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Temporomandibular joint disorders

A project

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By

Hussein Sattar Mohammed

Supervised By

Lec. Muna Abdullah Saleem

B.D.S, M.S.C

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Supervisor Declaration

This is to certify organization and preparation of this project has been made by the graduate student Hussein Sattar Mohammed under my supervision at the Collage of Dentistry, University of Baghdad in a partial fulfillment of the requirement for the degree of B.D.S.

Signature:

Lec. Muna Abdullah Saleem

B.D.S †M.S.C.

Acknowledgment

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Dedication

To my father who taught me the meaning of life.

To my mother the origin of my success.

To my brothers and sisters, may God bless them.

To my soul mate who stand with me at every step and never let me alone.

To my all friends

They gave me the power to stay strong and never fall down.

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List of Abbreviation

TMJ	Temporomandibular joint.
TMD	Temporomandibular disorder.
DJD	Degenerative joint disease.

introduction

The temporomandibular joint is a unique bi-condylar joint involved in normal function of mouth. It plays a role in chewing, swallowing, speaking, oral health and nutrition (Kitsoulis et al., 2011).

The temporomandibular joint (TMJ) is formed by the mandibular condyle fitting into the mandibular fossa of the temporal bone. The articular disk and synovial spaces are separating the two bones. The disc is attached to the condyle both medially and laterally by collateral ligaments (Wadhwa and Kapila, 2008).

Temporomandibular joint is different from other joints in the body by: Both temporomandibular joints are joined by a single bone (mandibular bone) and movement in one joint cannot occur without similar coordinating movement in the other joint. The articulating surfaces of the joint are covered by fibrocartilage while other synovial joints in the body covered by hyaline cartilage. The joint has two types of movement hinge type and gliding type movements. The movement of the joint has a rigid end point when the teeth are bringing in maximum intercuspation. The condyle with disk act as one unit against the articular eminence and not against fossa (Greenberg et al., 2004).

The temporomandibular joint (TMJ) may be affected by inflammatory, traumatic, infectious, congenital, developmental, and neoplastic diseases, as seen in other joints. However, the most common affliction of the TMJ and masticatory apparatus is a group of functional disorders with associated pain that occurs predominantly in women and was previously known as the TMJ pain dysfunction syndrome (Laskin, 2008)

Aim of the study

To have information about the disorder that effect on the TMJ function and management of this disorder.

Review of literature

1- Anatomy of temporomandibular joint

The primary components of the TMJ are: as in (figure 1).

1. The mandibular condyle.
2. The articular surfaces of the temporal bone.
3. The articular disk.
4. The joint capsule.

The superior portion of the lateral pterygoid muscle is considered as a part of the joint by some authors because the disk is regarded as a direct extension of it. (Martin et al., 2008).

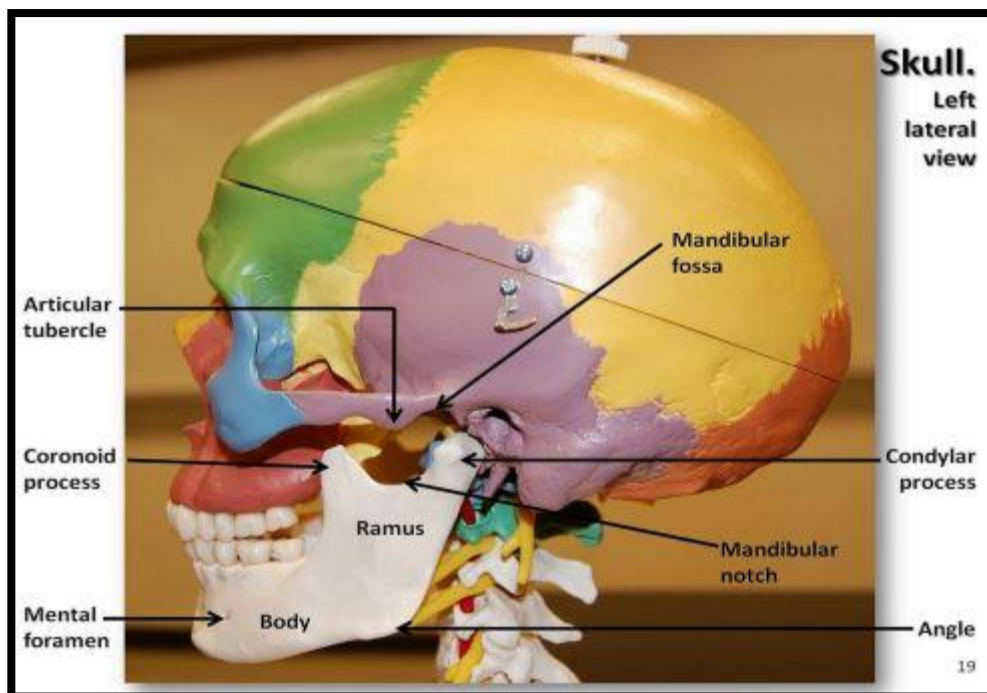


Figure (1) Bony components of TMJ. (Martin et al., 2008).

Muscles

Muscles of mastication as in figure (2). (Snell,2000).

1. Masseter muscle

It is a powerful rectangular muscle of two portions, the superficial and deep portion

2. Temporalis

It is a fan shaped muscle of three parts anterior, middle and posterior.

3. Medial pterygoid

It is a powerful rectangular muscle has two heads, the superficial head.

4. Lateral pterygoid.

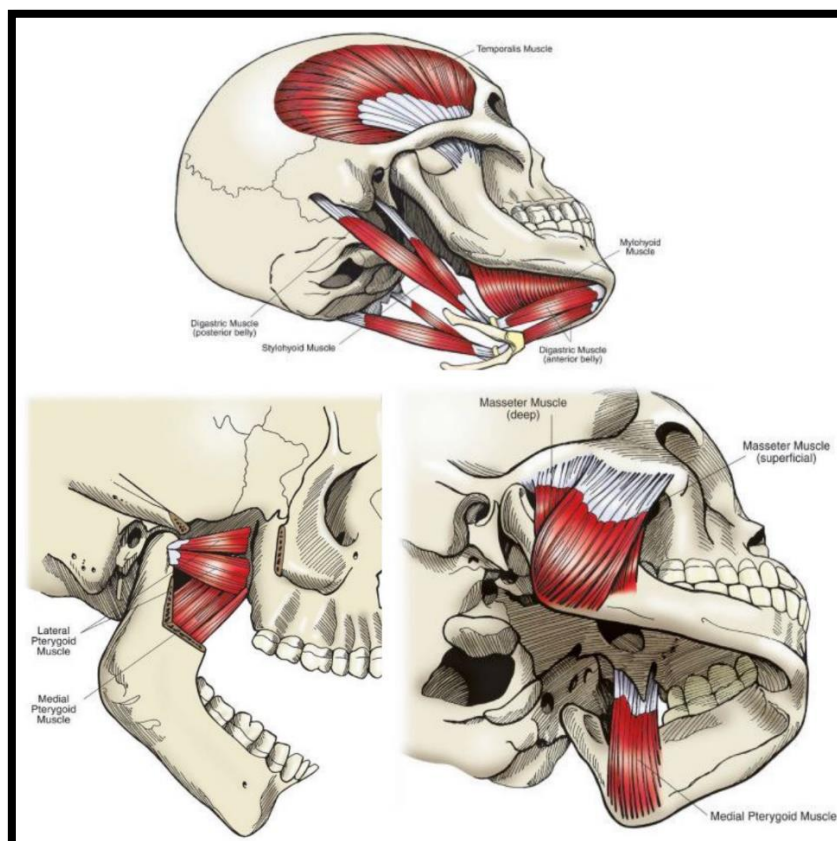


figure (2). Muscles of tempromandbular joint (Michael Glick, 2015)

Ligaments of Temporomandibular joint, figure (3)

1. The capsular ligament
2. The lateral temporomandibular ligament
3. The sphenomandibular ligament

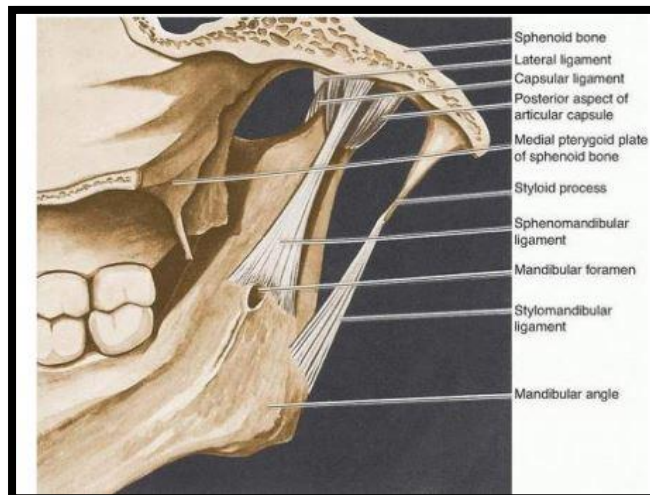


Figure (3) Ligaments of Temporomandibular joint (Martin et al., 2008).

Vascular and Nerve Supply of Temporomandibular Structures

The external carotid artery is the main blood supply for the temporomandibular structures. (Michael Glick, 2015)

The masticatory structures are innervated primarily by the motor fibers of trigeminal nerve (Michael Glick, 2015) Figure (4)

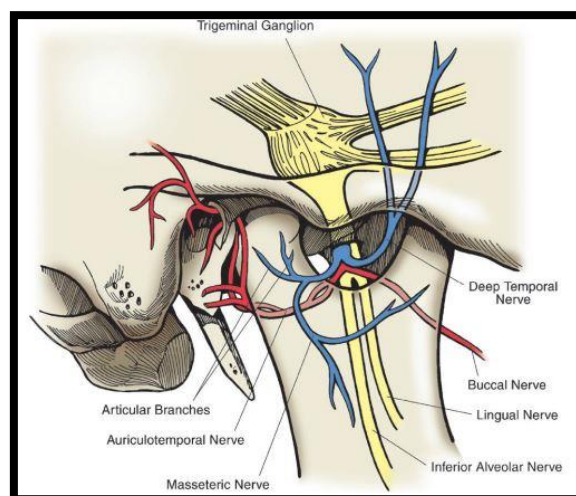


Figure (4) Vascular and Nerve Supply of Temporomandibular Structures (Michael Glick, 2015)

2- Normal Function of Temporomandibular Joint

At rest, the condyle is seated passively in the temporal fossa with the disc interposed at the most superior and anterior position of the condyle. (Michael Glick, 2015)

When the mouth opens, two distinct motions occur at the joint. The first motion is rotation around a horizontal axis through the condylar heads. The second motion is translation. The condyle and disk move together anteriorly beneath the articular eminence. When the mouth is fully open, the condyle may lie beneath the anterior band of the disk. (Michael Glick, 2015)

In the closed mouth position, the thick posterior band of the disk lies immediately above the condyle. As the condyle translates forward, the thinner intermediate zone of the disk becomes the articulating surface between the condyle and the articular eminence (Michael Glick, 2015) figure (5).

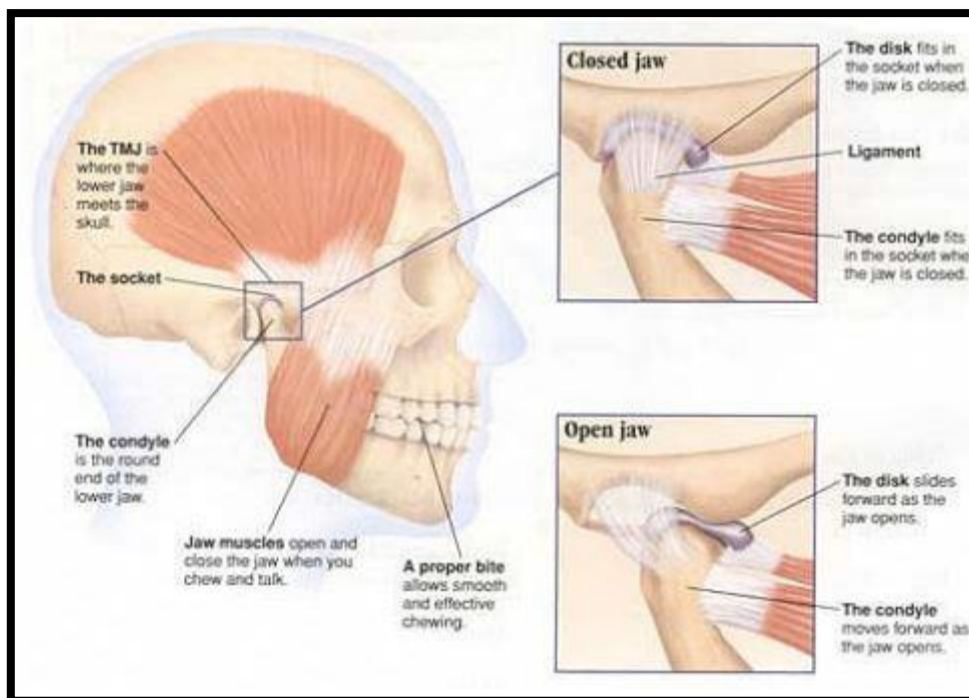


Figure (5) Normal motions of TMJ. (Michael Glick, 2015)

3- Temporomandibular Disorders (TMDs)

Temporomandibular disorders (TMDs) refer to collection of disorders characterized by:

1. pain in the temporomandibular joint (TMJ), the periauricular area, or the muscles of mastication.
2. TMJ noises (sounds) during mandibular function;
3. and deviations or limitation in mandibular range of motion. (Maydana et al, 2010).

Etiology

The etiology of temporomandibular disorders (TMDs) is multifactorial. These factors are classified as predisposing (structural, metabolic and/or psychologic conditions), initiating (e.g. trauma or repetitive adverse loading of the masticatory system) and aggravating (parafunction, hormonal, or psychosocial factors) to emphasize their role in the progression of TMD (Alarcon et al ., 2000).

Possible risk factors contributing to TMJ disorder:

1. Parafunctional habits (e.g., nocturnal bruxing, tooth clenching, lip or cheek biting)).
2. Emotional distress
3. Acute trauma from blows or impacts
4. Trauma from hyperextension (e.g., dental procedures, oral intubation for general anesthesia, yawning, hyperextension associated with cervical trauma)
5. Instability of maxillomandibular relationships
6. Laxity of the
7. Comorbidity of other rheumatic or musculoskeletal disorders
8. Poor general health and an unhealthy lifestyle (Packard, 2002).
9. Stress
10. Gender may present with characteristics (e.g.hormonal, constitutional factors, behavioral or psychosocial differences) that contribute to chronic TMD.

Signs and Symptoms of Temporomandibular Disorders (Michael Glick, 2015)

A-Myalgia

Pain of muscle origin that is affected by jaw movement, function, or parafunction, and replication of this pain occurs with provocation testing of the masticatory muscles.

B-Myofascial Pain with Referral

Pain of muscle origin as described for myalgia with referral of pain beyond the boundary of the masticatory muscle(s) being examined when using the myofascial examination protocol. Myofascial pain with referral is a subtype of myalgia.

C-Arthralgia

Pain of joint origin that is affected by jaw movement, function, or parafunction, and replication of this pain occurs with provocation testing of the TMJ.

D-Headache attributed to TMD

Headache in the temple area secondary to pain-related TMD that is affected by jaw movement, function, or parafunction, and replication of this headache occurs with provocation testing of the masticatory system.

Classification temporomandibular joint disorder

1- Most Common Intra-articular TMD.

A- Disc Displacement with Reduction

An intra-capsular biomechanical disorder involving the condyle–disc complex. In the closed mouth position, the disc is in an anterior position relative to the condylar head, and the disc reduces upon opening of the mouth.

Medial and lateral displacement of the disc may also be present. Clicking, popping, or snapping noises may occur with disc reduction. A history of prior locking in the closed position coupled with interference in mastication precludes this diagnosis. (Herb et al,2006).

B- Disc Displacement with Reduction with Intermittent Locking

An intracapsular biomechanical disorder involving the condyle–disc complex. In the closed mouth position, the disc is in an anterior position relative to the condylar head, and the disc intermittently reduces with opening of the mouth.

When the disc does not reduce with opening of the mouth, intermittent limited mandibular opening occurs. When limited opening occurs, a maneuver may be needed to unlock the TMJ. Medial and lateral displacement of the disc may also be present. Clicking, popping, or snapping noises may occur with disc reduction. (Michael Glick, 2015)

C- Disc Displacement Without Reduction with Limited Opening

An intracapsular biomechanical disorder involving the condyle–disc complex. In the closed mouth position, the disc is in an anterior position relative to the condylar head, and the disc does not reduce with opening of the mouth.

Medial and lateral displacement of the disc may also be present. This disorder is associated with persistent limited mandibular opening that does not resolve with the clinician or patient performing a specific manipulative maneuver. This is also referred to as “closed lock.” (Michael Glick, 2015)

D- Disc Displacement Without Reduction Without Limited Opening

An intracapsular biomechanical disorder involving the condyle–disc complex. In the closed mouth position, the disc is in an anterior relative the condylar head and the disc does not reduce with opening of the mouth. Medial and lateral displacement of the disc may also be present. This disorder is not associated with limited mandibular opening. (Michael Glick, 2015)

2- Inflammatory Joint Disorders

Inflammatory joint disorders are a group of disorders in which various tissues that make up the joint structure become inflamed as a result of insult or breakdown. Any or all joint structures may be involved.

Unlike disc derangement disorders, in which pain is often momentary and associated with joint movement, inflammatory disorders are characterized by constant, dull, aching pain that is accentuated by joint movement (Jeffrey, 2008).

A-Arthritides

Joint arthritides represent a group of disorders in which destructive bony changes are seen. One of the most common types of TMJ arthritides is called osteoarthritis, a degenerative joint disease DJD, is primarily a disorder of articular cartilage and subchondral bone, with secondary inflammation of the synovial membrane. (Michael Glick, 2015)

The causes may be chronic microtrauma or pressure. The microtrauma may be in the form of continuous abrasion of the articular surfaces as in natural wear associated with age or as increased loading forces possibly related to chronic parafunctional habits ((Michael Glick, 2015)

Degenerative joint disease may be divided into primary and secondary. DJD

1- Primary degenerative joint disease

Is of unknown origin, but genetic factors play an important role, often asymptomatic and is most commonly seen in patients above the age of 50 years (Michael Glick, 2015)

2- Secondary degenerative joint disease

results from a known underlying cause, such as trauma, congenital dysplasia, or metabolic disease. (Greenberg et al., 2004).

Many patients with mild to moderate Degenerative joint disease of the TMJ have no symptoms. Patients with symptomatic DJD of the TMJ may have:

1. unilateral pain directly over the condyle.
2. limitation of mandibular opening and crepitus.
3. feeling of stiffness after a period of inactivity. (Michael Glick, 2015)

B- Rheumatoid Arthritis

Rheumatoid arthritis (RA) is a chronic, systemic inflammatory disorder that may affect many tissues and organs, but principally the synovial joints. The TMJs are involved in approximately half of cases (Coulthard et al, 2003).

The disease process starts as a vasculitis of the synovial membrane, progresses to chronic inflammation marked by an intense round cell infiltrate and subsequent formation of granulation tissue. The cellular infiltrate spreads from the articular surfaces to cause an erosion of the underlying bone (Greenberg et al., 2004).

Rheumatoid arthritis (RA) is usually involved the TMJs bilaterally. The most common symptoms include:

1. pain and limitation of mandibular opening.
2. Pain is usually associated with the early acute phases of the disease but is not a common in later stages.
3. Morning stiffness, joint sounds, tenderness and swelling over the joint area are often experienced by the patients (Michael Glick, 2015)

The symptoms are usually temporary, and only some of patients with RA of the TMJs will experience permanent clinically significant disability (Greenberg et al., 2004).

3- Trauma Trauma is subdivided into:

A--Macro trauma

Macrotrauma leads either to fracture of the condyle head and neck or to less commonly dislocation of the mandible when the condyle is positioned anterior to the articular eminence and cannot return to its normal position without assistance, and may be unilateral or bilateral.

The patient with a condylar fracture usually presents with pain and edema over the joint area and limitation and deviation of the mandible to the injured side on opening. Bilateral condylar fractures may result in an anterior open bite. While the typical complaints of the patient with dislocation are an inability to close the jaws and pain related to muscle spasm. (Greenberg et al., 2004).

B--Microtrauma

Microtrauma refers to any small force that is repeatedly applied to the joint structures over a long period of time such as bruxism and high spots. If loading exceeds the functional limit of the tissue, irreversible changes or damage can result. (Greenberg et al., 2004).

4- Diagnosis of Temporomandibular Disorders

1- Clinical Examination

A-History The patient

Should be asked about the presence of TMJ pain, noises that occur with chewing or yawning, a history of trauma, and ear pain. Questions about the involvement of other joints in the body are also important because this finding can be indicative of osteoarthritis or rheumatoid arthritis, so taking thorough medical history, dental history and personal history (Michael Glick, 2015)

B--Physical Examination

Physical examination is primarily including the inspection of facial asymmetry, swelling, and masseter and temporal muscle hypertrophy and notice the opening pattern whether its straight, deviated or deviated with correction (Michael Glick, 2015)

Assessment of range of mandibular movement by measuring the maximum mouth opening with comfort, with pain and with clinician assistance, thus to differentiate the restrictions due to muscle or joint, also evaluate the maximum lateral and protrusive movements (Greenberg et al., 2004).

Palpation of the TMJ palpated on both sides of the face with mouth open and close to reveal pain and irregularities during condylar movement, and joints sounds like clicking and crepitus. In addition to joint noises and pain, there may be palpable differences in the form of the condyle when comparing right and left.

Assessment of parafunctional habits by the examination of tooth wear, multiple fracture of enamel and restorations, and soft-tissue changes like lip or cheek chewing, a hyperplastic occlusal line, and scalloped tongue borders (Greenberg et al., 2004).

2- Imaging

Several methods are available for imaging the TMJ including:

- A- Basic radiography for hard tissues.
- B- Arthrography when an indirect image of the disc is obtained by injection of a radiopaque contrast agent into one or both joints spaces under fluoroscopic guidance with opportunity for minor surgical treatment (Coulthard et al, 2003).
- C- Ultrasonography and magnetic resonance imaging enable visualizing of soft tissues such as the disc, ligaments, and muscles to be useful in diagnosis of internal derangement or joint dysfunction (Michael Glick, 2015)
- D- Cone beam computed tomography is a new technology provides three dimensions 3-D imaging of the oral and maxillofacial complex (Howerton and Mora, 2008).

5- Treatment of Temporomandibular Disorders

Treatment is aimed towards symptomatic relief and not cures, since most of the conditions that affect the temporomandibular system are untreatable. It should be conservative and reversible, and if this failed, irreversible treatment such as surgery should be offered but only in extreme conditions (Jerjes et al, 2008).

A-Home care

Are number one for most clinicians. Commonly used homecare measures may include

- 1- avoidance of parafunctional habits,
- 2- change to a soft consistency diet,
- 3- limited talking, and avoidance of wide yawning,
- 4- use of physical therapy such as local application of ice for acute pain or heat for low-grade chronic pain.
- 5- Passive or active jaw exercises have been recommended for joint clicking, restricted opening, irregular mandibular movement, lack of muscle coordination, and recurrent anterior dislocation of the condyle (Michael Glick, 2015)

B-Dental techniques

Dental techniques are including the following:

- 1- **Splint therapy** a variety of occlusal splint designs has been. The most common type is a hard intraocclusal splint, that covers the maxillary or mandibular teeth, preventing the grinding behavior from causing additional damage to the teeth. Theoretically, the splints reduce masticatory muscle activity (Kafas et al, 2007).

2- Occlusal adjustment

involves repositioning the mandible in a centric position by prosthodontic or orthodontic means and/or occlusal adjustment done by selective grinding of teeth to have better fitting between the maxillary and mandibular teeth. (Michael Glick, 2015)

3- Selective grinding is indicated when

- a- The occlusal appliance has eliminated the occlusal symptoms.
- b- Attempts to identify the feature of the appliance that affects the symptoms have revealed that it is the occlusal contact or jaw position (Jeffrey, 2008).

C- Pharmacotherapy

Mild analgesic, nonsteroidal anti-inflammatory analgesic drugs (NSAIDs), antianxiety agents, tricyclic antidepressants, and muscle relaxants are medications used as part of initial treatment.

Drug therapy as part of TMD management should follow the general principles of analgesic therapy and be used on a fixed dose schedule rather than as needed for pain (Martin et al, 2008).

D-Surgery

Surgery is indicated only in specific articular disorders, especially when there is **no response** usually to conservative treatment, and the patient's quality of life has been significantly affected.

Surgical management may vary from closed surgical procedures, such as arthrocentesis and arthroscopy, to more complex open joint operations, like arthrotomy, disk repositioning, discectomy and condylotomy (Michael Glick, 2015)

E- Complementary therapy

Acupuncture therapy, dry needling and trigger point injections may provide some reduction in local pain and tenderness, but these benefits last less than six months.

The infrared therapy has a significant role in lowering the hyperactivity of the masticatory muscles (Kameel, 2005).

F- Cognitive-behavioral therapy

Cognitive-behavioral programs utilize a variety of techniques that help patients to identify cognitive, behavioral and environmental triggers of pain, to develop strategies for coping more effectively with pain and its consequences (Jerjes et al, 2008).

CBCT is effective in reducing pain and disability in TMDs patients particularly in combination with other treatment modalities, such as medication and biofeedback (Gardea et al, 2001).

Conclusions

Temporomandibular disorders remain a frequent cause of visits to primary care physicians, internists, and pediatricians. Some approaches to understanding the basic causes of these conditions may prove to be promising, as much of the fundamental pathophysiology remains poorly understood.

Substantial improvements have been made in our diagnostic and imaging capabilities, and some treatment advances have been helpful in the long-term management of these common disorders. Future efforts in the fields of genetics, pain research, and arthritis offer the possibility of better defining this heterogeneous group of disorders and providing more focused and effective treatment strategies.

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