



Section III

Axial Skeleton

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SECTION OUTLINE

Chapter 11 Temporomandibular Joint

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11

Temporomandibular Joint

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LEARNING OBJECTIVES

After completing the chapter, the readers will be able to:

- Describe the anatomical components of the temporomandibular joint (TMJ), including the mandibular condyle, articular fossa, articular disc, capsule, and supporting ligaments.
- Understand the structural characteristics that classify the TMJ as a ginglymoarthrodial joint and its unique dual-function mechanics.
- Learn about the mandibular movements—depression, elevation, protrusion, retrusion, and lateral deviation—along with the corresponding arthrokinematics of rolling, gliding, and translation.
- Analyze muscle actions involved in TMJ movement, including the roles of the masseter, temporalis, medial and lateral pterygoids, digastric, and suprahyoid muscles.
- Interpret the kinematics of opening and closing, with emphasis on disc movement, condylar translation, and coordination between the upper and lower joint compartments.
- Identify functional biomechanics during mastication, speech, swallowing, and parafunctional habits (e.g., clenching, bruxism).
- Evaluate the impact of posture, particularly cervical alignment, on TMJ mechanics and dysfunction.
- Recognize common biomechanical dysfunctions, including disc displacement, hypomobility, hypermobility, and abnormal muscle activation patterns.
- Understand the pathological and anatomical alterations of the TMJ and their impact on joint function, movement mechanics, and clinical presentations.

CHAPTER OUTLINE

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|--|---------------------------|
| • Introduction | • Kinetics |
| • Anatomical Components | • Functional Biomechanics |
| • Kinematics | • Pathoanatomy |
| • Kinematics of Opening and Closing of the Mouth | |

INTRODUCTION

The temporomandibular joint (TMJ) a ginglymoarthrodial type of joint, plays a central role in linking craniofacial structure with functional movement of the lower jaw. Its coordinated interaction with muscles, ligaments, and posture allows precise control during daily activities and high-load tasks alike. A clear understanding of this joint provides the foundation for analyzing both efficient function and movement-related dysfunctions of the jaw.

ANATOMICAL COMPONENTS

The TMJ is a specialized synovial joint connecting the mandible to the temporal bone (Fig. 11.1). It supports complex movements, such as opening, closing, protrusion, retrusion, and lateral deviation of the mandible.

Mandibular Condyle

The mandibular condyle is the rounded, convex upper end of the mandible. It forms the lower articulating surface of the TMJ. Its structure is covered with fibrocartilage which is stronger and more wear-resistant than hyaline cartilage, enabling it to withstand repetitive chewing forces.

Articular Fossa

The articular fossa (glenoid fossa) is a concavity located in the temporal bone, just anterior to the external auditory meatus. Posteriorly bound by the tympanic plate and anteriorly by the articular eminence, it receives the mandibular condyle during mandibular movements. The fossa's fibrocartilaginous lining enhances durability and load distribution.

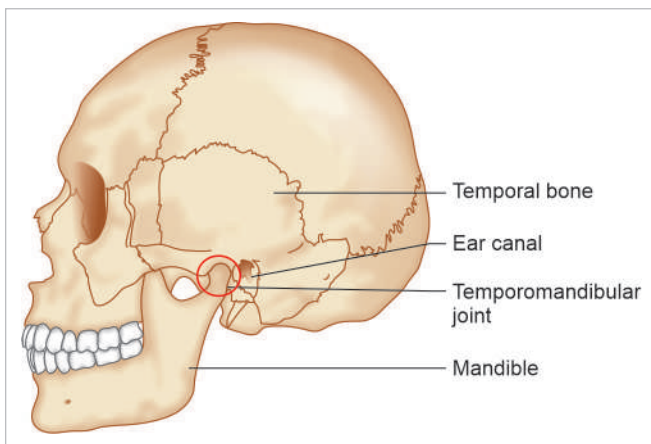


Fig. 11.1: The temporomandibular joint

Articular Disc

The articular disc is a biconcave, fibrocartilaginous structure situated between the condyle and the temporal bone. It divides the joint into upper and lower compartments, enabling smooth, coordinated gliding, and rotational movements. The disc is anchored to the condyle medially and laterally, and attaches posteriorly to retrodiscal tissue containing elastic fibers and vasculature.

Joint Capsule

The capsule is a fibrous envelope that encloses the entire joint. It attaches to the margins of the articular eminence and fossa superiorly, and to the neck of the condyle inferiorly. The capsule provides stability while permitting mobility. Its inner layer contains a synovial membrane, which produces synovial fluid for joint lubrication and nutrition.

Ligaments

The TMJ is stabilized by several key ligaments:

Temporomandibular Ligament

It is a thickening of the lateral capsule thus also known as the lateral ligament, this ligament prevents excessive posterior displacement of the condyle and limits rotational movement, providing primary support to the joint.

Sphenomandibular Ligament

Extending from the sphenoid spine to the lingula of the mandible, it acts as a passive support for the mandible and serves as a landmark during local anesthesia.

Stylomandibular Ligament

Running from the styloid process to the angle of the mandible, this ligament helps limit excessive protrusion and guides mandibular movements.

KINEMATICS

The term ginglymoarthrodial combines ginglymus (hinge) and arthroia (gliding), meaning the joint performs both rotational and translational movements. The TMJ fits this classification due to several unique structural features:

- **Biconcave articular disc:** The fibrocartilaginous disc divides the TMJ into upper and lower compartments, each designed for a specific type of motion. The lower compartment allows hinge (rotational) movement, whereas the upper compartment allows gliding (translational) movement. This separation of spaces is a key reason the TMJ functions as a combined hinge-sliding joint (Fig. 11.2).

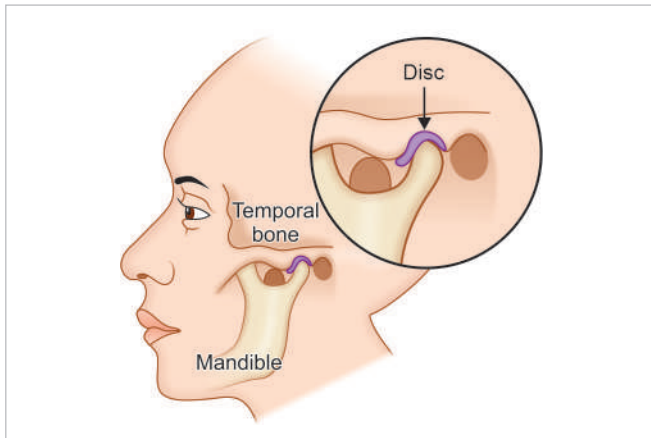


Fig. 11.2: Fibrocartilaginous disc of the temporomandibular joint

- **Shape and orientation of the mandibular condyle:** The condyle is elongated mediolaterally and rounded, enabling rotation around a fixed horizontal axis during the early phase of opening and smooth anterior gliding under the articular eminence during wider jaw movements.
- **Articular eminence and fossa:** The sloping articular eminence directs the forward gliding motion of the condyle-disc complex. This structural slope supports the translational component of movement.
- **Flexible joint capsule:** The capsule is loose enough to permit wide opening while still maintaining joint integrity. Its design accommodates both pivoting and forward movement without restriction.
- **Ligament support for controlled motion:** The lateral (temporomandibular) ligament limits excessive rotation, whereas the stylomandibular and sphenomandibular ligaments guide and restrict translation.

Together, they ensure that the disc and condyle move in a coordinated hinge-glide system.

Phy^{sio} CORNER

TMJ as a Ginglymoarthrodial Joint

The TMJ is classified as a ginglymoarthrodial joint because it combines hinge-like rotational movement with gliding translational movement. This dual function is made possible by the presence of a biconcave fibrocartilaginous articular disc that divides the joint into upper and lower compartments. The lower compartment permits rotational movement of the mandibular condyle beneath the disc during early mouth opening, while the upper compartment allows anterior translation of the disc-condyle complex along the articular eminence during wider opening. Additional contributors include the mediolaterally elongated condyle, sloping articular eminence, flexible joint capsule, and stabilizing ligaments, all of which allow controlled rotation and translation to occur in a coordinated manner.

Osteokinematics and Arthrokinematics

Osteokinematics of TMJ include 3 degrees of freedom:

1. Depression-Elevation
2. Protrusion-Retrusion
3. Lateral deviation

The TMJ exhibits dual-function mechanics by combining rotational (hinge) and translational (gliding) movements.

Rotational (Hinge) Movement—Early Phase

- Occurs mainly in the lower joint compartment.
- The condyle rotates beneath the disc.
- This phase allows limited opening (about 20–25 mm of mouth opening).
- Rotational movement occurs around a transverse horizontal axis passing through the mandibular condyles.

Translational (Gliding) Movement—Late Phase

- Occurs in the upper joint compartment.
- The disc-condyle complex moves forward and downward along the articular eminence.
- This phase is responsible for wide opening and protrusive movements.
- Translation occurs bilaterally as the condyle-disc complex glides anteriorly and inferiorly.

Phy^{sio} CORNER

Why is the TMJ unique?

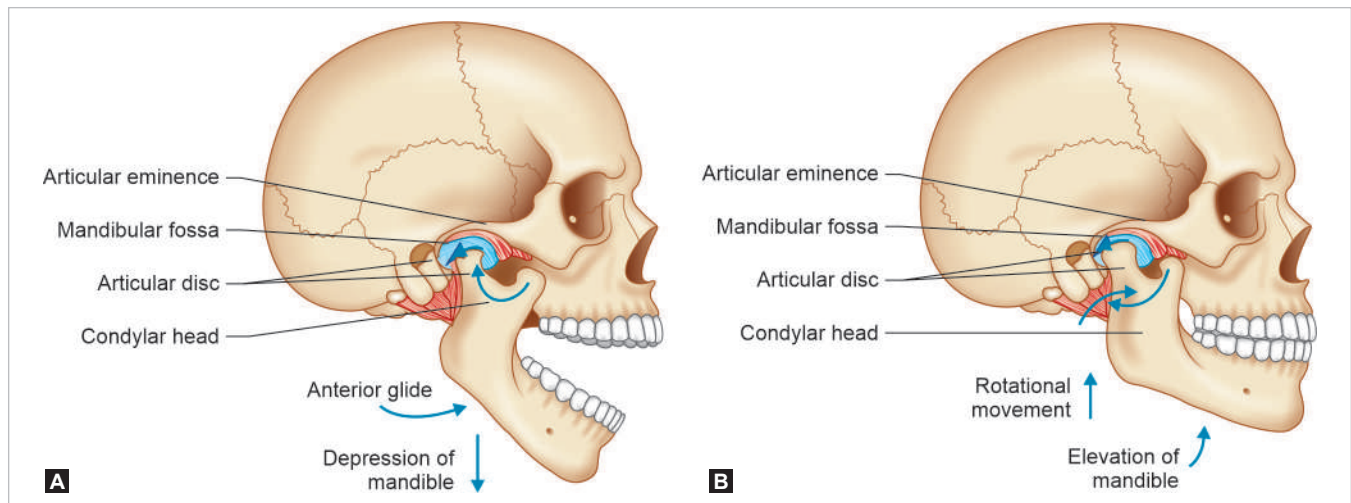
- It is the only bilateral synovial joint where the right and left sides must move together for proper function.
- It combines two types of motion in a single joint, unlike most joints which specialize in just one.
- Its articular surfaces are covered with fibrocartilage, not hyaline cartilage, enhancing durability under constant load.

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ROM of Depression/Opening of the Mouth

- The TMJ allows extensive motion of the mandible during mouth opening.
- It is only a few millimeters during whispering.
- It is up to 5 cm of depression when biting into a large apple.

The mandible performs several coordinated movements during functional activities, such as chewing, speaking, and swallowing. Each movement involves specific biomechanical actions—rolling, gliding, and translation—occurring within different compartments of the TMJ.



Figs 11.3A and B: A. Depression; B. Elevation

Depression (Jaw Opening)

Movement

- The mandible moves downward and slightly backward during the initial phase, then forward as opening continues (Fig. 11.3A).
- **Primary muscles:** Lateral pterygoid (inferior head), suprahyoid muscles.

Arthrokinematics

- **Early phase:**
 - The condyle and disc interact within the lower joint space to produce a rolling motion.
 - This hinge-like rotation allows partial opening.
- **Late phase:**
 - The upper compartment of the joint facilitates translation when the disc and condyle glide anteriorly along the articular eminence.
 - This enables wide opening.

Elevation (Jaw Closing)

Movement

- The mandible rises upward and slightly backward to return to its resting position (Fig. 11.3B).
- **Primary muscles:** Masseter, medial pterygoid, temporalis.

Arthrokinematics

- Translation reverses first as the disc-condyle complex moves back into the fossa.
- Rolling follows as the condyle rotates posteriorly beneath the disc.

Protrusion

Movement

- The mandible shifts forward so the lower incisors move ahead of the upper incisors (Fig. 11.4A).
- **Primary muscles:** Bilateral contraction of the lateral pterygoids.

Arthrokinematics

- Almost entirely a translational movement.
- The disc-condyle complex glides anteriorly along the articular eminence in the upper compartment.
- Minimal rotation occurs.

Retrusion

Movement

- The mandible moves backward from a protruded position to neutral alignment (Fig. 11.4B).
- **Primary muscles:** Posterior fibers of the temporalis, deep fibers of the masseter.

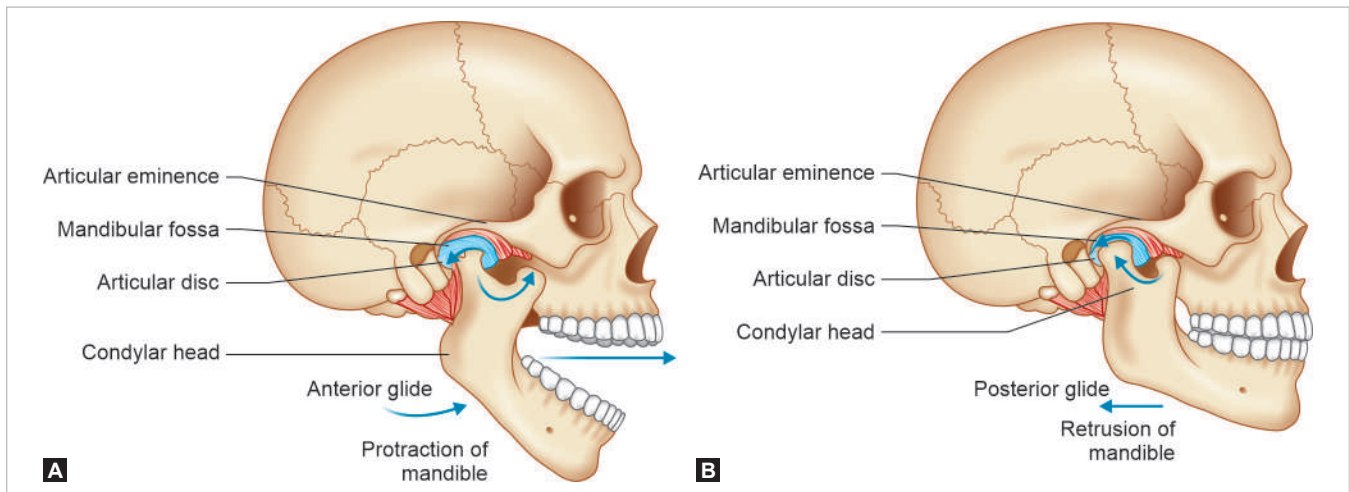
Arthrokinematics

- A reversal of protrusion.
- The disc-condyle complex translates posteriorly into the mandibular fossa.
- Movement mainly occurs in the upper compartment with negligible rolling.

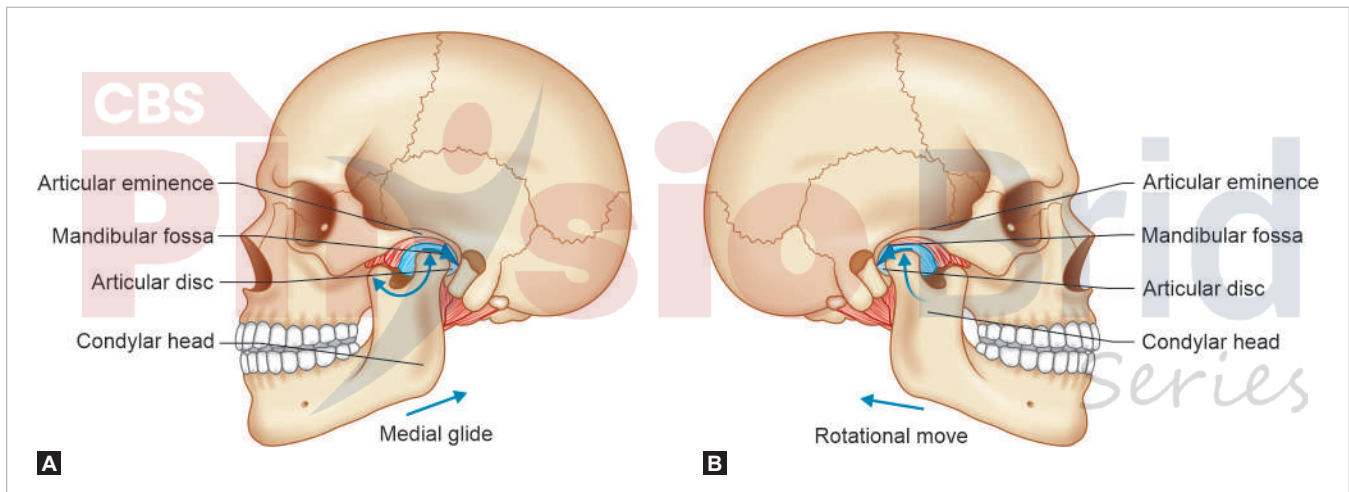
Lateral Deviation (Side-to-Side Movement)

Movement

- The mandible shifts to the left or right side.
- **Muscles:** Ipsilateral temporalis, masseter; contralateral lateral and medial pterygoids (Figs 11.5A and B).



Figs 11.4A and B: A. Protrusion; B. Retrusion



Figs 11.5A and B: Jaw lateral deviation arthrokinematics: A. Contralateral translation; B. Ipsilateral rotation

Arthrokinematics

- **Contralateral side (working side moves opposite the pull):**
 - Condyle translates anteriorly and medially with the disc.
 - Movement is predominantly gliding or translation.
- **Ipsilateral side (side toward which the jaw moves):**
 - The condyle performs mainly a rotational or pivoting action in the lower compartment.
 - Minimal translation occurs.

This combination creates the characteristic 'swinging' motion of lateral deviation.

KINEMATICS OF OPENING AND CLOSING OF THE MOUTH

Mouth opening and closing are highly coordinated movements involving both the upper and lower compartments of the TMJ. The articular disc and mandibular condyle move together in a sequence that ensures smooth, stable motion.

Opening

Mouth opening (mandibular depression) occurs in two phases, each involving distinct joint mechanics.

Early Phase

- Movement begins with rotation (hinging) of the condyle beneath the disc.
- This movement occurs within the lower compartment of the joint, situated between the condyle and the disc's inferior surface.
- The condyle rotates anteriorly, allowing partial mouth opening (approximately 20–25 mm).
- The disc remains relatively stable at this stage because its posterior attachments (retrodiscal tissue) prevent significant displacement.

Phyio CORNER**Movements at the TMJ during mouth opening and closing**

Early opening = condylar rotation + disc stability.

Late opening = forward translation of both disc and condyle.

Closing = translation → rotation.

Late Phase

- As opening continues the disc-condyle complex translates forward together along the articular eminence.
- Translation happens in the upper joint compartment, between the disc's superior surface and the temporal bone.
- The disc moves slightly ahead of the condyle due to tension in the lateral pterygoid and the shape of the articulating surfaces.
- This anterior glide enables wide opening of the mouth.

Movement of the Articular Disc

- The disc preserves its biconcave form throughout its sliding motion.
- Its intermediate zone stays between the articulating surfaces to distribute load.
- Posterior attachments stretch to permit translation but keep the disc aligned over the condyle.
- The upper portion of the lateral pterygoid muscle helps precisely regulate disc movement during motion.

Concept to Clinic**Functional Significance of Fibrocartilage**

Fibrocartilage enhances resistance to wear, distributes load efficiently, and tolerates repetitive mechanical stress better than hyaline cartilage, making it well suited for the functional demands of mastication.

Closing

Mouth closing (mandibular elevation) reverses the mechanics of opening but requires greater neuromuscular coordination to ensure joint stability.

Early Phase

- It involves posterior translation. The disc-condyle complex first moves backward into the mandibular fossa.
- Translation in the upper compartment occurs before rotation.
- The superior head of the lateral pterygoid helps prevent posterior disc displacement, keeping the disc properly centered.

Late Phase

- This phase involves condylar rotation. As the mandible nears full closure, the condyle performs posterior rotation beneath the disc.
- This occurs in the lower joint compartment.
- The disc is guided back to its resting position by elastic recoil of the retrodiscal tissue.

Movement of the Articular Disc

- The disc moves posteriorly but remains in congruence with the condyle.
- Elastic fibers in the retrodiscal tissue help restore the disc's position.
- Controlled tension from the superior lateral pterygoid prevents the disc from collapsing backward.

Concept to Clinic**Coordination Between Upper and Lower Compartments**

The TMJ functions as two joints in one:

- **Lower compartment:**
 - Responsible for rotational or hinge movement.
 - Allows fine adjustments in jaw position.
- **Upper compartment:**
 - Responsible for translational movement.
 - Enables wide opening and protrusion.
- **Functional integration:**
 - Opening combines *rotation first*, then *translation*.
 - Closing reverses this sequence in a smooth, coordinated pattern.
 - Disc stability depends on synchronized muscle activity and balanced movement in both compartments.

KINETICS**Muscle Actions**

Movement of the TMJ relies on coordinated activity among several muscle groups. Each muscle contributes to precise control of elevation, depression, protrusion, retrusion, and lateral deviation of the mandible (Fig. 11.6).

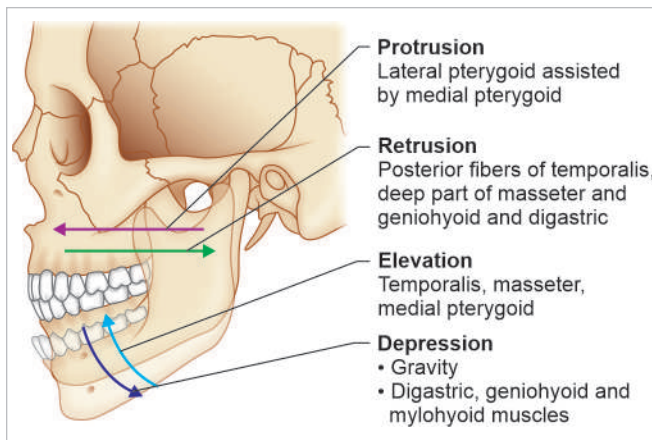


Fig. 11.6: Muscle action and movements at the temporomandibular joint

Masseter

The masseter is one of the strongest jaw muscles and plays a primary role in closing the mouth.

Functions

- **Elevation of the mandible:** Its powerful vertical fibers raise the jaw during biting and chewing.
- **Assists in protrusion:** The superficial fibers help push the mandible forward.
- **Stabilization:** Provides firm occlusal contact during mastication.

Temporalis

A broad, fan-shaped muscle located on the lateral skull, the temporalis offers fine control of mandibular positioning.

Functions

- **Elevation:** The anterior fibers lift the mandible during closing.
- **Retrusion:** Posterior fibers draw the mandible backward from a protruded position.
- **Side-to-side control:** Unilateral contraction contributes to lateral deviation.

Medial Pterygoid

Situated on the inner surface of the mandible, this muscle mirrors the masseter in both position and function.

Functions

- **Elevation:** Strongly assists in closing the jaw from the medial side.
- **Protrusion:** Bilateral action helps move the mandible forward.
- **Lateral deviation:** Unilateral contraction shifts the mandible to the opposite side.

Lateral Pterygoid

This muscle plays the most complex role in TMJ mechanics, particularly in disc-condyle coordination.

Functions

- **Protrusion:** Bilateral contraction pulls the condyle and disc forward along the articular eminence.
- **Depression:** The inferior head assists in initiating mouth opening.
- **Disc control:** The superior head helps stabilize and position the articular disc during closing.
- **Lateral deviation:** Unilateral activity moves the jaw to the opposite side due to anterior-medial pull.

Digastric

The digastric muscle has anterior and posterior bellies connected by a tendon.

Functions

- **Depression of the mandible:** When the hyoid is fixed by infrahyoid muscles, the digastric helps lower the jaw during mouth opening.
- **Stabilization:** Assists in fine control of jaw movement while swallowing and speaking.

Suprahyoid Muscles

It involves the mylohyoid, geniohyoid, stylohyoid muscles. These muscles support both mandibular and hyoid movements.

Functions

- **Depression:** With a stabilized hyoid bone, the suprahyoids help lower the mandible.
- **Swallowing-related stabilization:** They elevate the hyoid and floor of the mouth, contributing to coordinated jaw movements during speech and swallowing.

Integrated Functional Overview

Elevation (Closing)

- **Primary muscles:** Masseter, temporalis, medial pterygoid
- **Role:** Create strong upward force for biting and chewing.

Depression (Opening)

- **Primary muscles:** Lateral pterygoid (inferior head), digastric, suprahyoids
- **Role:** Lower the mandible and initiate translation.

Protrusion

- **Primary muscles:** Bilateral lateral pterygoids; assisted by masseter and medial pterygoid
- **Role:** Move the jaw forward for incising and repositioning.

Retrusion

- **Primary muscles:** Posterior temporalis; deep masseter fibers
- **Role:** Pull the jaw backward to neutral alignment.

Lateral Deviation

- **Primary muscles:**
 - **Opposite side:** Lateral and medial pterygoids (produce anterior-medial pull)
 - **Same side:** Temporalis and masseter (provide pivot and compression)
- **Role:** Essential for grinding and chewing efficiency.

MUST KNOW**Overview of Mouth Opening and Closing**

Mouth opening occurs in two sequential phases. During the early phase, the condyle rotates anteriorly beneath the articular disc within the lower joint compartment, allowing limited mouth opening. In the late phase, the disc-condyle complex translates forward and downward along the articular eminence in the upper joint compartment, permitting wide opening. The inferior head of the lateral pterygoid initiates opening, while suprahyoid muscles assist in depression. Closing reverses this sequence: posterior translation of the disc-condyle complex occurs first, followed by posterior rotation of the condyle beneath the disc. Elevator muscles, such as the masseter, temporalis, and medial pterygoid generate the force required for elevation, while coordinated muscle activity maintains disc alignment and joint stability.

FUNCTIONAL BIOMECHANICS

The TMJ supports a wide range of functional and nonfunctional activities. Each activity produces distinct loading patterns, muscle recruitment strategies, and joint mechanics.

Mastication**Biomechanical Features**

- Mastication (chewing) involves cyclical, rhythmic movements that combine opening, closing, and lateral deviation.
- The working (chewing) side undergoes controlled compression, while the opposite side experiences translation and reduced loading.
- The disc and condyle move in a coordinated fashion to distribute forces across the articular surfaces.

Muscle Activity

- Masseter and medial pterygoid generate strong vertical forces for crushing.
- Temporalis stabilizes and aligns the mandible.

- Lateral pterygoid guides forward and sideward motion during grinding.

Mechanical Outcome

- The TMJ absorbs repetitive loads while maintaining joint congruence.
- Alternating sides reduces fatigue and protects articular tissues.

Speech**Biomechanical Features**

- Speech requires rapid, low-force movements with minimal joint loading.
- Movements are small and precise, involving slight opening, fine protrusion, and subtle positional adjustments of the mandible.

Muscle Activity

- Suprahyoids and lateral pterygoids guide subtle opening and positioning.
- Temporalis provides mild stabilization to keep the jaw centered.
- The tongue and lips coordinate with the mandible for articulation.

Mechanical Outcome

- Because forces are low, speech places little stress on the TMJ.
- Joint motions focus on precision rather than power.

Swallowing**Biomechanical Features**

- During swallowing, the mandible is held in a firm, stable position.
- The condyle is gently seated in the fossa, and the disc remains stationary.

Muscle Activity

- Temporalis, masseter, and medial pterygoid maintain strong but brief isometric contraction to fix the jaw.
- Suprahyoid muscles elevate the hyoid and floor of the mouth, coordinating bolus transfer.

Mechanical Outcome

- Swallowing produces short bursts of compression through the TMJ.
- Stability is prioritized over movement.

Physo CORNER**Parafunctional Habits**

Parafunctional activities are nonfunctional behaviors that place abnormal or excessive loads on the TML e.g., Bruxism, Teeth clenching, etc.

Clenching**Biomechanical Features**

- Sustained, forceful isometric contraction of closing muscles.
- Condyles are pressed firmly into the fossa.
- Disc is compressed and often displaced posteriorly or anteriorly depending on muscle imbalance.

Muscle Activity

- Hyperactivation of the masseter and temporalis.
- Minimal joint movement, but high compressive load.

Mechanical Outcome

- Increased stress on the disc and retrodiscal tissues.
- Potential for inflammation, muscle fatigue, and headache.

Bruxism (Grinding)**Biomechanical Features**

- Involves repetitive lateral, protrusive, and closing movements under heavy load.
- Occurs mainly during sleep, often without neuromuscular control.
- The disc-condyle complex undergoes excessive shear and compressive forces.

Muscle Activity

- Overactivity of the lateral pterygoids, masseter, and medial pterygoid.
- Cyclical contractions mimic chewing but with significantly greater force.

Mechanical Outcome

- Accelerated joint wear, disc displacement, and muscle soreness.
- Enamel erosion and tooth mobility due to repetitive grinding forces.

PATHOANATOMY

The pathoanatomy of the TMJ examines how structural changes in the joint, disc, ligaments, muscles, occlusion, and posture contribute to dysfunction. Because the

TMJ functions within an interconnected cranio-cervico-mandibular system, disturbances in any related region can alter joint loading and movement patterns.

Articular Disc Pathologies**Disc Displacement with Reduction**

- The disc moves anteriorly due to ligamentous laxity or muscle imbalance.
- Clicking occurs when the condyle repositions beneath the displaced disc during opening.
- Recurrent displacement strains retrodiscal tissues, causing inflammation and pain.

Disc Displacement without Reduction

- The disc remains chronically displaced and is not recaptured during opening.
- Produces limited mouth opening (closed-lock) and deviation toward the affected side.
- Long-term displacement can alter cartilage integrity and synovial lubrication.

Disc Degeneration or Perforation

- Chronic overload or parafunctional habits damage the disc and may cause perforation.
- Loss of disc integrity reduces shock absorption and accelerates degenerative change.

Degenerative Joint Disorders**Osteoarthritis**

- Progressive loss of fibrocartilage, joint space narrowing, osteophytes, and subchondral changes.
- Symptoms include crepitus, stiffness, and pain that worsens with function.

Osteoarthrosis

- Represents remodeling changes without overt inflammation.
- May precede symptomatic osteoarthritis.

Inflammatory Disorders**Synovitis and Capsulitis**

- Caused by trauma, microtrauma, overuse or infection.
- Leads to joint tenderness, swelling, and restricted motion.

Systemic Arthritis

- Rheumatoid arthritis, psoriatic arthritis, and other conditions affect the TMJ.

- Cause bilateral symptoms, cartilage erosion, and gradual loss of stability.

Muscular and Myofascial Pathologies

Myofascial Pain Dysfunction

- Trigger points in the masseter, temporalis, and pterygoids produce referred pain.
- Often associated with stress, bruxism, and clenching.

Muscle Imbalance

- Overactive lateral pterygoid displaces the disc anteriorly.
- Excessive elevator muscle activity increases compressive loading and fatigue.

Ligamentous and Capsular Dysfunction

Capsular Tightness

- Trauma, fibrosis or inflammation restricts condylar translation causing hypomobility.
- Limits mouth opening and causes deviation toward the restricted side.

Ligamentous Laxity (Hypermobility)

- Excessive translation may lead to subluxation or habitual dislocation (hypermobility).
- Overstretching increases retrodiscal tissue strain and instability.

Dental Occlusion

Dental occlusion refers to the manner in which the upper and lower teeth meet during rest and functional activities, shaping the alignment and movement of the mandible. TMJ pathoanatomy examines structural and functional alterations within the TMJ that arise from abnormal loading, adaptation or injury. Together, they provide insight into how tooth contacts and joint integrity interact to influence jaw function and dysfunction. Dental occlusion directly affects condylar position, disc alignment, and loading patterns.

Malocclusion

- Uneven occlusal contacts shift mandibular alignment.
- Deep bite, open bite, crossbite, and Class II or III relationships (posteriorly or anteriorly positioned mandible relative to the maxilla) alter condylar seating and disc loading.
- Abnormal occlusion increases strain on elevator muscles and may trigger disc displacement.

Occlusal Interference

- Premature contacts force the mandible into compensatory positions.
- Increases activity in masseter and temporalis, leading to pain and fatigue.
- May change the resting condylar position, stressing the disc.

Loss of Posterior Support

- Missing molars elevate joint loading as the condyle is pushed superiorly.
- Reduces vertical dimension, alters muscle tension, and can initiate degenerative changes.

Dental Restorations and Prosthetics

- Poorly designed crowns, fillings or dentures modify occlusal relationships.
- Can introduce abnormal forces on the TMJ and alter biomechanics.

Influence of Body Posture

Posture significantly influences mandibular position, muscle activity, and joint loading (Fig. 11.7).

Normal Posture

- The head is aligned over the shoulders with balanced cervical curvature.
- Mandible rests in a neutral position, allowing minimal muscle tension.

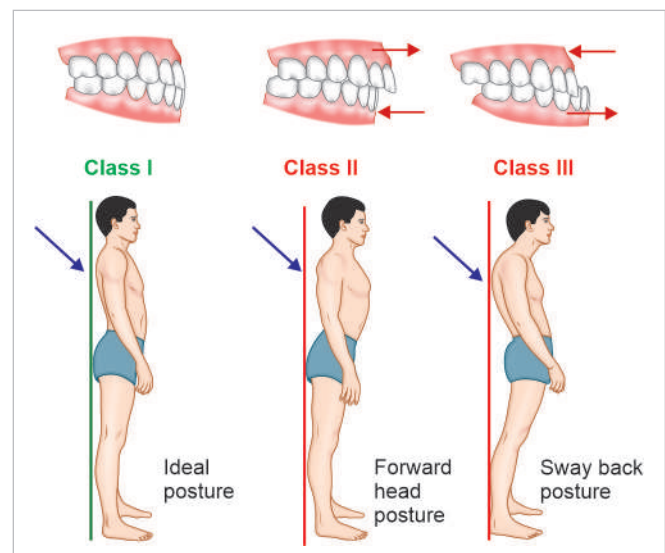


Fig. 11.7: Posture and the temporomandibular joint position with dental occlusion

- TMJ loading is symmetrical, and disc-condyle coordination is stable.
- Promotes efficient chewing, speaking, and swallowing mechanics.

Forward Head Posture

- Forward head posture (FHP) characterized by anterior displacement of the head relative to the trunk.
- **Causes:**
 - Posterior rotation and retrusion of the mandible
 - Increased tension in suprahyoid and infrahyoid muscles
 - Compensatory hyperactivity in the lateral pterygoid
- **Consequences:**
 - Higher risk of anterior disc displacement
 - Increased joint compression
 - Myofascial pain in masseter, temporalis, and cervical extensors
- FHP is strongly associated with chronic TMJ disorders.

Sway-Back Posture

- Includes posterior pelvic tilt, flattened lumbar spine, backward trunk leaning, and forward-shifted hips.
- The head often compensates by shifting forward or upward.

Effects on TMJ:

- Alters cervical alignment, modifying mandibular rest position
- Causes uneven muscle activation in mastication muscles
- May lead to changes in occlusal contact patterns
- Contributes to disc-condyle discoordination due to fluctuating muscle tension
- Often associated with fatigue of stabilizing muscles and increased clenching during stress.

Trauma-Related Changes

- Direct impact may fracture the condyle or damage soft tissues.
- Microtrauma from bruxism gradually strains ligaments and thins cartilage.

Developmental and Structural Abnormalities

- Conditions, such as ankylosis, condylar hyperplasia or hypoplasia, and asymmetries impair biomechanics.
- Lead to uneven occlusal loading and progressive dysfunction.

SUMMARY

- The TMJ is a uniquely structured joint with complex biomechanical behavior, functioning as a combined hinge and gliding system.
- It allows coordinated mandibular movements required for mastication, speech, and swallowing.
- The stability and efficiency of the TMJ depend on the interaction of the masticatory muscles, ligaments, and the articular disc.
- Functional loading patterns, postural influences, and pathological alterations can affect normal joint mechanics and contribute to dysfunction.
- Understanding the integrated aspects of anatomy, kinematics, kinetics, and pathoanatomy is essential for interpreting normal and abnormal TMJ function.

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STUDENT ASSIGNMENT

LONG ANSWER QUESTIONS

1. Explain the structural features that classify the temporomandibular joint as a ginglymoarthrodial joint. Discuss how these features enable its dual-function mechanics during mandibular movements?
2. Describe the kinematics of mandibular opening and closing, highlighting the role of the articular disc, joint compartments, and associated muscle activity?

SHORT ANSWER QUESTIONS

1. What is the functional significance of fibrocartilage in the temporomandibular joint?
2. Differentiate between the movements occurring in the upper and lower compartments of the TMJ.

MULTIPLE CHOICE QUESTIONS

1. Which structure divides the temporomandibular joint into two functional compartments?
 - a. Mandibular condyle
 - b. Articular eminence
 - c. Articular disc
 - d. Joint capsule
2. During the early phase of mouth opening, the primary movement occurring at the TMJ is:
 - a. Anterior translation in the upper compartment
 - b. Rotation in the lower compartment
 - c. Lateral deviation of the mandible
 - d. Posterior glide of the condyle
3. Which muscle plays a key role in controlling the position of the articular disc during closing of the mouth?
 - a. Masseter
 - b. Medial pterygoid
 - c. Superior head of lateral pterygoid
 - d. Digastric

ANSWER KEY

1. c 2. b 3. c
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