

Recent Non-Invasive Trends in the Management of Temporo-Mandibular Joint Disorders (TMDs)

Essay

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Abstract

The Temporo-mandibular joint (TMJ) is a ginglymo-arthrodial joint since it is both a ginglymus (hinging) joint and an arthrodial (sliding) joint that allows both side to side movement as well as a gliding motion.

Temporo-mandibular joint disorders (TMDs) are a class of degenerative musculoskeletal conditions associated with morphological and functional deformities. TMD can be divided into articular and extra articular abnormalities.

Diagnosis criteria include symptoms and signs along with the patient's history and a thorough clinical and radiological investigation of the TMJ.

The non-invasive modalities implemented most commonly include physical therapy, orthodontics, occlusal splints and/or adjustments and pharmacological medications.

Although minimal and non-invasive techniques are successful in management of TMD, Invasive surgeries may be needed in later stages.

Keywords:Temporo-mandibular joint (TMJ), Temporo-mandibular disorders (TMDs), Noninvasive, Management.

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List of Abbreviations:

TMJ: Temporo-mandibular joint

TMDs: Temporo-mandibular disorders

CT: Conventional tomography

CBCT: Cone- Beam computed tomography

MRI: Magnetic Resonance imaging

PD: Proton density

FLASH: Fast low angle shot

NSAIDs: Non-steroidal anti-inflammatory drugs

FDA: Food and Drug administration

Aim of the work

The aim of the work is to review recent modalities for management of Temporo-mandibular Joint Disorders (TMDs) with minimal and non-invasive techniques.

Introduction

The Temporo-mandibular joint (TMJ) is a ginglymo-arthrodial joint since it is both a ginglymus (hinging) joint and an arthrodial (sliding) joint that allows both side to side movement as well as a gliding motion. As other synovial joints in the body, TMJ has articular surfaces, fibrous capsule, synovial fluid, synovial membrane and ligaments. Yet, the characteristic feature of the TMJs is the articular disc. The disc is composed of fibro-cartilaginous tissue which is positioned between the two bones that form the joint, the glenoid fossa of the temporal bone and the condylar head of the mandible. The disc divides each TMJ into two compartments. These two compartments are synovial cavities, which consists of an upper and lower synovial cavities. (Asim et al., 2014)

Temporo-mandibular joint disorders (TMDs) are a class of degenerative musculoskeletal conditions associated with morphological and functional deformities. TMD can be divided into articular and extra articular abnormalities. (Murphy et al., 2013)

Diagnosis criteria include symptoms and signs along with the patient's history and a thorough clinical and radiological investigation of the TMJ. (Ohrbach et al., 2013)

In management of the TMD symptoms, it has been established that non-invasive modalities should first be explored. (Murphy et al., 2013)

The non-invasive modalities implemented most commonly include physical therapy, orthodontics, occlusal splints and/or adjustments and pharmacological medications. (Navratil et al., 2014)

In this review, Management will start by modifying the patient's lifestyle including diet adjustment along with behavioral modifications and psychological consultation which is needed to help patients to understand and avoid stress-related lifestyle habits. (Guidelines for diagnosis and Management of Disorders involving the Temporo-mandibular joint and related Musculoskeletal Structures, 2001)

The primary intervention for pain in patients with TMD is the use of pharmacotherapy. The aim of pharmacotherapy is not curative but rather to aid the patients in managing the dysfunction and discomfort which occurs as the result of suffering from such a chronic disorder. (Mujakperuo et al., 2010)

Physical therapy, laser and manual/exercise techniques are used to relieve pain in the joint and masticatory muscles and improve the range of motion.

Laser acupuncture as an alternative treatment modality for TMDs is now strongly debated because it is non-invasive, results in

partial or total relief of pain and has no side effects. (Huang et al., 2014)

Occlusal adjustments and splints may be used to achieve the most stable and least joint traumatizing bite position. The ultimate goal of splints and adjustments is to minimize pain in the joint and masticatory muscles by establishing stability and treatment of occlusal disharmony. (Navratil et al., 2014)

Minimally invasive modalities are used if non-invasive methods fail to reach their goal in treatment or in diagnosis and pre-operative planning. They include sodium hyaluronate and corticosteroid injections, arthrocentesis and arthroscopy. These techniques require entrance into the joint capsule to lubricate articulating surfaces and reduce inflammation. (Navratil et al., 2014)

Although minimal and non-invasive techniques are successful in management of TMD, Invasive surgeries may be needed in later stages. (Kurtus, 2012)

Temporomandibular joint (TMJ), also known as Craniomandibular joint is a special type of joint. It is a Ginglymoid (Hinge) joint and a condyloid (Bicondylar) joint based on the shape of the articulating surfaces. It articulates between the squamous part of the temporal bone and the head of the mandibular condyle. It is also a complex joint because it involves two separate synovial joints in which they are separated by the presence of intracapsular disc and meniscus. (Durham, 2008)

Embryology:

Early TMJ structures emerge from a block of embryonic mesenchymal cells derived from the neural crest interposed between the developing temporal bone and the mandible. The critical period of morphogenesis of the TMJ occurs between the 7th and the 11th week of gestation (Velasco et al, 2009)

At about the 7th week, Meckels cartilage which is the skeletal element of the first branchial arch provides the template for mandibular development. It extends from the midline backwards and dorsally acting as a scaffold to the developing mandible. It terminates at the malleus and articulates with the incus cartilage forming the primary TMJ. The cartilages then ossify and become incorporated in the middle ear. (Sadler, 2010)

Two distinct regions of the mesenchymal condensation appear; the temporal blastemata and the condylar blastemata. The temporal blastema gives rise to the articular eminence and the glenoid fossa. The first appearance of the articular fossa occurs at approximately the 7-7.5 weeks. Up to 9 weeks of gestation, the shape of the articular fossa is convex later it progressively takes on its definitive concave shape. (Sadler, 2010)

The condylar blastema is formed from a condensation of mesenchymal cells which then proliferate and differentiate into the condylar cartilage. Growth of the condylar blastema causes both blastematas to meet about the twelfth week. Cavitation then occurs by a process of cell death and breakdown to form upper and lower joint spaces so that the basic morphology of the joint is established by the 14th week. (Velasco et al., 2009)

The TMJ changes and adapts with age to functional stress. The articular layer which is vascular at birth becomes progressively fibrous as well as the articular disc which is initially flat and highly vascular. The central part of the articular disc thins out and the posterior parts become thicker. (Avery, 2001)

Anatomy:

The articular surface of the joint consists of a mandibular component and a cranial component. The mandibular component is an ovoid condylar process seated on top of a narrow mandibular

neck and its articular surface which lies on its antero-superior aspect is covered with a white fibro-cartilage. The lateral pole of the condyle is rough, bluntly pointed and projects only moderately from the plane of the ramus and the medial pole extends sharply inwards from this plane. (FangHänel and Gedr Ange, 2007)

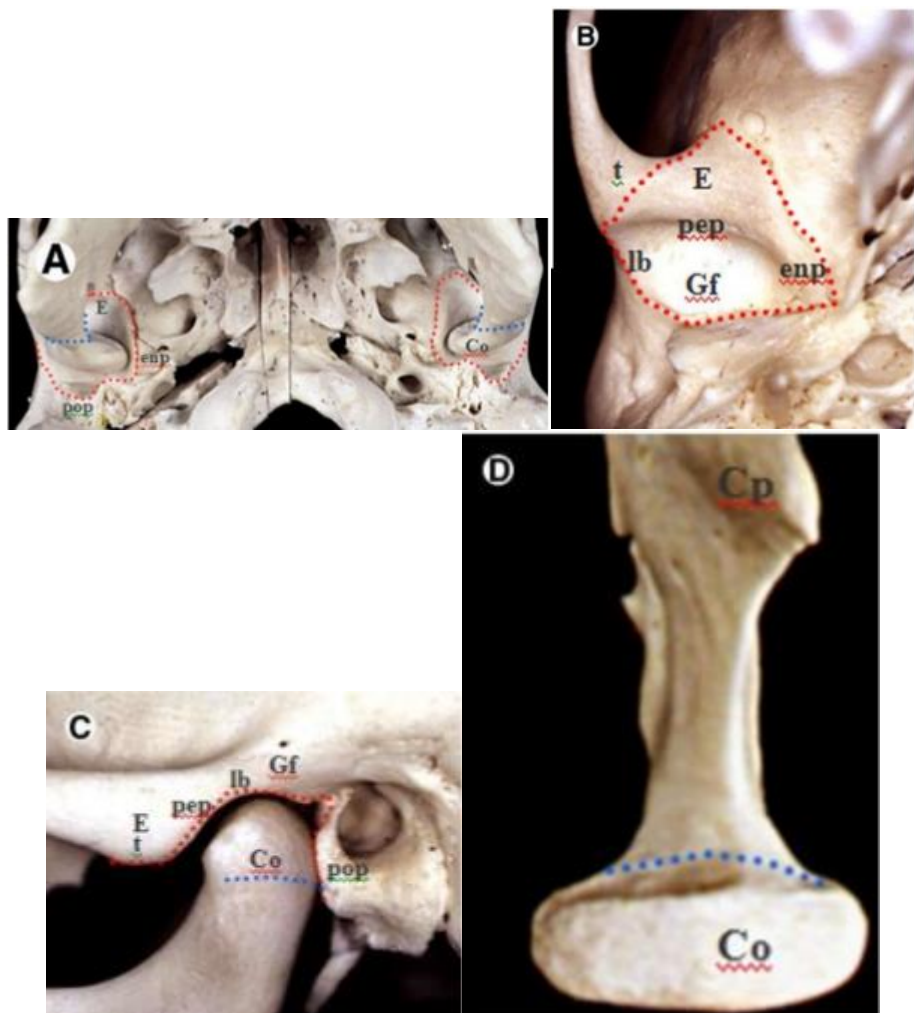


Figure 1: Anatomy of the TMJ;

E: Articular eminence, enp: entoglenoid process, t: articular tubercle, Co:

condyle, pop: post-glenoid process. lb: lateral border of the mandibular fossa, pep: pre-glenoid plane, Gf: glenoid fossa, Cp: condylar process
(Williams, 1999)

The cranial component is formed of the articular eminence, articular tubercle, pre-glenoid plane, posterior articular ridge and post-glenoid process and the lateral border of the mandibular fossa.

The articular eminence is a transverse bony bar that forms anteriorly the root of the arch of the zygoma. It is related to the condyle and articular disc as they ride forward and backward in the normal jaw function. The articular tubercle is a small, raised, rough bony knob on the outer end of the articular eminence which serves to attach the lateral collateral ligament of the joint. The pre-glenoid plane is a slightly hollowed, almost horizontal, articular surface continuing anteriorly from the height of the articular eminence. The posterior part of the mandibular fossa is an anterior margin of the petrosquamous suture and is elevated to form a ridge known as posterior articular ridge or lip. The ridge increases in height laterally to form a thickened cone shaped prominence called the postglenoid process. The lateral body of the mandibular fossa is usually raised to form a slight crest joining the articular tubercle in front with the postglenoid process behind. (Lee et al., 2001) (Williams, 1999)