomatic arch with the mouth open and closed alternately. Dynamic ultrasound examnation was also performed on patients with the mouth open and closed simultaneously; according to Emshoff et al, this is an excellent method to exclude disc displacement. In the present study, this method was discontinued due to difficulty in tracking disc images when the mandible moves. It is recommended to use a probe with a band equal to or higher than 8 MHz. When analyzing using a probe, the examiner can observe with the probe frequency reaching 17 MHz. There are 2 methods in analyzing the image obtained. The first method, the direct method, involves examining the relationship between anatomical structures seen on ultrasound and making a diagnosis based on this. Another method is the indirect method which is based on the size of the joint space which is the basis for diagnosis.

According to research by Kaya et al., ultrasound is useful in diagnosing disc displacement but is not very effective in excluding TMJ disorders, although ultrasound can detect disc displacement, ultrasound can not determine the type of disc displacement so it is not suitable in detecting joint effusion.

Ultrasound examination is a procedure that depends on the skill and experience of the operator. A probe with a higher frequency (12 MHz) can produce a better picture of the network. The position of the transducer follows the chamfer line and is in the supine position. When calculating joint spacing, some investigators have found that examination with the mouth open gives a better picture of disc displacement and when mouth is closed it is more useful in determining the normal position of the disc. Other studies have found that it is difficult to pinpoint the location of the disc when the mouth is open because the bony structure blocks the underlying structure. Researchers also found that the sensitivity of ultrasound examination was higher when the mouth was open than when the mouth was closed.

It should be noted that only the lateral portion of the TMJ is visible on ultrasound images. The medial portion is obstructed by bony structures so that lateral or medial displacement and disc rotation are difficult to see on ultrasound images, thus giving a negative effect on the diagnosis. This encourages the use of an indirect method based on measuring the distance between the joint capsule and the condylar head.

Electromyography (EMG)[9]

Electromyograph is the only diagnostic tool to evaluate muscle function and its efficiency to directly and objectively detect electrical potential. This method has been widely used to diagnose patients with general muscle disorders, neuromuscular diseases and neuromuscular related diseases. Surface-EMG (sEMG) is global electromyography, as opposed to quantitative intramuscular electromyography which uses intramuscular needle electrodes. Where the results of the analysis with sEMG are still limited to 3 things: "general muscle activity, different muscle cooperation, and the variability of their activity over time". The main advantage

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of sEMG is that it is non-invasive, painless and is a harmless method of evaluating muscle function that can be used in the identification of TMD.

The most dominant condition in TMD is pain-related temporomandibular disorders (TMD-P). The main manifestation of TMD-P is persistent, recurring, or chronic pain affecting the TMJ jaw muscles and or surrounding structures. Subjects diagnosed with TMD-P modify the tension in their masticatory muscles. Pain can induce adaptation by reworking muscle activity to protect the masticatory motor system from possible trauma. During pain, muscle contraction can cause greater changes in electromagnographic activity, which can affect the accuracy of this tool.

DIAGNOSTIC DC/TMD

Pain in the DC/TMD diagnostic criteria was divided into three groups, muscle pain, joint pain, and headache, plus one schema for joint disorders: 1) muscle pain/myalgia. Myalgia is the most common pain and occurs in 80% of patients with TMD. At the time of provocation examination, the patient should be able to identify that the pain has been felt before; 2) joint pain/arthralgia. Arthralgia is often found together with myalgia; only in very rare cases (2%) arthralgia is found only as the only diagnosis; 3) headache, that is a headache associated with TMD. This pain occurs in the temporal area and is a secondary pain that is influenced by jaw movement during function or parafunction. This headache should also be present when the masticatory system is provoked. This condition can eliminate other causes of headaches, thus facilitating communication between dentists, neurologists, and specialists; 4) joint disorders that covers (a) the first joint deformity includes disc displacement with or without limitation of the mandibular opening. The term disc displacement is used to describe a biomechanical abnormality involving the complex relationship between the disc and the condyle. Clinical studies report that there is a prevalence of 10% in young adults and 30% in middle adults with disc displacement with reduction. Most report joint sounds, but are considered harmless if they do not cause pain or limitation in jaw movement. An MRI scan for this condition is needed to make a definitive diagnosis; (b) arthrosis or osteoarthrosis, which is a degenerative condition of the joints. This condition is characterized by loss of cartilage and bone, followed by remodeling of the underlying bone tissue. The diagnostic criteria for this condition are the presence of crepitus on jaw movement and confirmed by clinical findings. A CT scan is needed to confirm the diagnosis.[4]

It was concluded that TMD is a complex group of non-dental pain condition which similar to other chronic pain condition. The etiology was multifactorial and the diagnosis and management still remains a challenge for clinicians. Psychological variables are closely tied to the development of TMD has been confirmed by the orofacial pain. To diagnose TMD, clinician must know not only the clinical sign and symptom of TMD, but also has to take photography and radiography. The DC/TMD protocol is the most widely used to diagnonosed TMD and a standardized tool for assessment and classification of TMD. The axis I contains a protocol for a prescribed physical examination to arrive at specific physical diagnoses of TMD with regards to the joint and musculature; the axis II contains several instruments to assess the psychological state of the patients; and the axis III represent the underlying pathobiologic processes contributing to the TMD phenotype. Other diagnostic test can be used to obtain additional information and not to establish a diagnosis such as radiographic technique (panoramic, CBCT, MRI and bone scintigraphy), ultrasound to exclude disc displacement and electromyography to evaluate muscle function.

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