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Anatomo-phisiological features of temporo-mandibular joint. Contractue, ankylosis of TMJ, dislocations of lower jaw: etiology, classification, pathogeny, clinic, differential diagnostics, treatment, basic principles of prophylaxis.

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Lecture plan

1.TMJ anatomy

- Capsule and articular disc
- Ligaments
- Nerve supply
- Blood supply
- Development
- Function
- Jaw movement

2.Clinical significance

- Pain
- Examination
- Disc displacement
- Congenital disorders
- Traumatic disorders
- Inflammatory disorders
- Degenerative disorders

The **temporomandibular joint** is the joint of the jaw and is frequently referred to as **TMJ.** The TMJ is a bilateral synovial articulation between the mandible and temporal bone. The name of the joint is derived from the two bones which form the joint: the upper temporal bone which is part of the cranium (skull), and the lower jaw or mandible.

There are six main components of the TMJ

- Mandibular condyles
- Articular surface of the temporal bone
- Capsule
- Articular disc
- Ligaments
- Lateral pterygoid m.

Capsule and articular disc

The capsule is a dense fibrous membrane that surrounds the joint and incorporates the articular eminence. It attaches to the articular eminence, the articular disc and the neck of the mandibular condyle.

The unique feature of the TMJs is the articular disc. The disc is composed of fibrocartilagenous tissue (like the firm and flexible elastic cartilage of the ear) which is positioned between the two bones that form the joint. The TMJs are one of the few synovial joints in the human body with an articular disc, another being the sternoclavicular joint. The disc divides each joint into two.

These two compartments are synovial cavities, which consists of an upper and a lower synovial cavity. The synovial membrane lining the joint capsule produces the synovial fluid that fills these cavities

The central area of the disc is avascular and lacks innervation, and, in contrast, the peripheral region has both blood vessels and nerves. Few cells are present, but fibroblasts and white blood cells are among these. The central area is also thinner but of denser consistency than the peripheral region, which is thicker but has a more cushioned consistency. The synovial fluid in the synovial cavities provides the nutrition for the avascular central area of the disc. With age, the entire disc thins and may undergo addition of cartilage in the central part, changes that may lead to impaired movement of the joint.

The lower joint compartment formed by the mandible and the articular disc is involved in rotational movement—this is the initial movement of the jaw when the mouth opens. The upper joint compartment formed by the articular disc and the temporal bone is involved in translational movement—this is the secondary gliding motion of the jaw as it is opened widely. The part of the mandible which mates to the under-surface of the disc is the condyle and the part of the temporal bone which mates to the upper surface of the disk is the articular fossa or glenoid fossa or mandibular fossa.

Ligaments

There are three ligaments associated with the TMJ:

one major and two minor ligaments.

These ligaments are important in that they define the border movements, or in other words, the farthest extents of movements, of the mandible. Movements of the mandible made past the extents functionally allowed by the muscular attachments will result in painful stimuli, and thus, movements past these more limited borders are rarely achieved in normal function.

The major ligament, the temporomandibular ligament,

is actually the thickened lateral portion of the capsule, and it has two parts: an outer oblique portion (OOP) and an inner horizontal portion (IHP). The base of this triangular ligament is attached to the zygomatic process of the temporal bone and the articular tubercle; its apex is fixed to the lateral side of the neck of the mandible. This ligament prevents the excessive retraction or moving backward of the mandible, a situation that might lead to problems with the TMJ.

The **two minor ligaments**, the **stylomandibular and sphenomandibular ligaments** are accessory and are not directly attached to any part of the joint.

The **stylomandibular ligament** separates the infratemporal region (anterior) from the parotid region (posterior), and runs from the styloid process to the angle of the mandible; it separates the parotid and submandibular salivary glands. It also becomes taut when the mandible is protruded.

The **sphenomandibular ligament** runs from the spine of the sphenoid bone to the lingula of mandible. The inferior alveolar nerve descends between the sphenomandibular ligament and the ramus of the mandible to gain access to the mandibular foramen. The sphenomandibular ligament, because of its attachment to the lingula, overlaps the opening of the foramen. It is a vestige of the embryonic lower jaw, Meckel cartilage. The ligament becomes accentuated and taut when the mandible is protruded.

Other ligaments, called **"oto-mandibular ligaments"**, connect middle ear (malleus) with TMJ.

Innervation

Sensory innervation of the temporomandibular joint is derived from the auriculotemporal and masseteric branches of V3 or mandibular branch of the trigeminal nerve. These are only sensory innervation. Recall that motor is to the muscles.

- The specific mechanics of proprioception in the temporomandibular joint involve four receptors. Ruffini endings function as static mechanoreceptors which position the mandible. Pacinian corpuscles are dynamic mechanoreceptors which accelerate movement during reflexes. Golgi tendon organs function as static mechanoreceptors for protection of ligaments around the temporomandibular joint. Free nerve endings are the pain receptors for protection of the temporomandibular joint itself.

Blood supply

Its arterial blood supply is provided by **branches of the external carotid artery**, predominately the superficial temporal branch. Other branches of the external carotid artery namely:

- the deep auricular artery,
- anterior tympanic artery,
- ascending pharyngeal artery and maxillary artery

- may also contribute to the arterial blood supply of the joint.

Function

Each TMJ is classed as a "ginglymoarthrodial" joint since it is both a ginglymus (hinging joint) and an arthrodial (sliding) joint. The condyle of the mandible articulates with the temporal bone in the mandibular fossa. The mandibular fossa is a concave depression in the squamous portion of the temporal bone.

Jaw movements

Normal full jaw opening is 40-50 millimeters as measured from edge of lower front teeth to edge of upper front teeth. During jaw movements, only the mandible moves.

Normal movements of the mandible during function, such as mastication, or chewing, are known as excursions. There are two lateral excursions (left and right) and the forward excursion, known as protrusion. The reversal of protrusion is retrusion.

The mandible is moved primary by the **four muscles of mastication:**

- **the masseter,**
- **medial pterygoid,**
- **lateral pterygoid,**
- **temporalis.**

- These four muscles, all innervated by V3, or the mandibular division of the trigeminal nerve, work in different groups to move the mandible in different directions. Contraction of the lateral pterygoid acts to pull the disc and condyle forward within the glenoid fossa and down the articular eminence; thus, action of this muscle serves to protrude the jaw, it with assistance of gravity and the digastricus muscle also opens the jaw. The other three muscles close the mouth; the masseter and the medial pterygoid by pulling up the angle of the mandible and the temporalis by pulling up on the coronoid process of the mandible.

How Is TMJ Diagnosed?

TMJ disorder is usually diagnosed by a **dentist** or an otolaryngologist **(ENT).**

Many individuals seek the help of an ENT because pain from the jaw leads them to believe they have an ear infection.

The doctor will perform a physical exam, which could include looking inside mouth for signs of wear on your teeth from grinding and clenching; assessing your neck muscles for spasms; and signs of joint tenderness. The physician may also measure how far you are able to open your mouth. Sometimes, doctor will request a **CT or MRI scan** to get a better look at any damage to the joint.

Examination

- To palpate the joint and its associated muscles effectively, have the patient go through all the movements of the mandible in relationship to the TMJ while bilaterally palpating the joint just anterior to the external acoustic meatus of each ear. This includes asking the patient to open and close the mouth several times and then to move the opened jaw to the left, then to the right, and then forward. To further assess the mandible moving at the TMJ, use digital palpation by gently placing a finger into the outer part of the external acoustic meatus.

Examination may involve:

- A dental examination to show if you have poor bite alignment
- Feeling the joint and connecting muscles for tenderness
- Pressing around the head for areas that are sensitive or painful
- Sliding the teeth from side to side
- Watching, feeling, and listening to the jaw open and shut
- X-rays to show abnormalities

Sometimes, the results of the physical exam may appear normal.

Doctor will also need to consider other conditions, such as infections, ear infections, neuralgias, or nerve-related problems and headaches.

TMJ disorders-Definition

Temporomandibular joint and muscle disorders (**TMJ disorders**) are problems or symptoms of the chewing muscles and joints that connect your lower jaw to your skull.

Alternative Names –TMD: Temporomandibular joint disorders; Temporomandibular muscle disorders.

Disorders

- The most common disorder of the TMJ is disc displacement. In essence, this is when the articular disc, attached anteriorly to the superior head of the lateral pteygoid muscle and posteriorly to the retrodiscal tissue, moves out from between the condyle and the fossa, so that the mandible and temporal bone contact is made on something other than the articular disc. This, as explained above, is usually very painful, because unlike these adjacent tissues, the central portion of the disc contains no sensory innervation.

- In most instances of disorder, the disc is displaced anteriorly upon translation, or the anterior and inferior sliding motion of the condyle forward within the fossa and down the articular eminence. On opening, a "pop" or "click" can sometimes be heard and usually felt also, indicating the condyle is moving back onto the disk, known as "reducing the joint" (disc displacement with reduction). Upon closing, the condyle will slide off the back of the disc, hence another "click" or "pop" at which point the condyle is posterior to the disc. Upon clenching, the condyle compresses the bilaminar area, and the nerves, arteries and veins against the temporal fossa, causing pain and inflammation.

In disc displacement without reduction the disc stays anterior to the condylar head upon opening. Mouth opening is limited and there is no "pop" or "click" sound on opening.

TMJ pain is generally due to one of **four reasons**.

The most common cause of TMJ pain is **myofascial pain dysfunction syndrome**, primarily involving the muscles of mastication.

- Internal derangements is defined as an abnormal relationship of the disc to any of the other components of the TMJ.
- Disc displacement is an example of internal derangement.
- Degenerative joint disease, otherwise known as osteoarthritis is the organic degeneration of the articular surfaces within the TMJ.
- TMJ pain remains one of the most reliable diagnostic criteria for temporal arteritis.

Pain or dysfunction of the temporomandibular joint is commonly referred to as "TMJ", when in fact, TMJ is really the name of the joint, and Temporomandibular joint disorder (or dysfunction) is abbreviated TMD. This term is used to refer to **a group of problems** involving

the TMJs and the muscles, tendons, ligaments, blood vessels, and other tissues associated with them.

Some practitioners might include the neck, the back and even the whole body in describing problems with the TMJs.

Although rare, other pathologic conditions may affect the TMJ function, causing pain and swelling, as well. These conditions include chondrosarcoma, osteosarcoma, giant cell tumor and aneurysmal bone cyst.

Classification of disfunction

- ***Muscular:***
- Hyperactivity, spasm, and trismus
- Inflammation (myositis)
- Trauma
- Myofascial pain and fibromyalgia
- Atrophy or hypertrophy

Arthrogenic:

- Disc displacement (internal derangement)
- Hypomobility of the disc (adhesions or scars)
- Dislocation and subluxation, Fracture
- Arthritis , Infections
- Metabolic disease (chondrocalcinosis)
- Capsulitis, synovitis, Ankylosis (fibrous or bony)
- Condylar hyperplasia, hypoplasia or aplasia
- Neoplasia

People who have TMJ disorder may have some of the following symptoms:

- facial pain
- jaw pain or tenderness of the jaw
- pain while chewing
- popping or clicking of the jaw
- grating sound when opening or closing the mouth
- dull, aching pain in the face
- headaches
- earaches, tinnitus
- difficulty opening and closing the mouth
- biting or chewing difficulty or discomfort
- locked jaw
- reduced ability to open or close the mouth
- generalized pain and tenderness around the joint
- a history of poor sleep or a diagnosed sleep disorder

Who Gets TMJ?

TMJ disorders are more common in women than in men, and more common in white people than in African-Americans. Other disorders or conditions that have been associated with TMJ include:

- rheumatoid arthritis
- degenerative joint diseases
- anxiety or other psychiatric disorders that lead to chronic jaw clenching or teeth grinding
- dental malocclusion
- tongue tie (ankylosis)
- bruxism
- some birth defects

HOW CAN A TMJ PROBLEM CAUSE PROBLEMS ELSEWHERE IN THE BODY?

The TMJ has been called the most important joint in the body because of its profound influence on other aspects of the body. Your lower jaw is attached to the head and neck by numerous muscles. Therefore, any disturbance of the bite or function of the TMJ will affect the balance of the head, neck, and shoulders. In turn the posture and function of the rest of your body will be affected.

TMJ disorders lead to stress in the skull, spine, and connective tissues which house, protect, and nourish the nervous system. Though your skull may seem as one bone, it is pliable and made of many bones that move in relation to one another. Problems with the TMJ and the bite may cause distortion in the shape and movement of these bones.

This affects what is known as the **cranial -sacral system** (this is an integrated system connecting movements of the skull with those within the tailbone and pelvis). These effects on the muscles and supporting structures of the body create physical stress.Though the body has the ability to compensate for stress, eventually this ability deteriorates and symptoms develop.

Classification - TMD is considered by some to be one of the 4 major symptom complexes in chronic orofacial pain, along with

burning mouth syndrome, **atypical facial pain** and **atypical odontalgia**.

TMD has been considered as a type of **musculoskeletal**,

neuromuscular, or **rheumatological** disorder. It has also been called a **functional** pain syndrome, and a **psychogenic** disorder.

Others consider TMD a "central sensitivity syndrome", in reference to evidence that TMD might be caused by a **centrally** mediated sensitivity to pain. It is hypothesized that there is a great deal of similarity between TMD and other pain syndromes like **fibromyalgia**,

bowel syndrome, **interstitial cystitis**, headache, chronic lower **back pain** and chronic **neck pain**.

DISLOCATION OF THE JAW

Dislocation of the mandible can be **acute or chronic**.

The mandibular condyle can be **displaced superiorly, posteriorly or anteriorly**; the last of these is the most common when associated with a fracture. The **condyle can also be displaced laterally** or, more commonly, **medially**, as this is the direction of muscle pull.

Acute dislocation is relatively common and may be the result of trauma or excessive mouth opening. It can also occur in patients with psychiatric disorders.

In chronic disease, lax ligaments predispose to recurrent dislocation. Long-standing dislocation is often overlooked, especially in a withdrawn psychiatric or geriatric patient.

Condylar dislocation normally occurs on **one side** and results in the chin deviating to the opposite side with an inability to close the mouth.

A preauricular depression and radiological evidence of an **empty glenoid fossa** confirm the diagnosis.

The **acute dislocation** is painful, and the masticatory muscles soon go into spasm. Simple reduction may prove impossible unless undertaken immediately; muscle relaxants and intravenous diazepam (Valium) are usually required. Reduction is accomplished by applying downward pressure in the molar region, with thumbs well protected by padding, and at the same time elevating the chin point with the fingers.

TRISMUS

Trismus is a functional inability to open the mouth, and is a symptom rather than a disorder in its own right. The most frequent cause is temporomandibular joint dysfunction, and it may also follow an inferior dental nerve block from trauma or haematoma in the medial pterygoid muscle. Direct invasion of muscles by a carcinoma is another unremitting cause of trismus.

Disorders of the central nervous system in which trismus is an incidental feature include tetanus, motor neurone disease, dyskinesia produced by phenothiazine drugs, and hysteria.

Symptoms regress with the treatment of the underlying condition.

ANKYLOSIS

Permanent limitation of movement of the jaw may be caused by fibrous, bony ankylosis or mechanical obstruction of mandibular movement. There may be an associated deficiency in mandibular growth if it occurs in childhood. The majority of patients have surprisingly little difficulty in taking an adequate diet.

Ankylosis is an uncommon condition in developed countries.

The majority of cases follow injury or occasionally infection in children under10 years of age. Unilateral ankylosis causes deviation of the mandible to the affected side. In children, bilateral ankylosis results in a ‘bird face’, with a tiny, retruded mandible and compensatory growth of the alveolar bone around the teeth in an attempt to maintain dental occlusion.

In children, it is important to re-establish mandibular mobility and function; facial aesthetics are of secondary concern as they maintain a potential for growth. Reconstructive procedures are delayed until the teenage years. In adults, once the ankylosis has been convincingly eradicated (recurrence is common), reconstruction of the mandible is undertaken. In long-standing ankylosis, it is necessary to remove both the coronoid processes to release the vice-like grip of the fibrotic temporalis muscles. Once the segment of ankylosed bone is removed from around the condyle, a strip of temporalis muscle is rotated inferiorly to line the glenoid area, and an interpositional graft is used to replace the condylar segment to maintain the vertical height of the ramus. Early mobilization of the joint is encouraged to avoid reankylosis.

ARTHRITIS OF THE TEMPOROMANDIBULAR JOINT

Rheumatoid arthritis

The temporomandibular joint is never involved alone: patients usually seek treatment for other affected joints. Surgical intervention is rarely required in adults, but in Still's disease the childhood condyle may lose its growth potential, leading to a bird face.

Suppurative arthritis

Suppurative arthritis is rare, as most infections are now promptly treated with antibiotics. The joint is swollen and painful, with marked trismus.

Destruction of bone may lead to ankylosis if left untreated.

Treatment is by antibiotics combined with bone and joint debridement.

Treatment- simple, gentle therapies are usually recommended first.

Learn how to gently stretch, relax, or massage the muscles around your jaw. Doctor, dentist, or physical therapist can help with these.

- Avoid actions that cause symptoms, such as yawning, singing, and chewing gum.
- Try moist heat or cold packs on face.
- Learn stress-reducing techniques.
- Exercising several times each week may help you increase your ability to handle pain.

Outlook (Prognosis)

For many people, symptoms occur only sometimes and do not last long. They will go away in time with little or no treatment. Most cases can be successfully treated. Some cases of pain go away on their own without treatment. TMJ-related pain may return again in the future. If the cause is nighttime clenching, treatment can be very tricky because it is a sleeping behavior that is hard to control.

Mouth splints are a common treatment approach for teeth grinding. While some splints may silence the grinding by providing a flat, even surface, they may not be as effective at reducing pain or stopping clenching. Splints may be effective in the short-term but could become less effective over time. Some splints can also cause changes in your bite. This may cause a new problem.

Possible Complications

- Chronic face pain
- Chronic headaches

Prevention

Many of the home-care steps to treat TMJ problems can prevent such problems in the first place:

- Avoid eating hard foods and chewing gum.
- Learn relaxation techniques to reduce overall stress and muscle tension.
- Maintain good posture, especially if you work all day at a computer. Pause often to change position, rest your hands and arms, and relieve stressed muscles.
- Use safety measures to reduce the risk of fractures and dislocations.

Questions for discussion of the lecture

1. How do you understand temporomandibular joint dysfunction?
2. Structural features and functions of articular disc?
3. Features of movements in the TMJ?
4. What are the four muscles of mastication, and their location?
5. Types and Features of Mandibular dislocation.

Thank you for attention