Occlusion

Tempro Mandibular Joint and Stomatognathic System

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(1)

Stomagnathic System

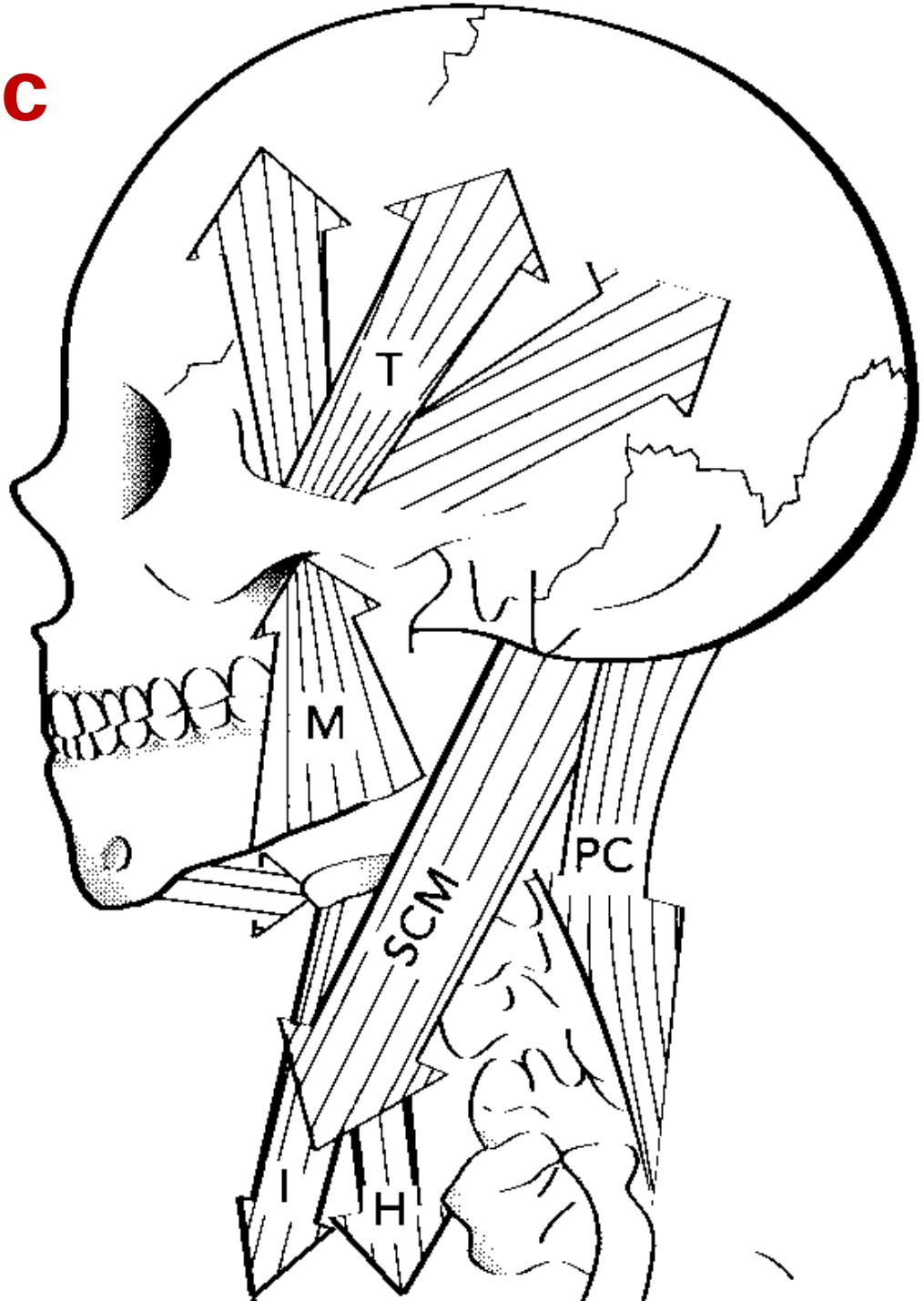
Stoma= mouth
Gnathion = jaws

- The movement of the jaw is intiated by a complex set of muscles' actions, which are in turn controlled by the body's local and central nervous system

The stomatognathic system

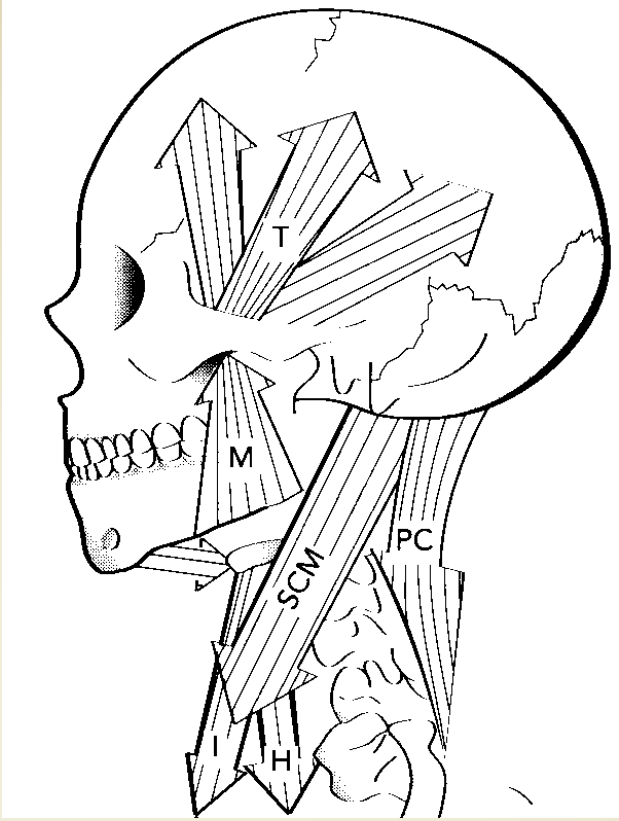
= Masticatory system =

- **Teeth**
- **Periodontium**
- **Jaws**
- **TMJ**
- **Associated muscles + tongue & ms of the soft palate**
- **Investing tissues**
- **Neural control**



The stomatognathic system

(Masticatory system)



- There is a ***complex, dynamic balance*** between the way that the teeth come together, the muscle that work the jaws, the joints, and their relationship to the posture of the head & neck. A change in any part of the system affects all the others and change the balance

The stomatognathic system

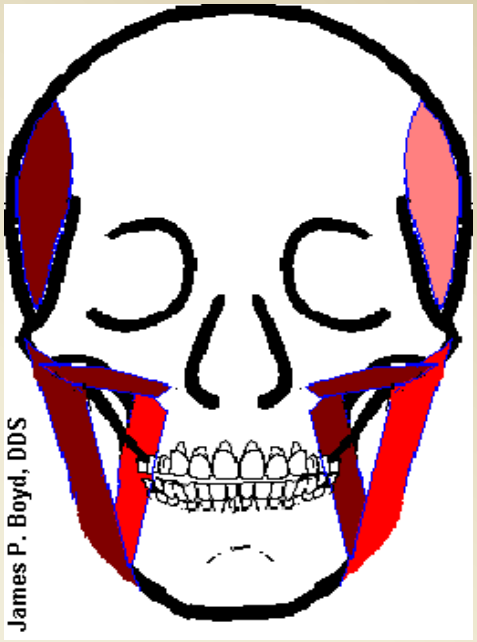
- **Is the functional unit of the body primary responsible for chewing, speaking and swallowing, as well as parafunctional actions.**
- **Disturbance of any part could disturb the whole odontostomatognathic system and subsequently the body as well.**

The stomatognathic system

- When opposing teeth are in contact and mandibular movements are made, the direction of the movement is controlled by the neuromuscular system as limited by the movement

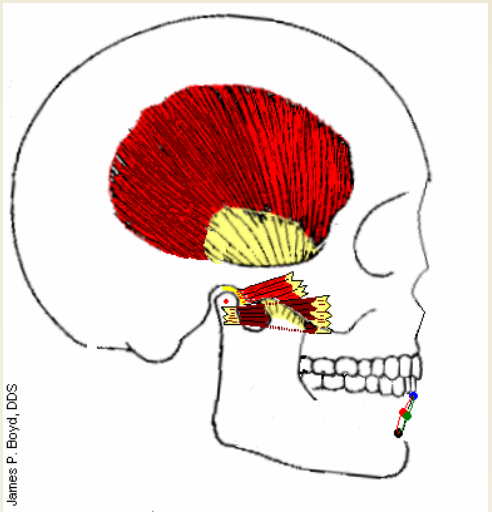
Neuro Muscular System:

The direction of mand. movement is controlled by the neuromuscular system



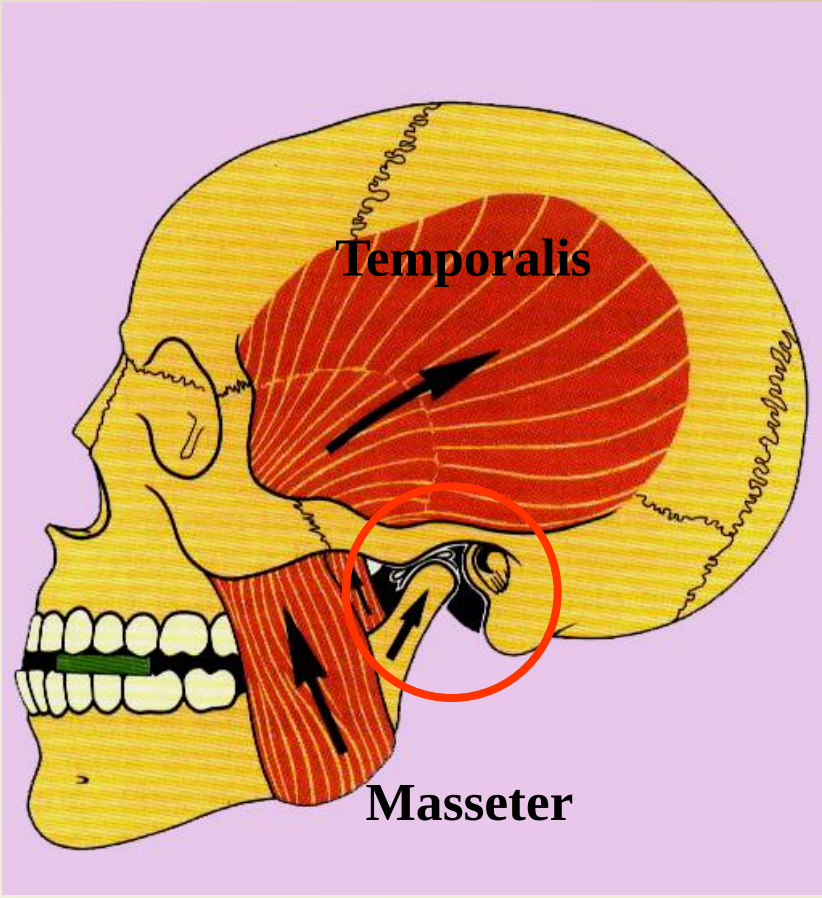
- **Muscles of Mastication:**
- **TMJ Capsule**
- **Associated Ligaments**

Tempromandibular
Sphenomandibular
Stylomandibular



What is TMJ?

- The letters TMJ are short for of 'temporo-mandibular joint', which is the joint connecting your lower jaw and your skull.



The movement in this joint lets you open and close your mouth and chew from side to side.

TMJ: is a bilateral joints permits the mandible to move as a unit with two functional patterns:

- ***Hinge (inferior portion)***
- ***Translation (superior portion)***

It has 4 anatomical parts:

1- condyle

2- Articular fossa

3- Articular disc

4- Articular capsule

- **Condyle**: The rounded articular surface at the end of the mandible (lower jaw).

- **Glenoid fossa**: A deep concavity in the temporal bone a the root of the zygomatic arch that receives the condyle of the mandible.
- **Tubercle**: A slight elevation from the surface of the bone giving attachment to a muscle or ligament.

C.T. capsule

Biconcave articular disc

- Dense fibrous connective tissue
- Lacks blood vessels and nerves
- Able to tolerate forces without damage or pain being produced
- Provides protection to condyle and fossa during movements

The Synovial fluid:

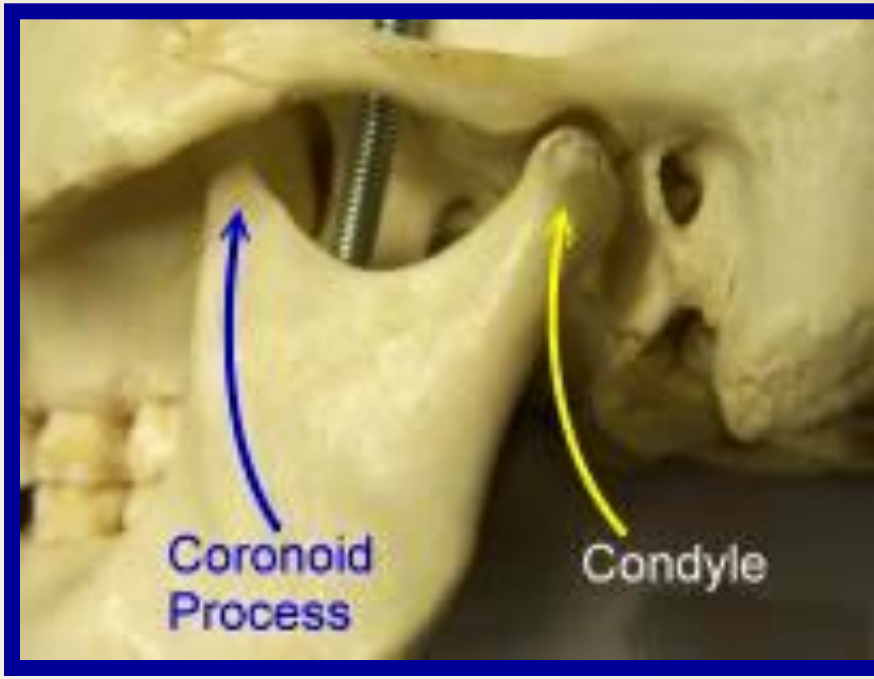
Consist of small amounts of a clear, straw-colored viscous fluid. It is an infiltrate of the blood diffused out from the rich capillary network of the Synovial membrane.

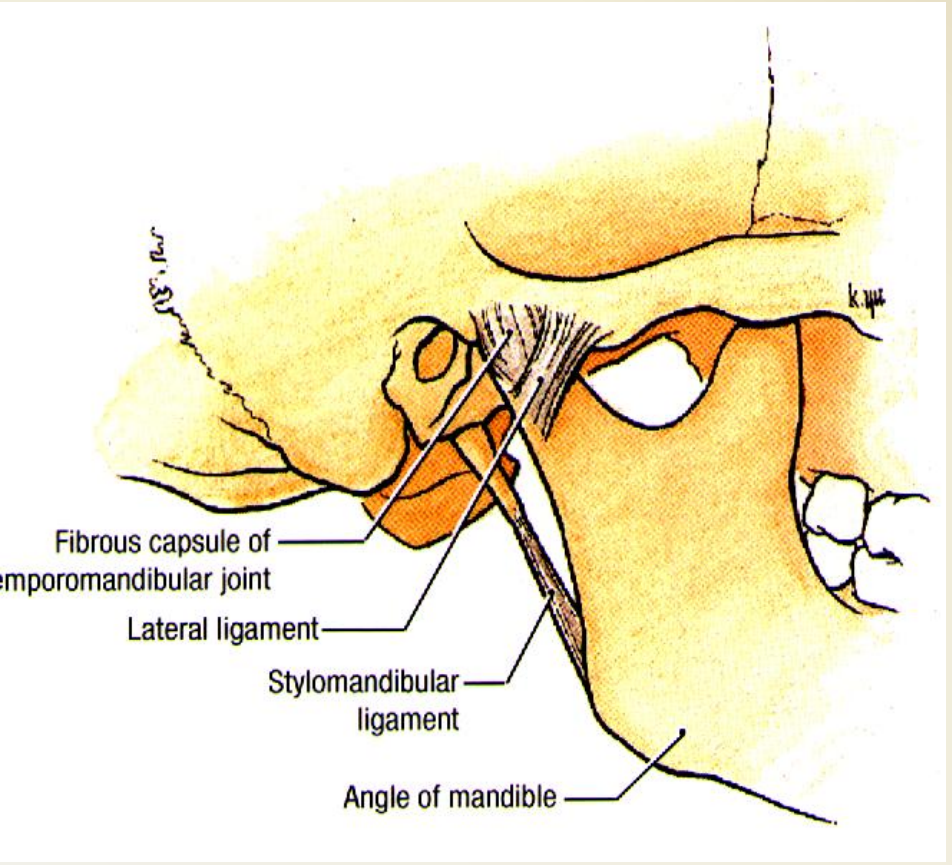
Function:

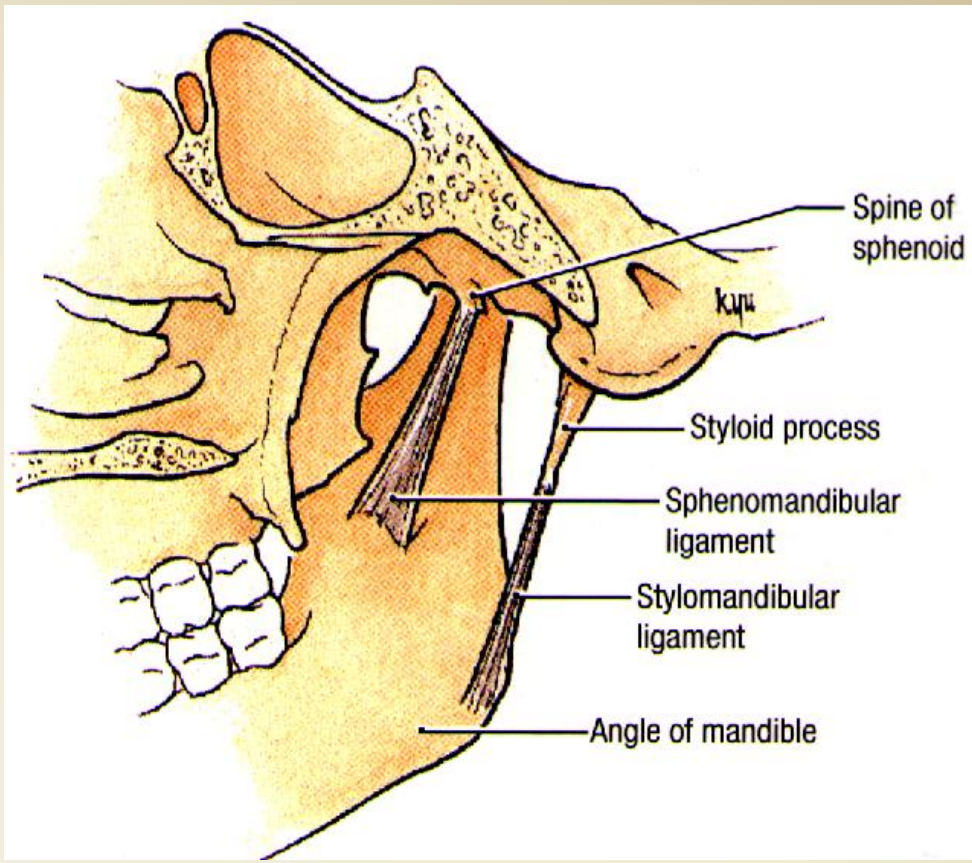
1- Lubrication

2- Nutrition.

3- Clear the tissue debris.







TMJ LIGAMENTS AND CAPSULE

1-Collateral(discal)

2-Capsular

3-Tempromandibular

4-Sphenomandibular

5-Stylomandibular

Muscles of Mastication

Introduction

- Muscles of mastication develop from the mesoderm of the first pharyngeal arch.
- They are innervated by the Mandibular division of the trigeminal nerve (cranial nerve V)

Muscles of Mastication

They are functionally classified as:

→ **Jaw elevators**

- Masseter
- Temporalis
- Medial pterygoid
- Upper head of lateral pterygoid

→ **Jaw depressors**

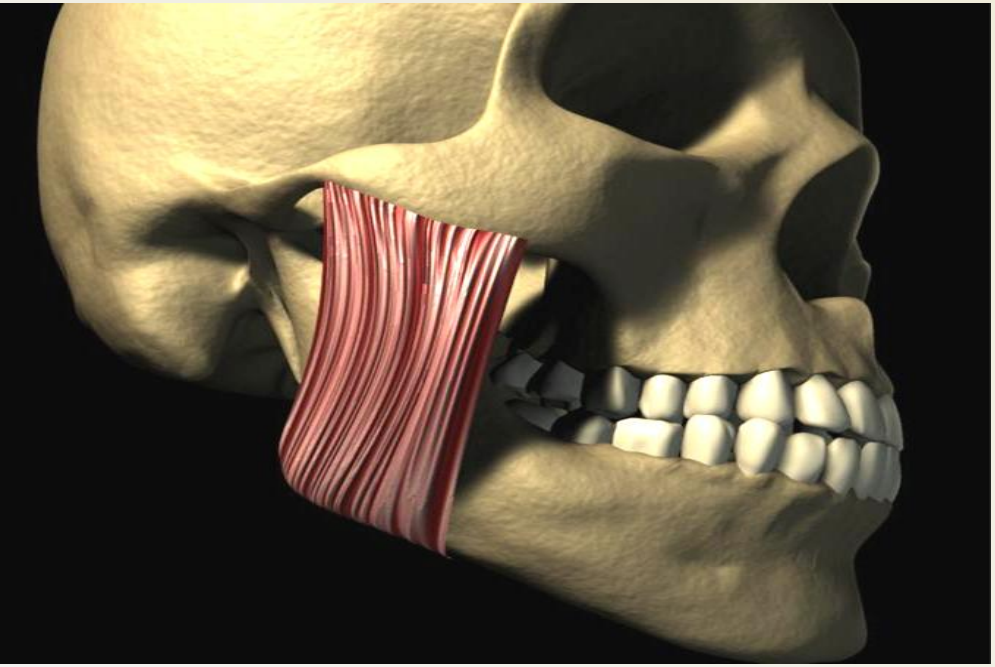
- Lower head of lateral pterygoid
- Anterior digastric
- Geniohyoid
- Mylohyoid

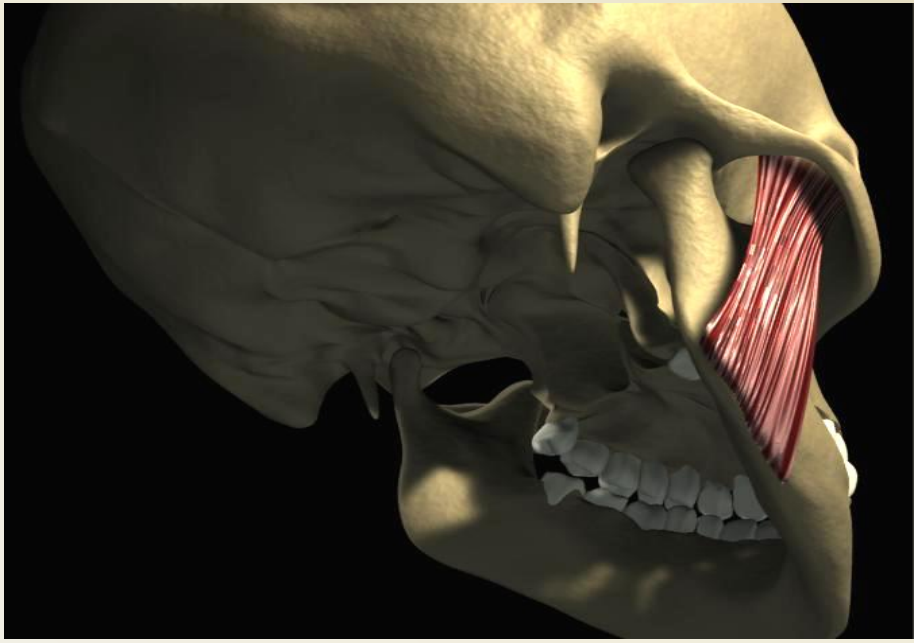
Other related Muscles

- **Orbicularis oris** ⟶ anterior oral seal
- **Buccinator and Tongue** ⟶ Help to keep the bolus of food on the occ. Surface of teeth

Masseter Muscle

- It has 3 layers
- Origin: border of the zygomatic arch
- Insertion: lateral surface of the ramus





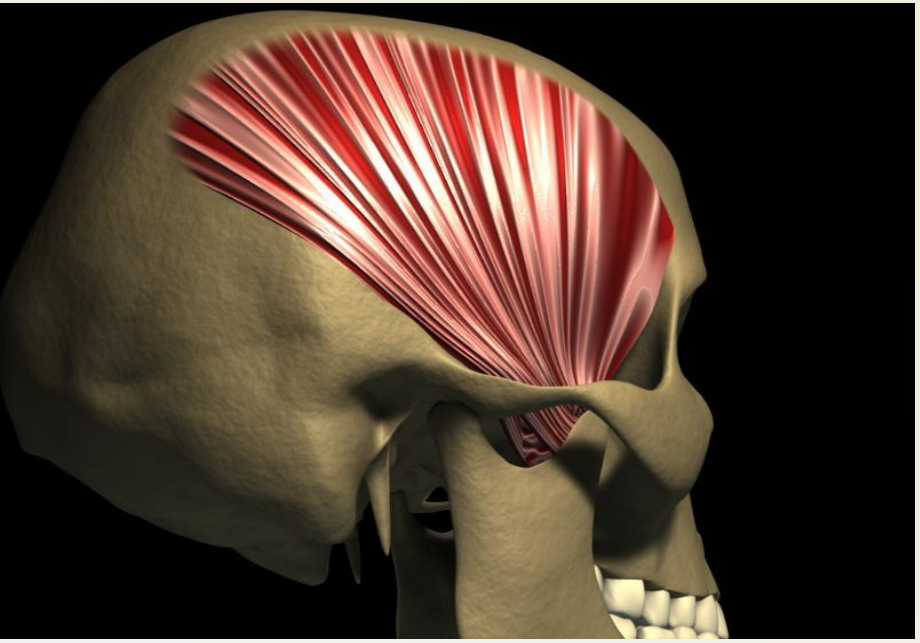
Masseter Muscle

- **Action:**
  - **Elevation (deep fibers)**
  - **Protraction (superficial fibers)**
- **Nerve supply:**
  - **Anterior division of mandibular nerve (masseteric nerve)**
- **Blood supply:**
  - **Transverse facial artery**

Temporalis Muscle

Has 2 heads:

- **Deep head (anterior, middle and posterioe fibers)**
- **Superficial head (much smaller)**



Temporalis Muscle

- **Origin:** Temporal fossa, Temporal fascia
  - In an area bound by the inferior temporal line above and the infra temporal crest below
- **Insertion:**
  - Cronoid process in its medial aspect (apex, anterior and posterior border)
  - Anterior border of the ramus.

Temporalis Muscle

Action:

- Elevation (anterior fibers)
- Protraction (posterior fibers)

Nerve supply:

- Anterior division of the mandibular nerve

  (2 deep temporal nerves)

Lateral Pterygoid Muscle

Has 2 heads:

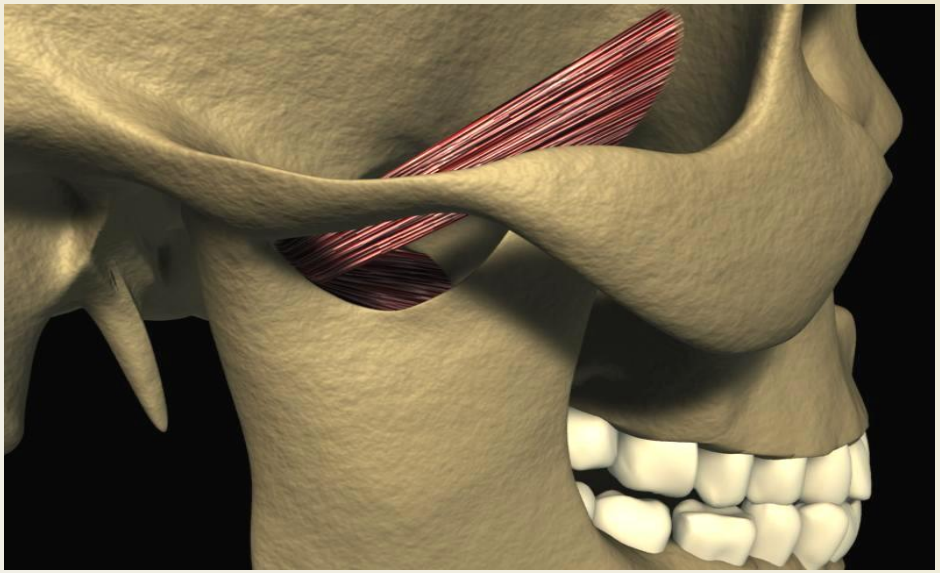
- **Upper head:**
  - **Origin:** infratemporal surface & crest of the greater wing of sphenoid
  - **Insertion:** enters the TMJ & inserted into:

    a) Pterygoid fovea of the neck of the mandible

    b) Articular disc

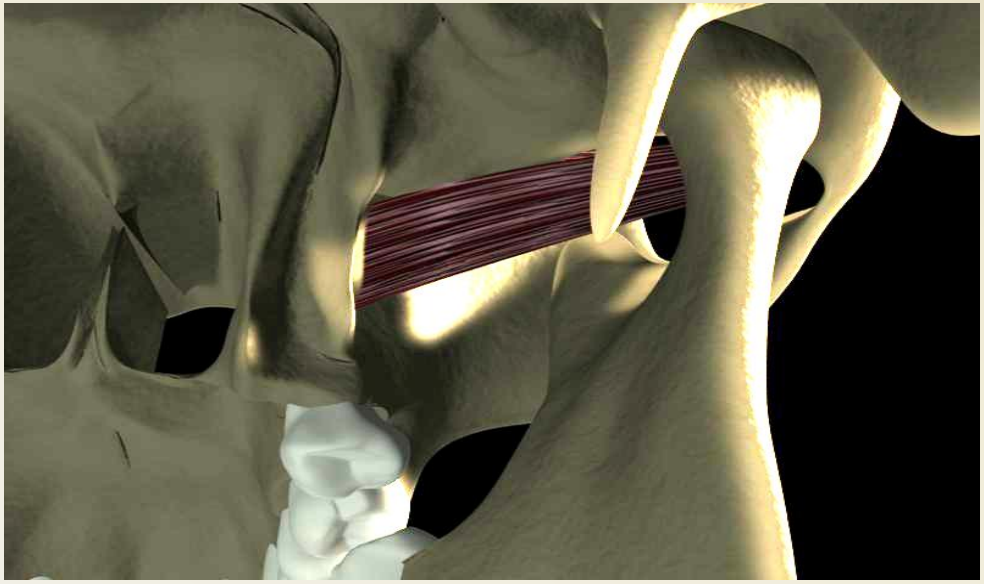
    c) capsule of TMJ

    (anterior aspect)



Lateral Pterygoid Muscle

- **Lower head:**
  - Origin: Lateral surface of the lateral pterygoid plate
  - Insertion: as upper head



Lateral Pterygoid Muscle

Action:

1. Both muscles produce depression of the mandible.
2. Lat. & Med pterygoid on 1 side protrude the mandible to the opposite side.
3. Lat & Med pterygoid on the 2 sides cause side to side movement

Nerve supply:

Anterior division of mandibular nerve (nerve to lateral Pterygoid)

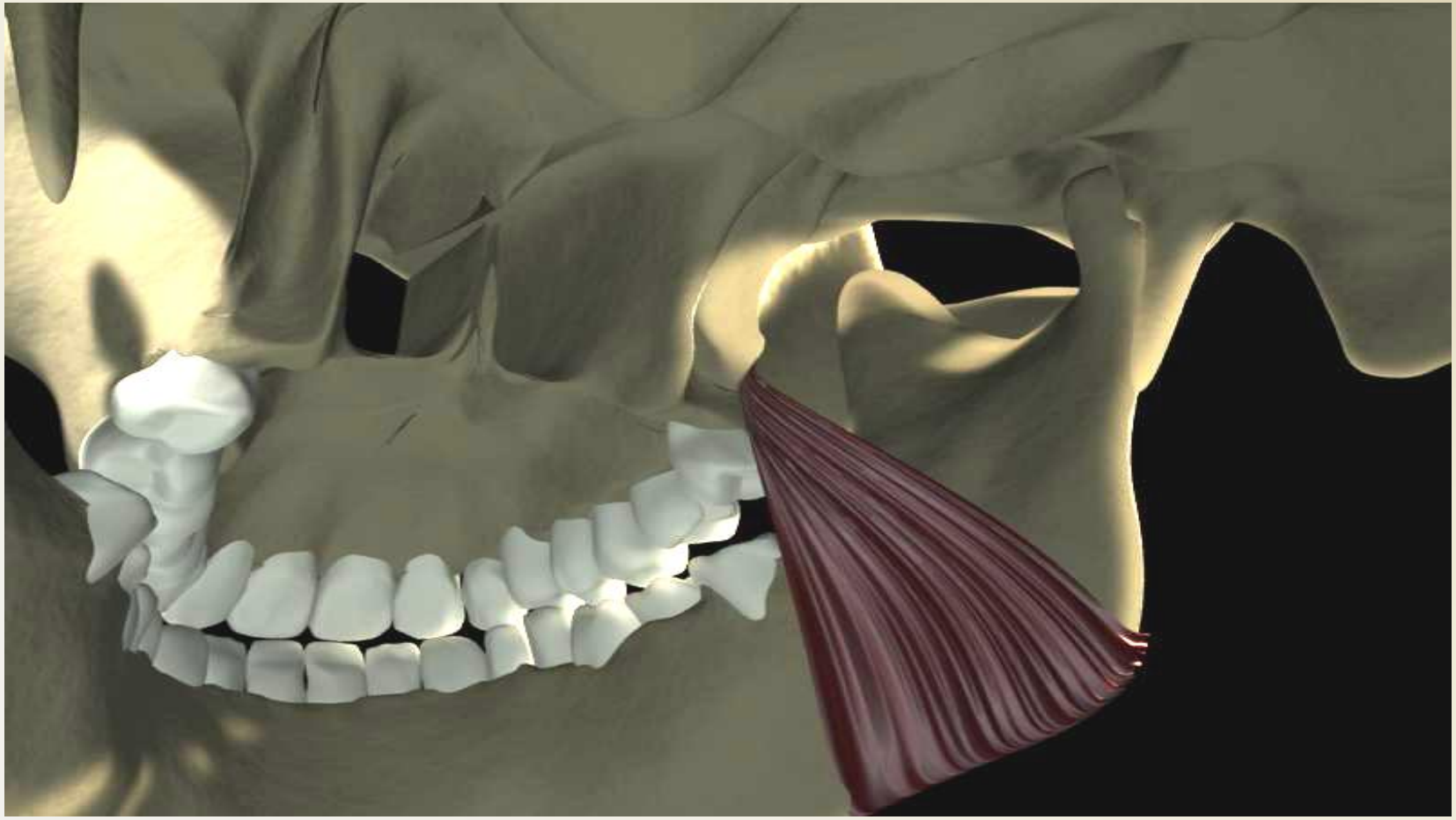
Medial Pterygoid (sup. head) Muscle

Has 2 heads

- Superficial head:
  - **Origin:** a) maxillary tuberosity

    b) neighboring part of palatine bone.
  - **Insertion:** Medial surface of the angle & ramus below the mandibular foramen.

Medial Pterygoid (sup. head) Muscle

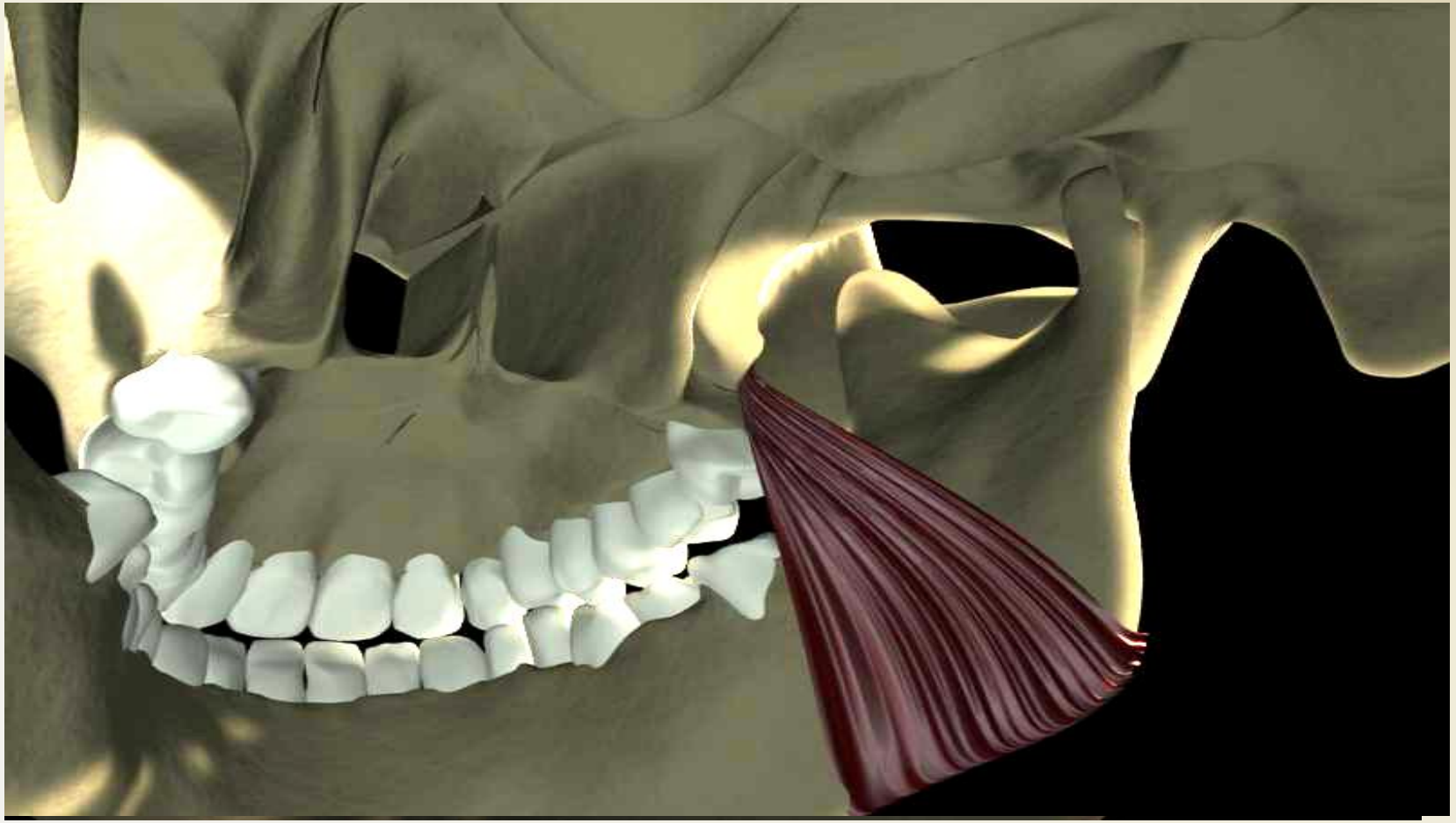


Medial Pterygoid (deep head) Muscle

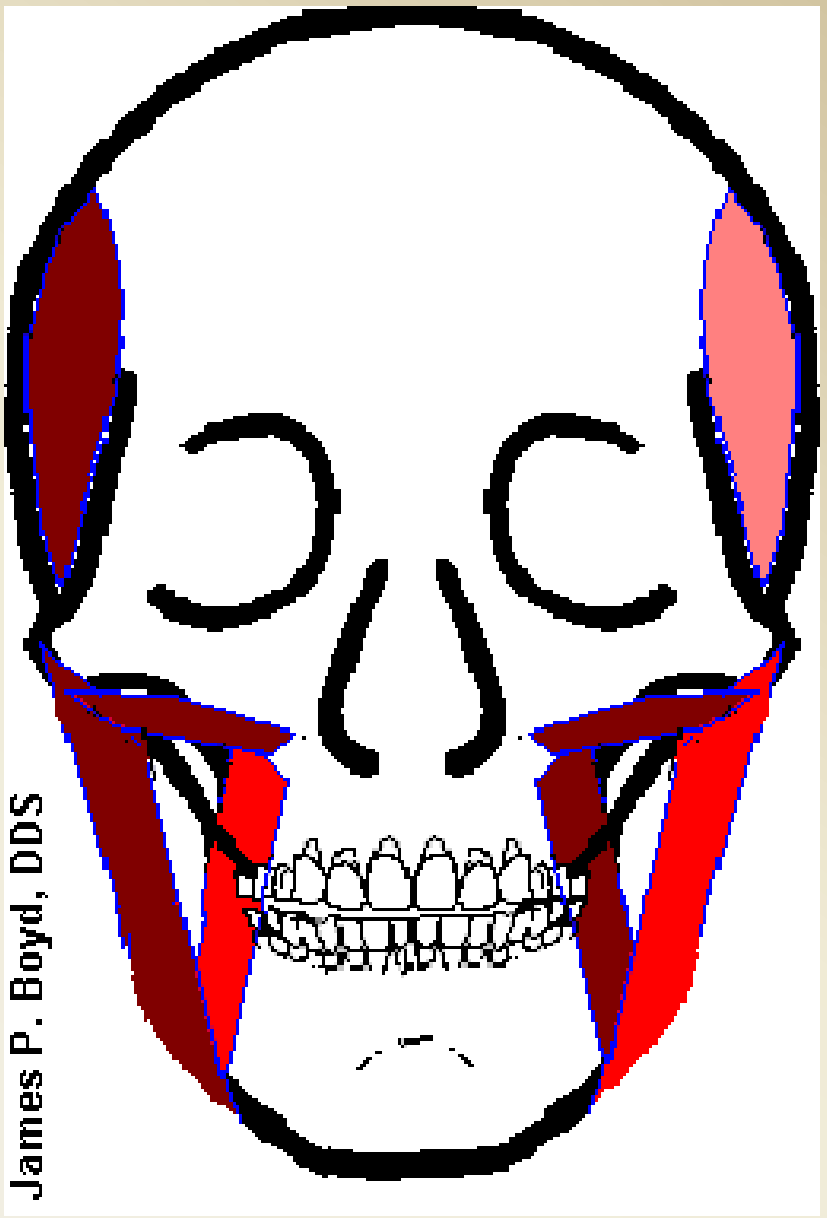
- **Deep head:**
  - **Origin:** Medial surface of the lateral Pterygoid plate.
  - **Insertion:** as upper head.
- **Action:** 1) both muscles elevate the mandible.

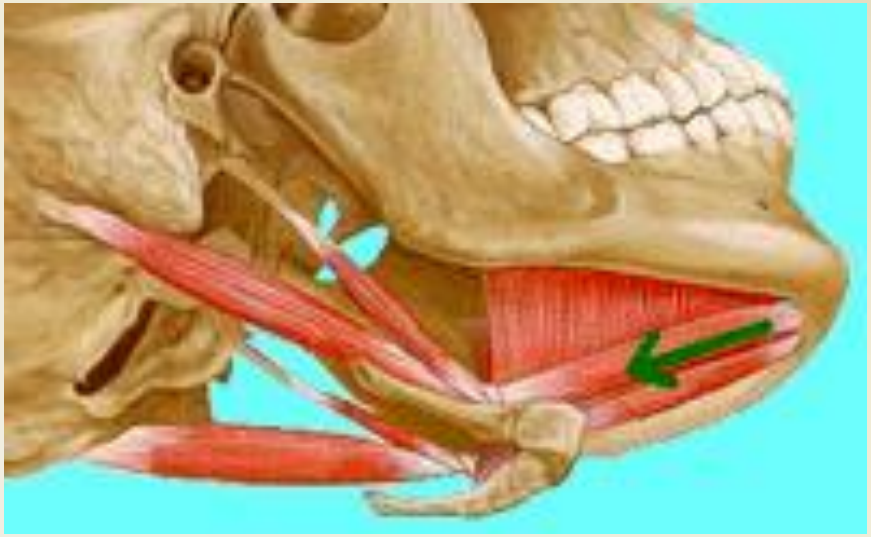
  2 & 3 as in lateral Pterygoid.
- **Nerve supply:** Trunk of the mandibular nerve (nerve to medial pterygoid muscle)

Medial Pterygoid (deep head) Muscle



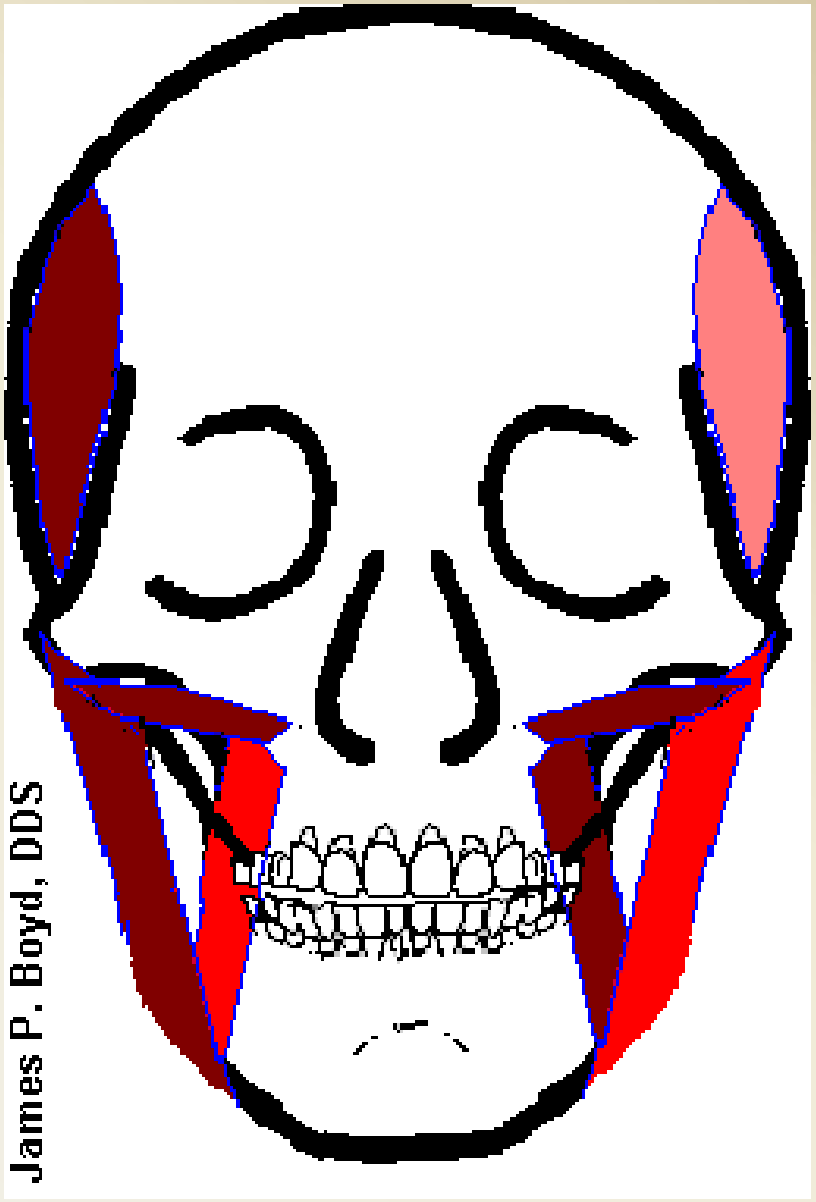
The Lat. Pterygoid M. advance the condyles, thereby opening the mouth (depressing the mandible), with the assistance of the Digastric M.

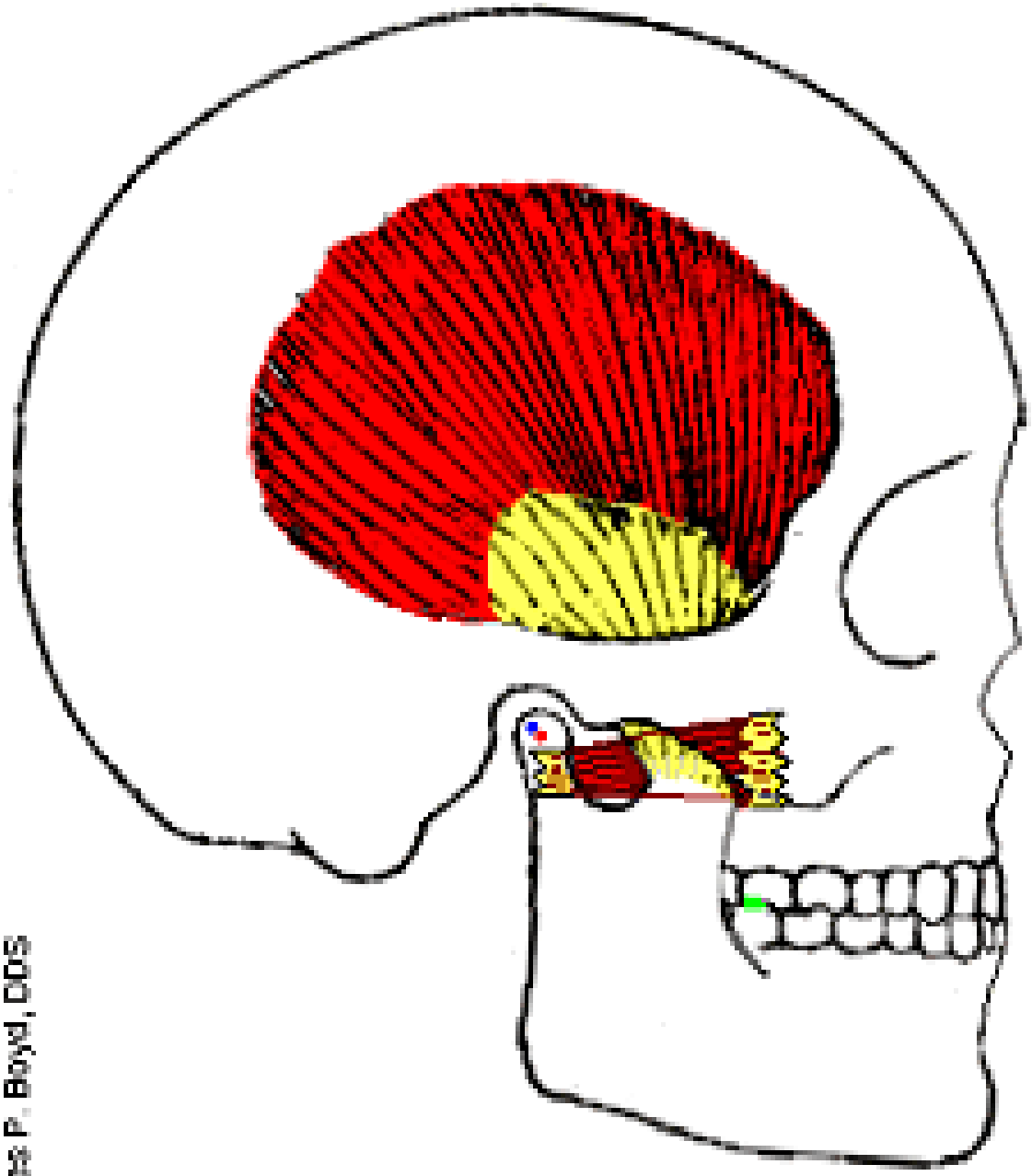




Digastric muscles **is not a muscle of mastication but it play an important role in mandibular function**

In normal chewing function, while initiating closing the mand., there is *a shift slightly to the side of the bolus*, due to the orientation of the *masseter and medial pterygoid Ms.*

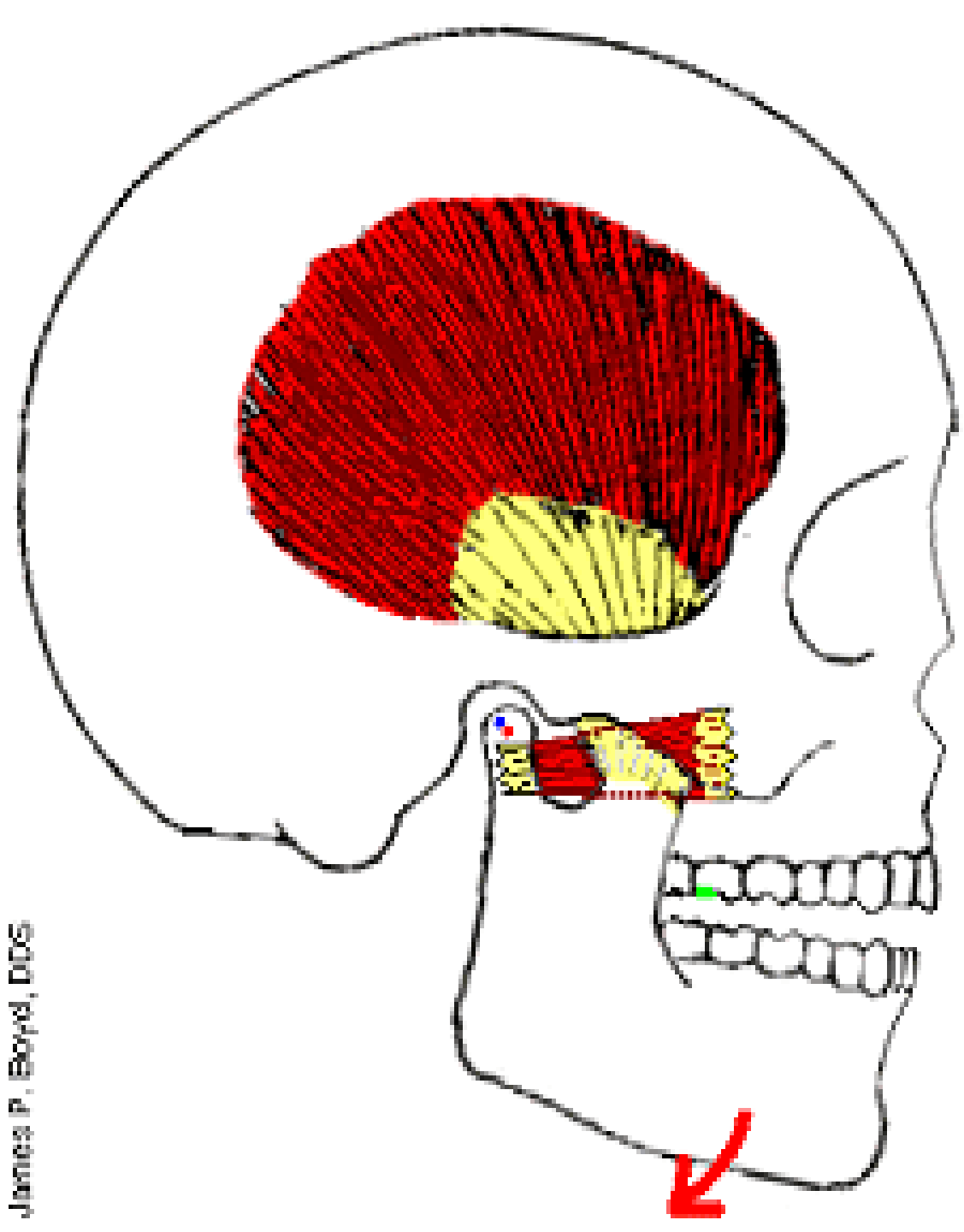




Temporalis relaxes as soon as the teeth contact (occlusion normally last for .2 seconds)

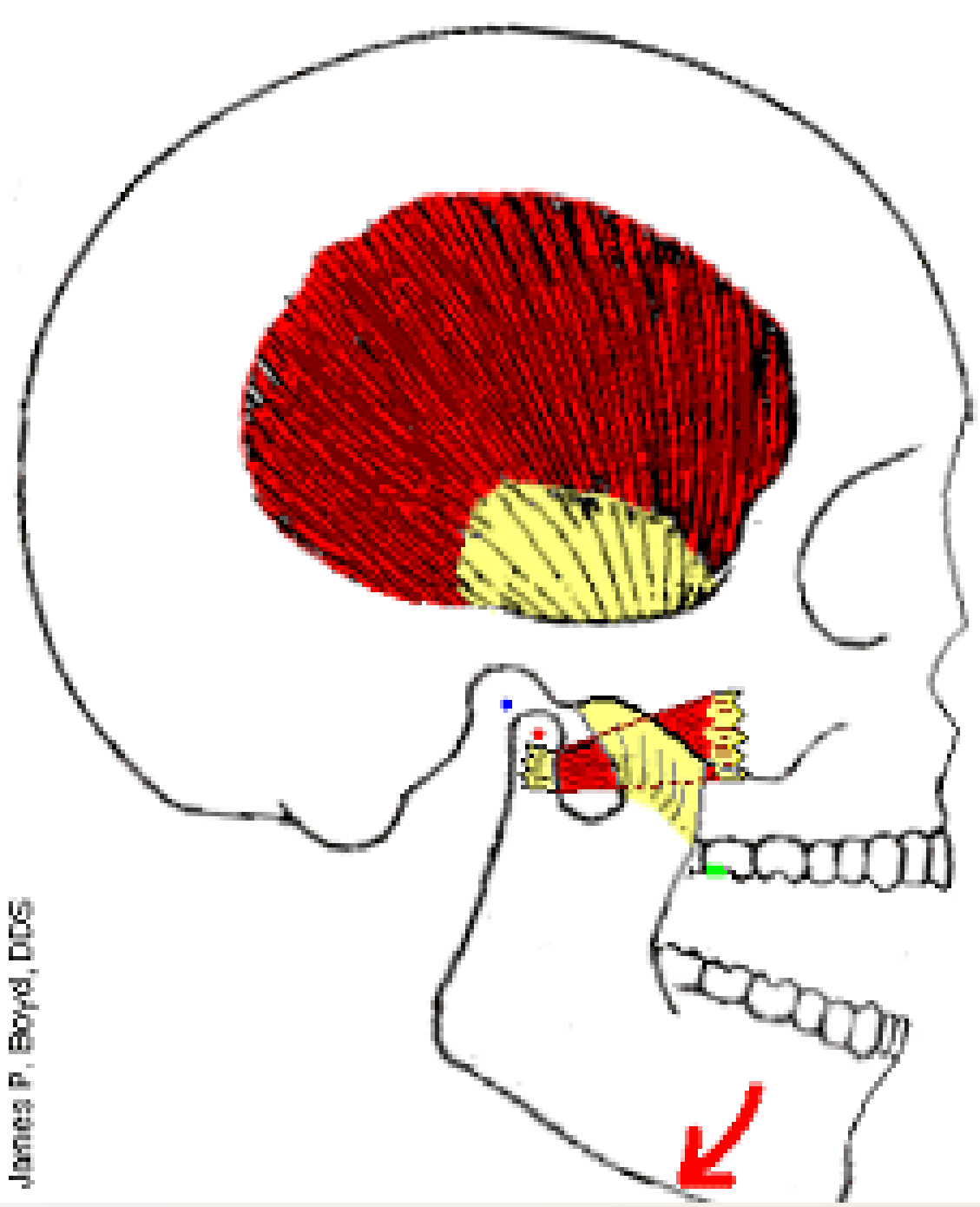
Lateral pterygoid will reflexively contract to disclude the teeth

James P. Boyd, DDS



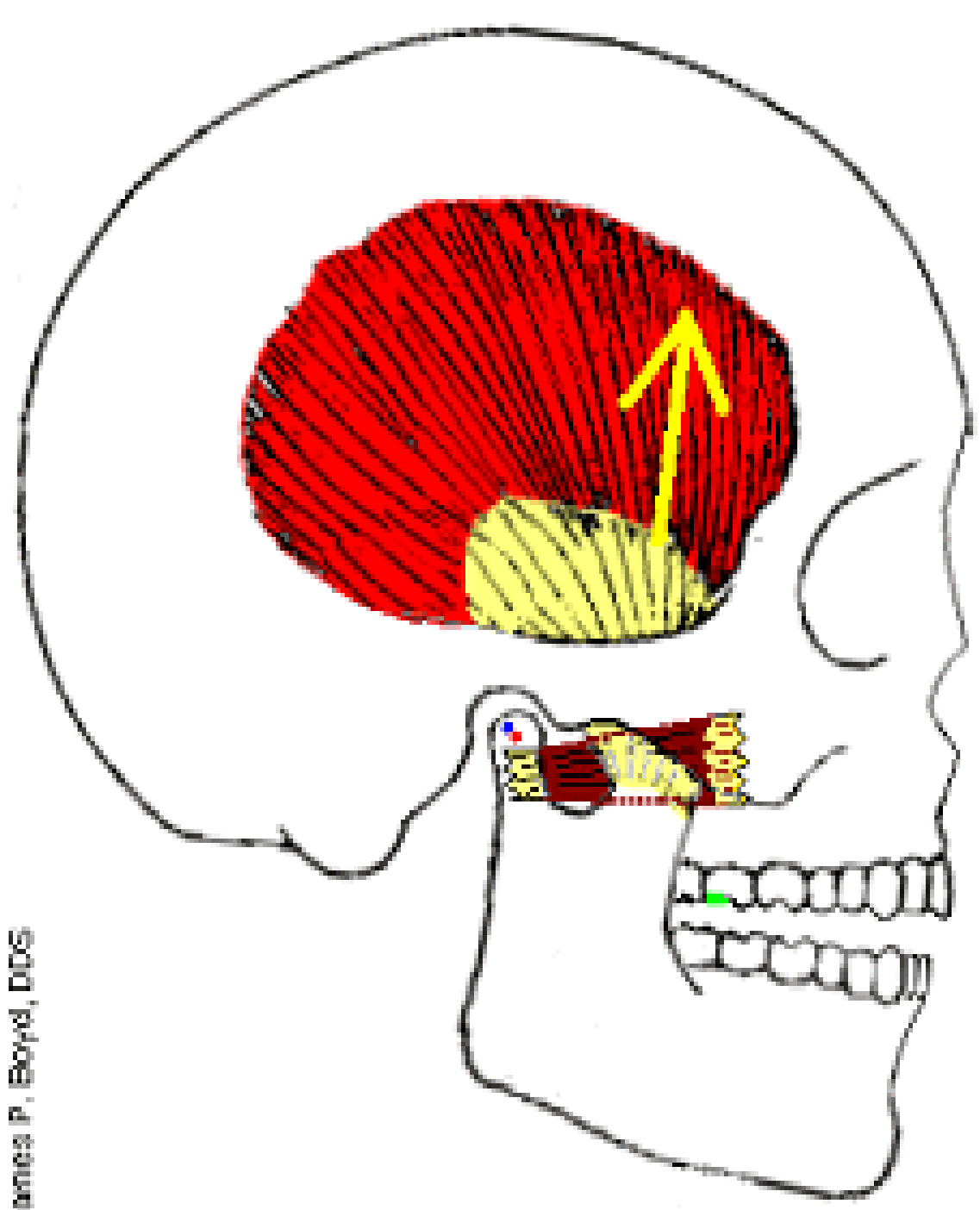
Temporalis relaxes while lateral pterygoid and diagastric (red arrow) contract to disclude teeth and re-open mandible

James P. Boyd, DDS



The normal maximum functioning contraction of the lateral pterygoid and digastric creates maximal opening

James P. Boyd, DDS

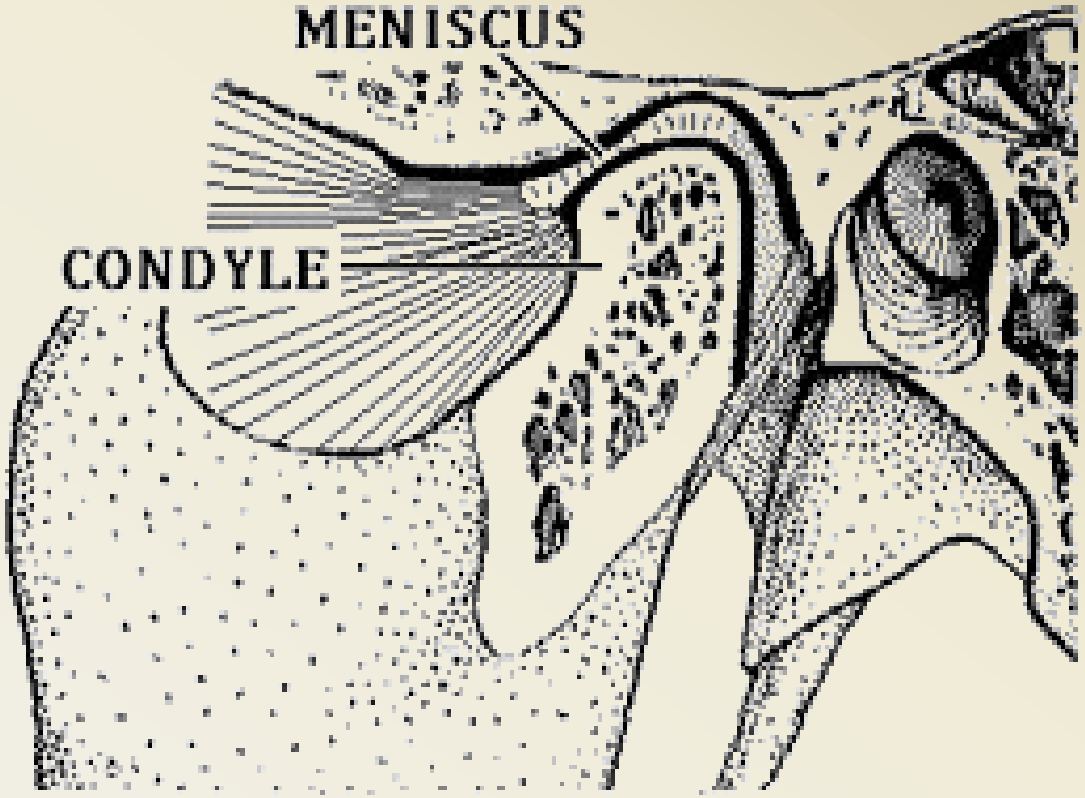


Temporalis will normally elevate (close), and brace (seat) condyle anterior / superior while lateral pteygoid is relaxes

Occlusion Terminology & Definitions

Centric Relation

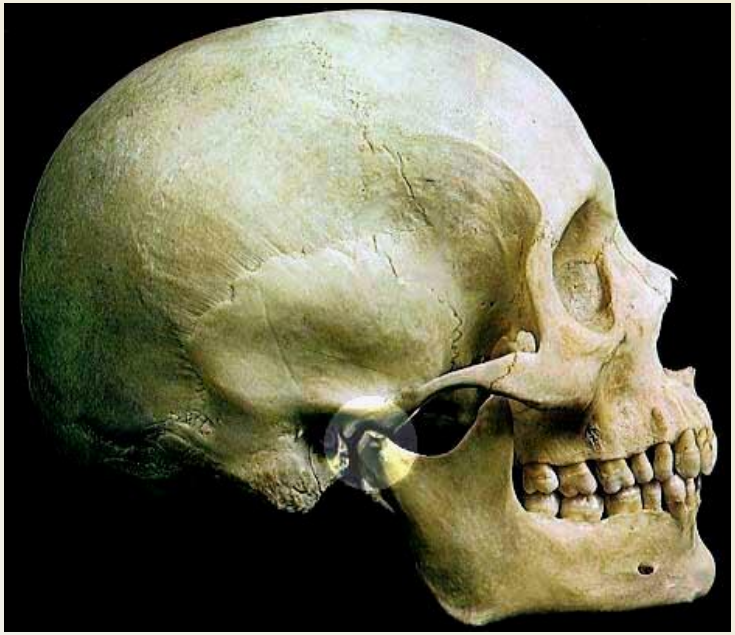
It is bone to bone relationship *independent* on tooth contacts



Centric relation

It is the most retruded unstrained position of the condyle in the glenoid fossa from which lateral movements can be performed.

CENTRIC RELATION



<u>Others define as:</u> The relation of the mandible to the maxillae, at a given vertical dimension, when the condyles occupy the most supero-anterior position in their mandibular fossae axis.

MAXIMUM INTERCUSPATION

The complete intercuspation of the opposing teeth *independent* of condylar position.

Occlusion

- **Occlude → close.**
  Occlusion → is the act or process of closure

- **It is the <u>STATIC</u> relationship between the incising or masticating teeth analogues.**

- **So Occlusion is the closure of the maxillary and mandibular teeth throughout the range of functional and nonfunctional movements of the mandible**

- **It is an important factor that influences stability and retention of complete dentures.**

CENTRIC OCCLUSION

The occlusion of opposing teeth when the mandible is in centric relation


1/2x

Eccentric Occlusion

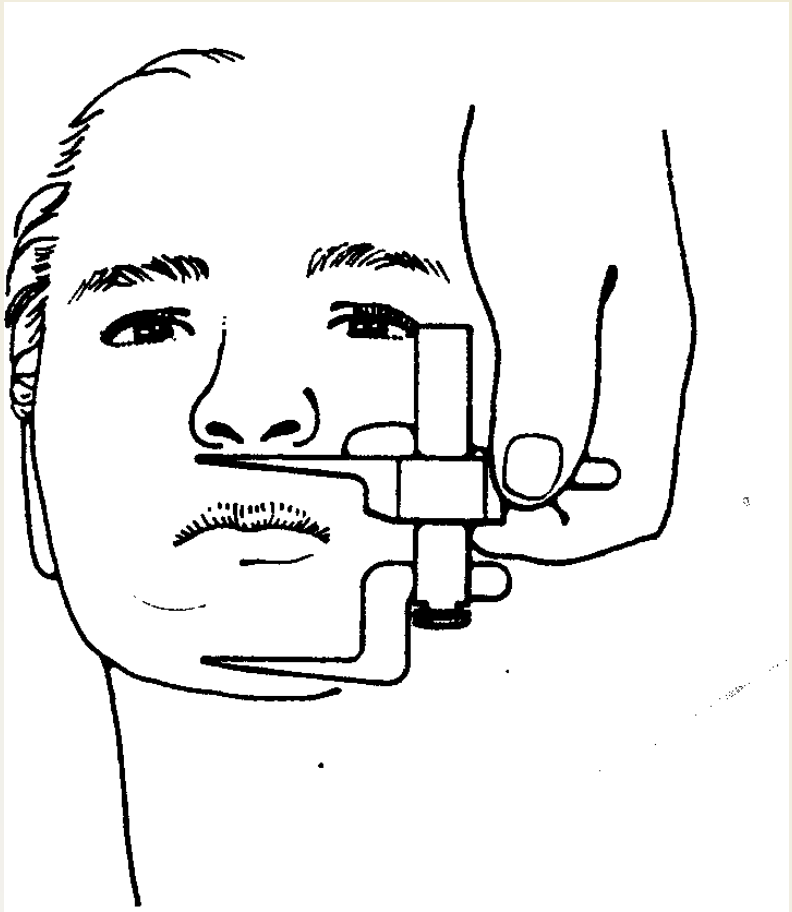
Any occlusion other than centric relation

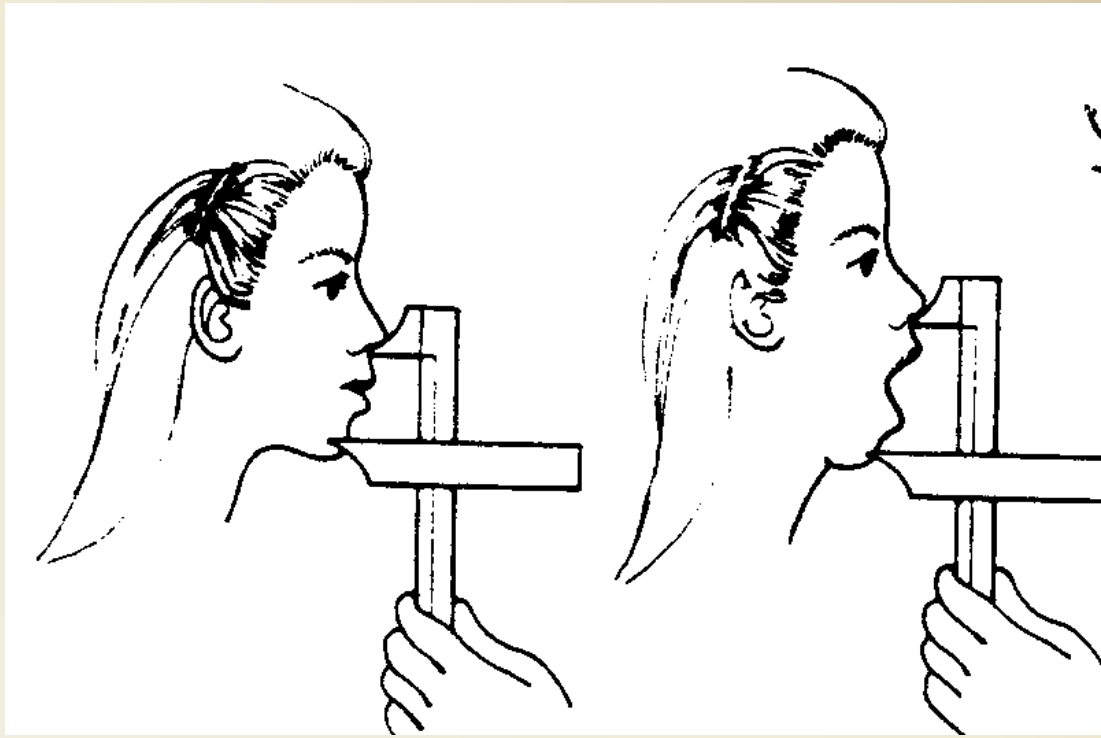
Articulation:

The dynamic movements of the teeth in relation to each other

VERTICAL DIMENSION OF OCCLUSION

The degree of separation between the maxillae and the mandible when the teeth are in occlusion.

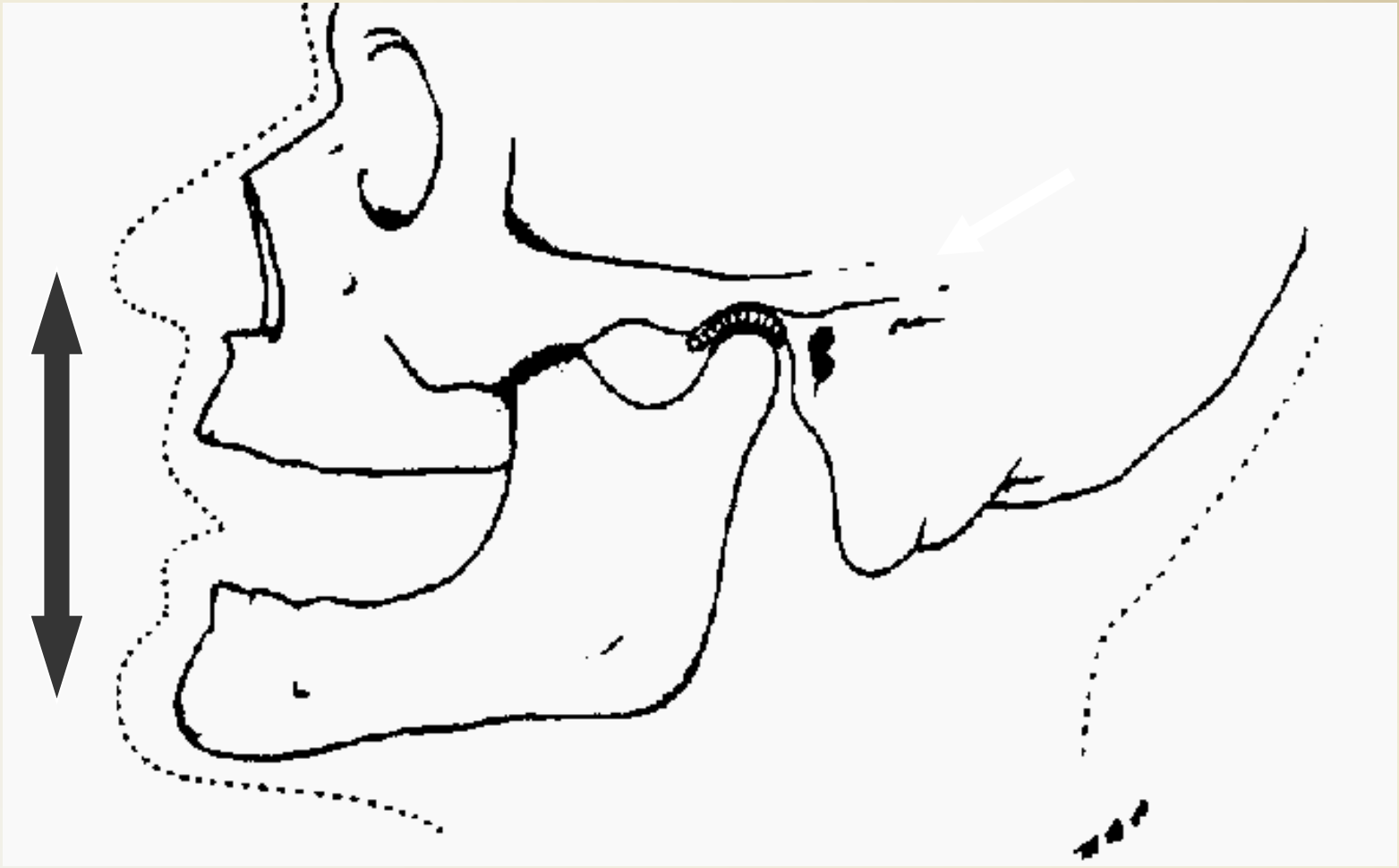




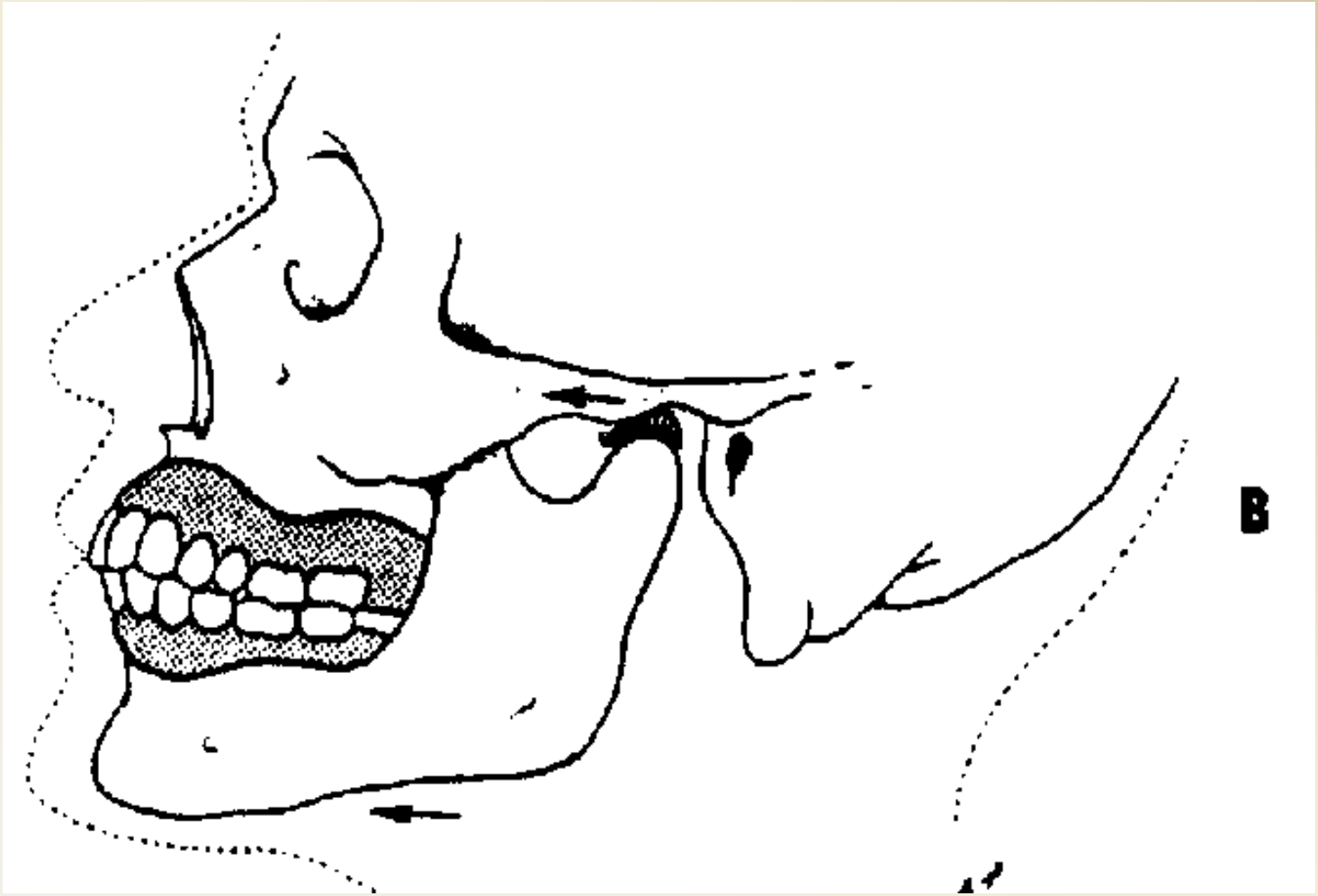
VERTICAL DIMENSION OF OCCLUSION

Interocclusal distance (Free way space)

The distance between the occluding surfaces of the maxillary and mandibular teeth when the mandible is in a specified relaxed position, it ranges from 2-4 mm.

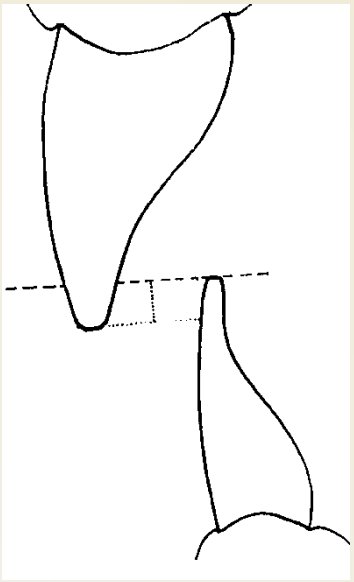


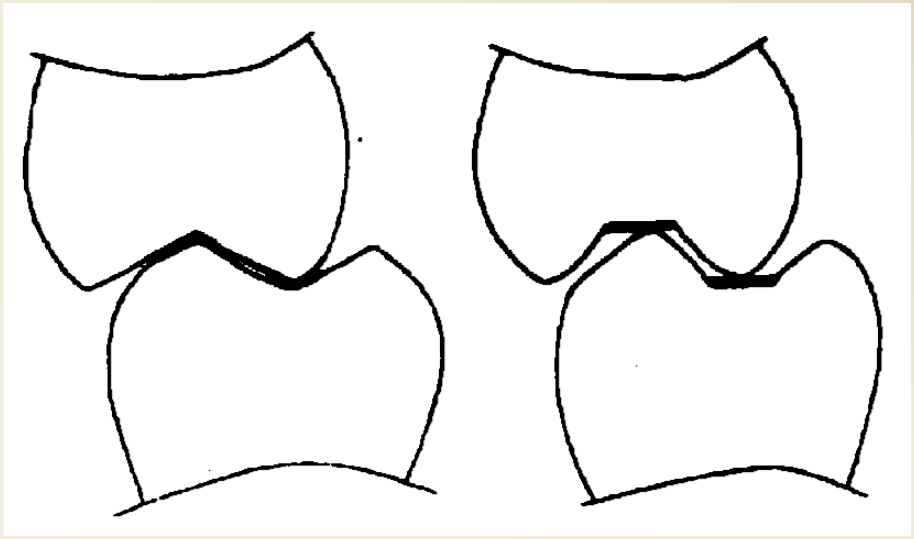
In the edentulous patients, use the most retruded position of the condyle in its fossa (centric relation)

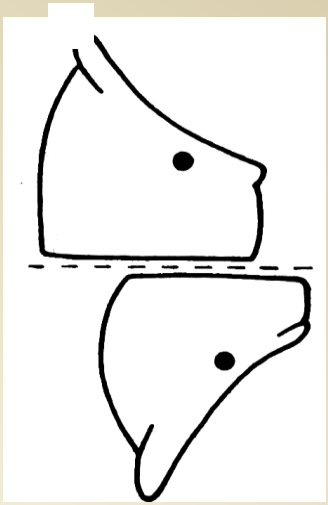


Centric Occlusion can be made to coincide with CR

long centric or Freedom in centric

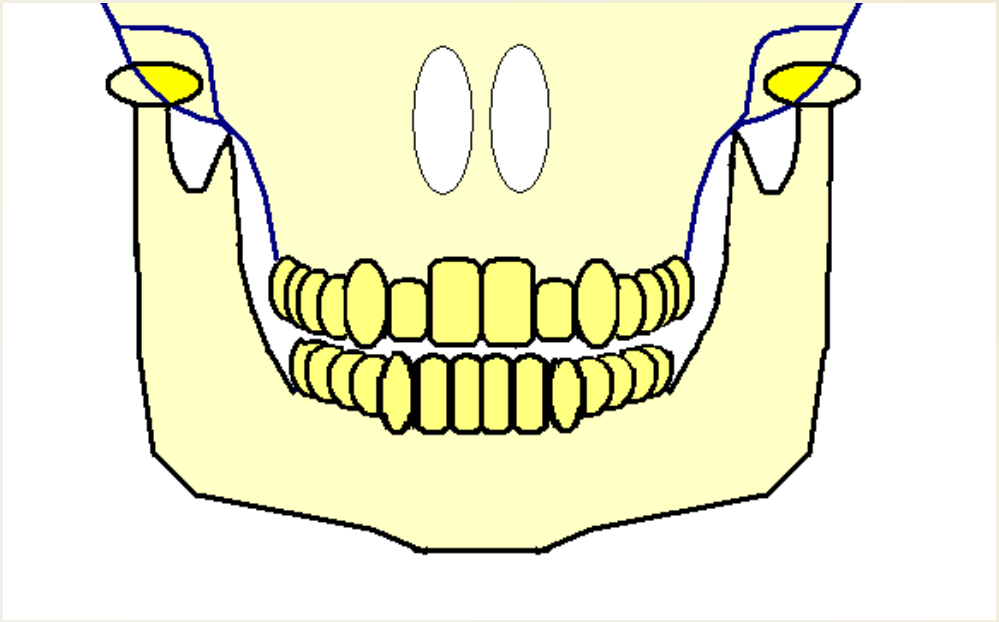


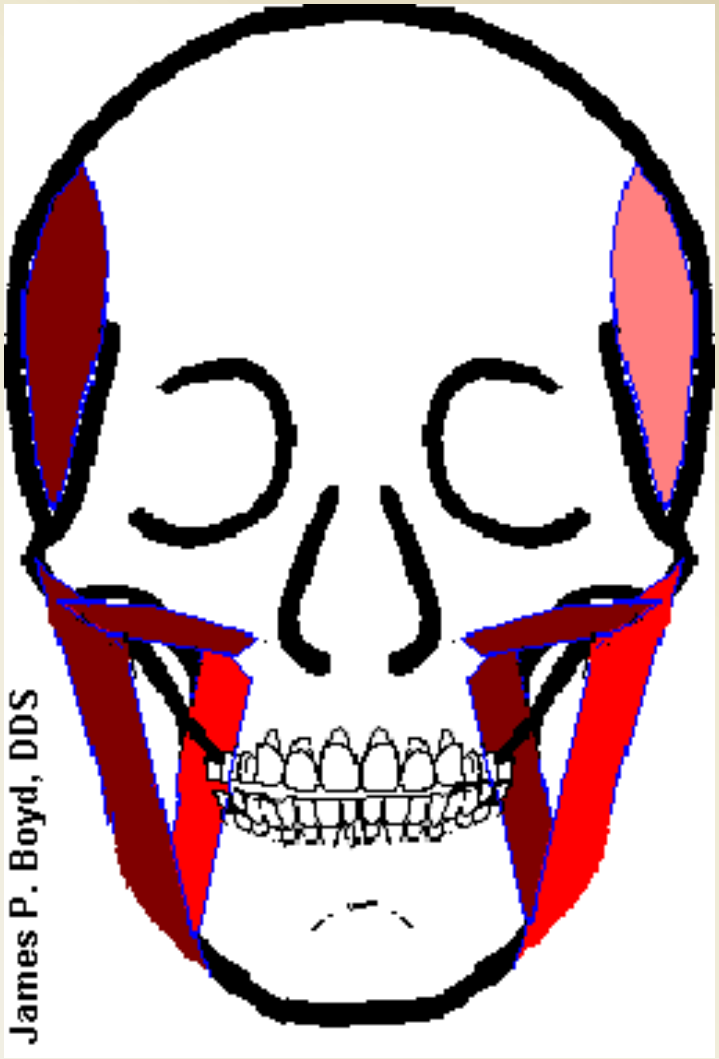


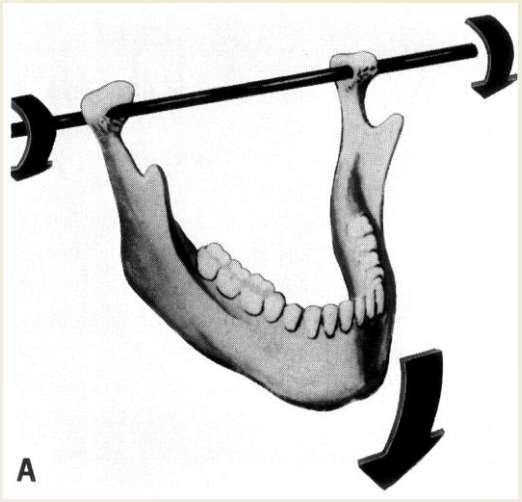


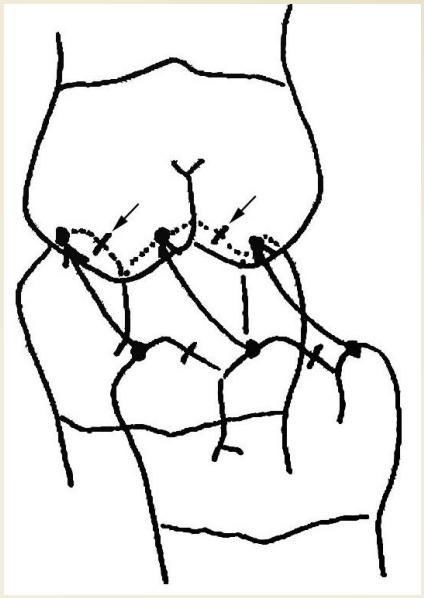
the occlusal surface of the teeth could be altered to *allow freedom of tooth movement* in harmony with the rotation of condyle. (from hinge position to habitual intercuspal position).

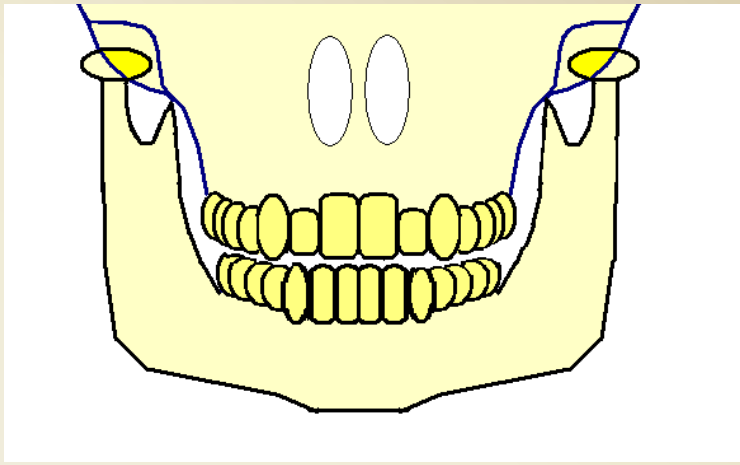
Movements of Mandible within Functional Range



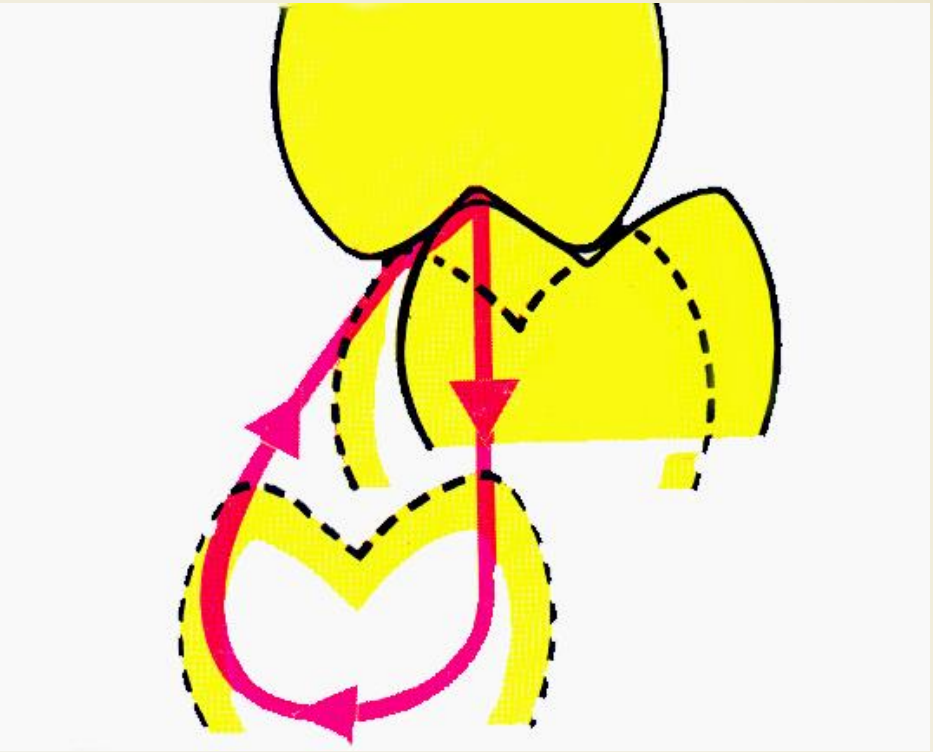


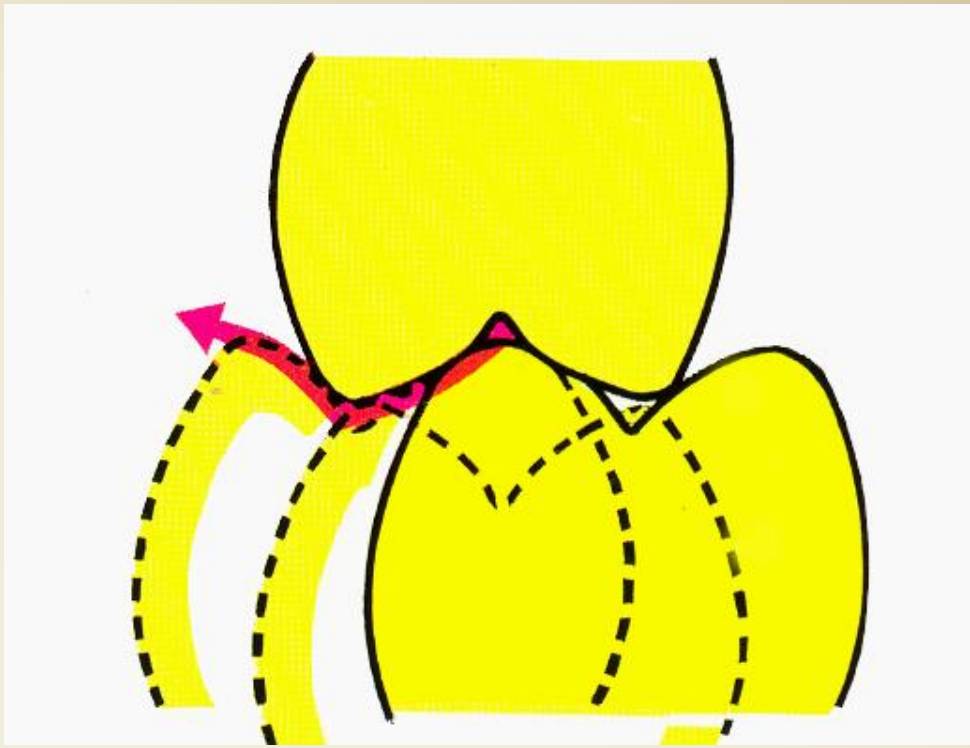






The closure of the mandible does not occur in a straight upward movement but rather in a curve





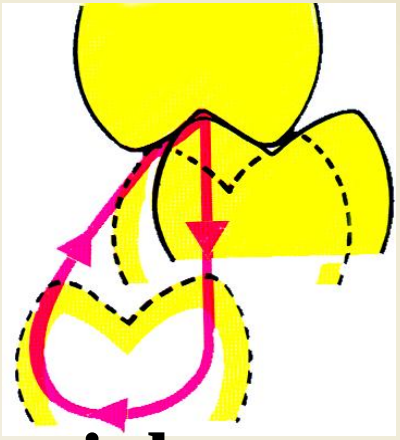
Masticatory cycle
(Balanced Articulation)

Normal masticatory cycle

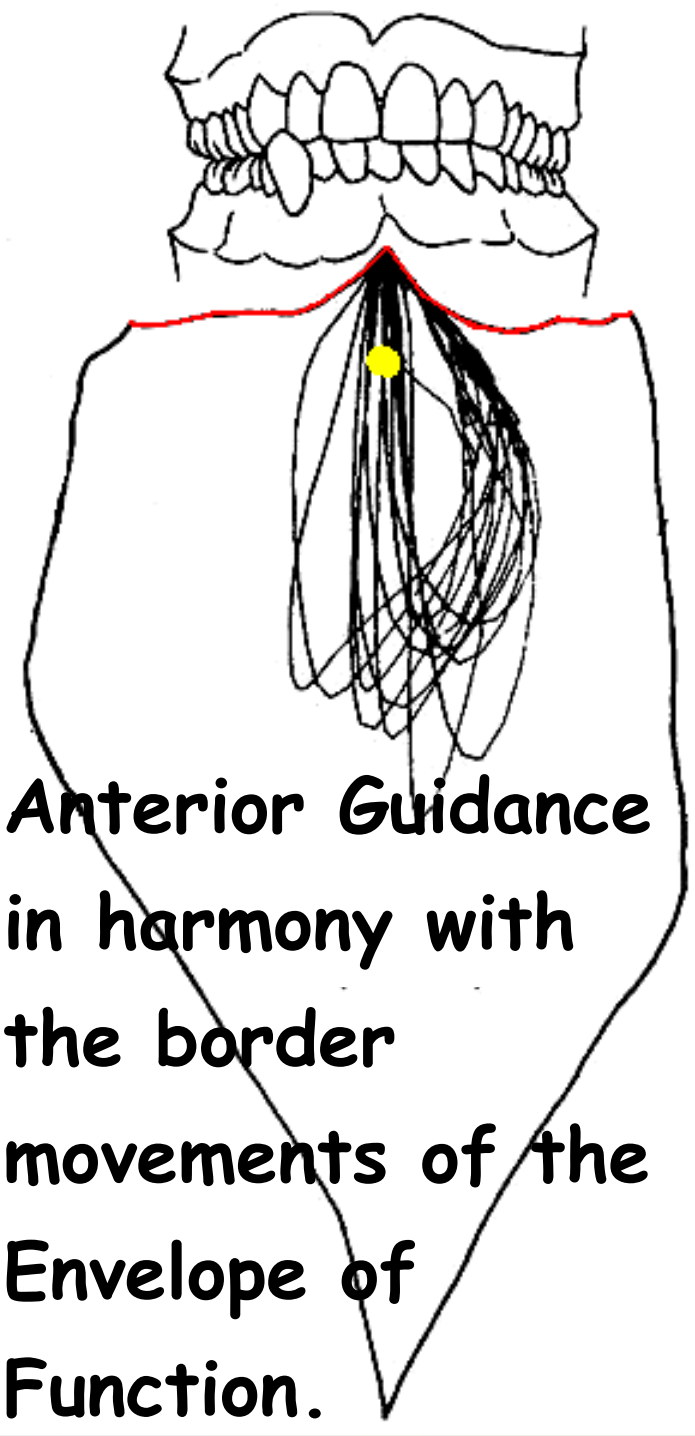
Envelope of function

Most normal chewing stays within the red area, but the lower teeth have the range of the black line.

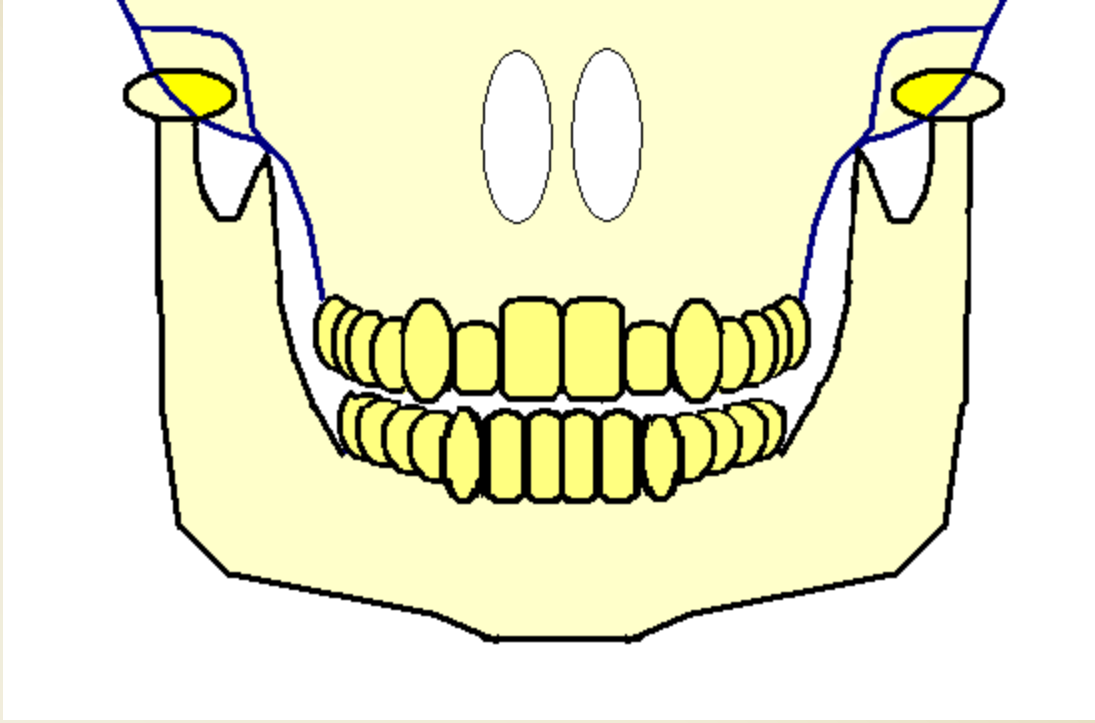
Lower teeth are 'guided' by a gentle slope of the upper lingual surfaces.

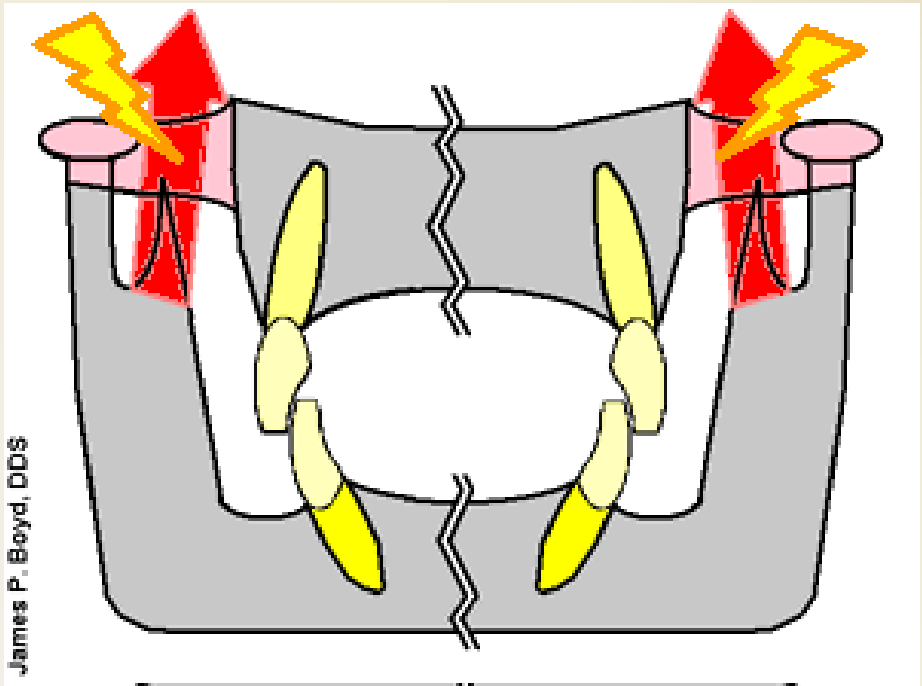


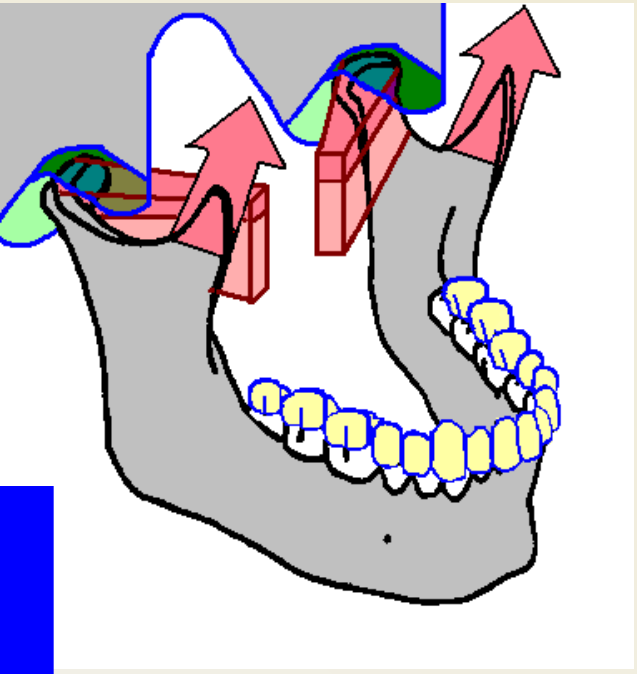
Teeth harmonious with bone / craniofacial structures

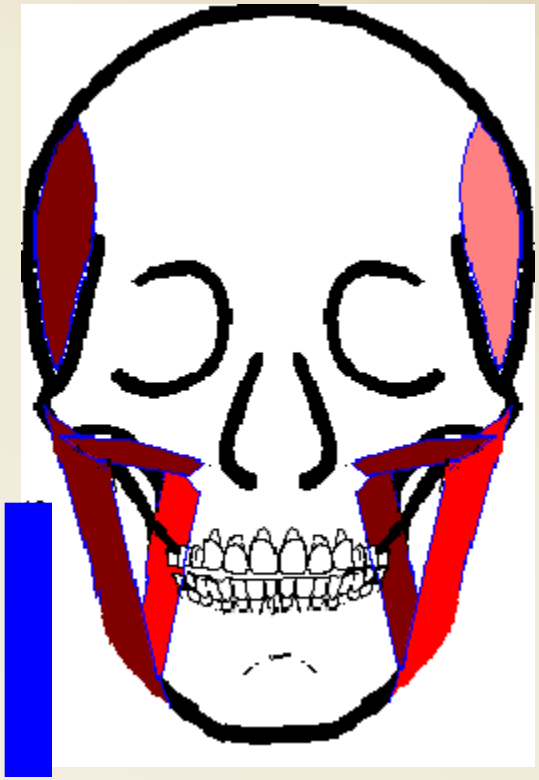


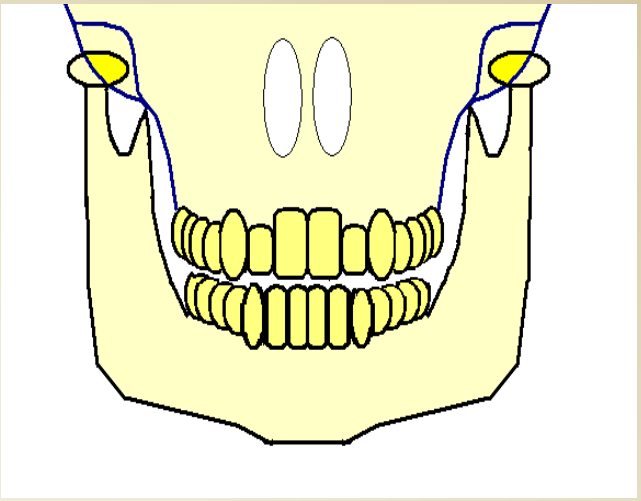
Anterior Guidance in harmony with the border movements of the Envelope of Function.











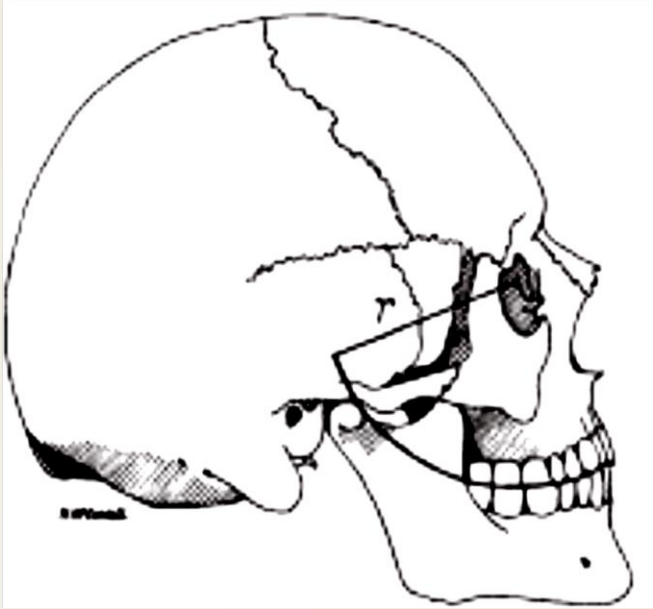
- In normal chewing function, the mandible opens, and then, while initiating closing, there is a shift slightly to the side of the bolus, due to the orientation of the masseter and medial pterygoid.

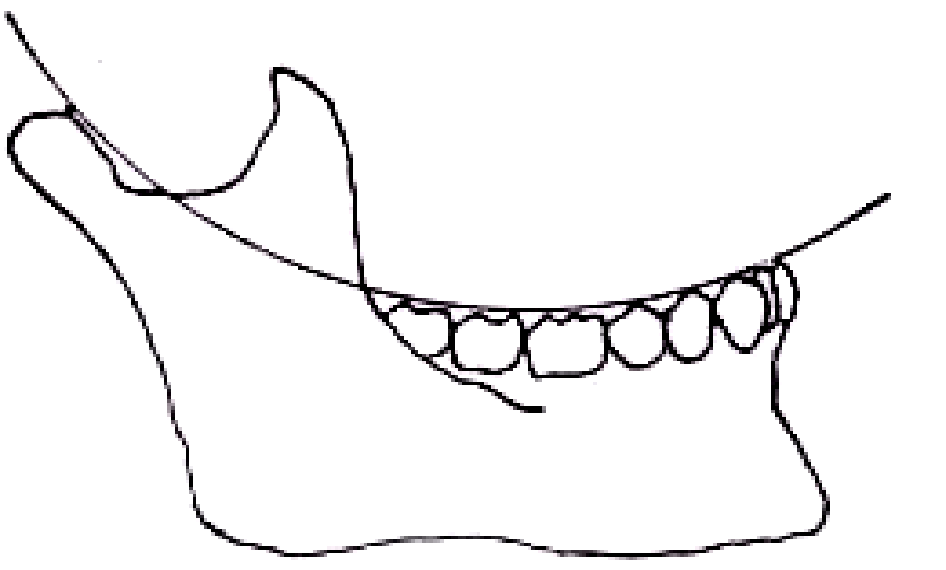
Change the pattern of mandibular closure as a result of premature contact

The Masticatory Cycle occur according to the Compensating curves

Compensating curves

Spee's curve

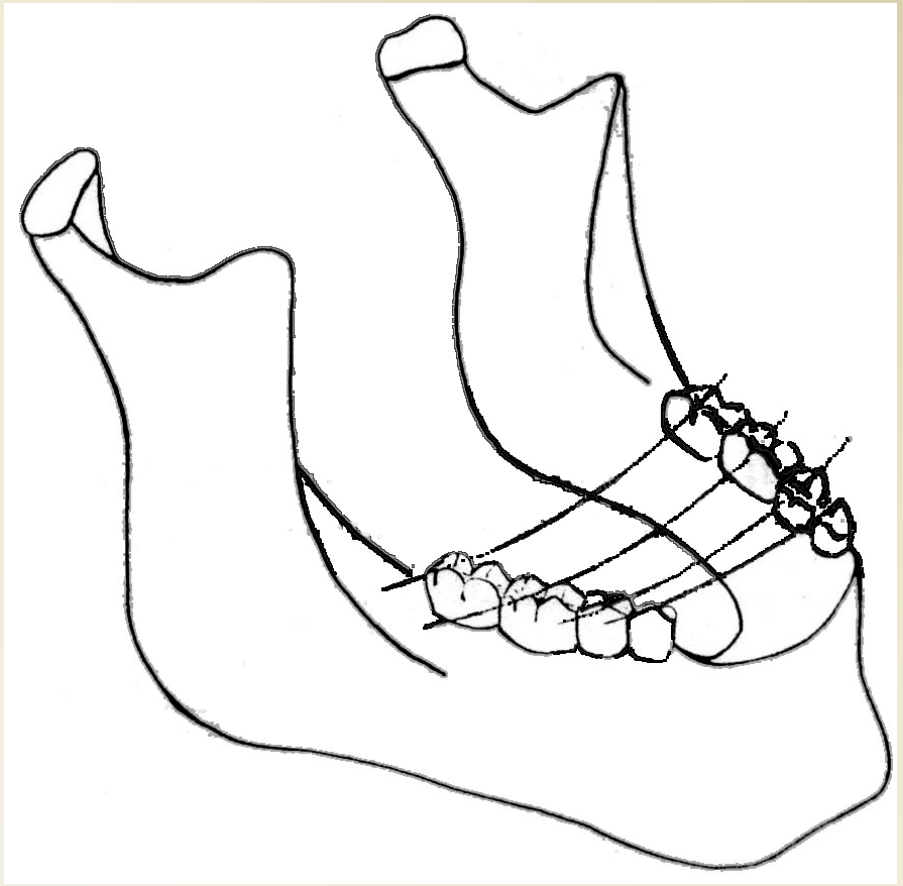


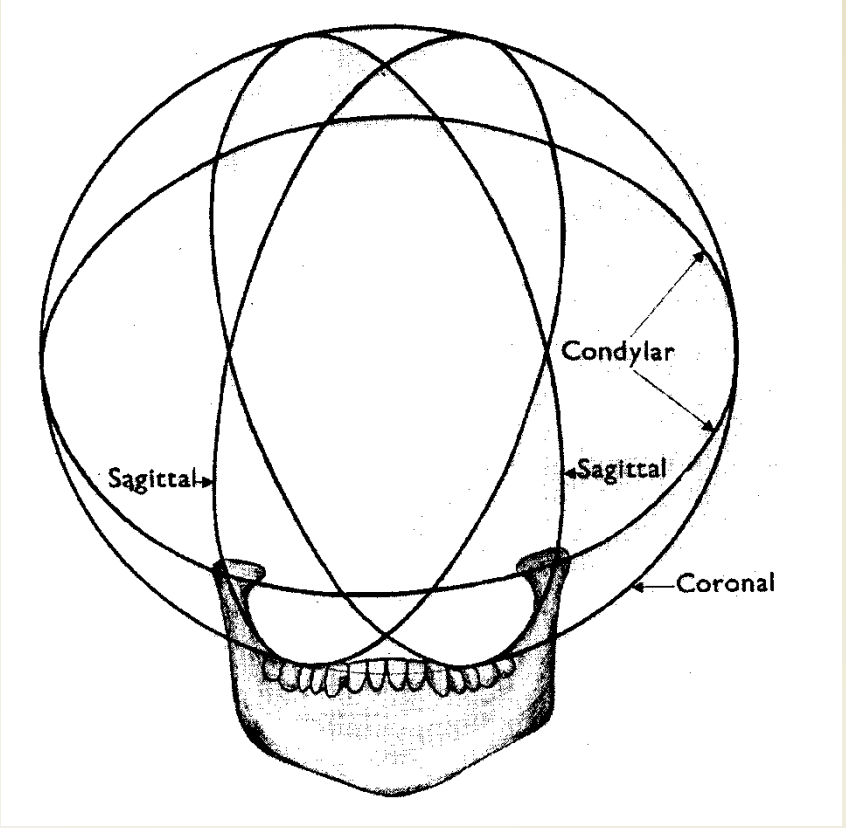


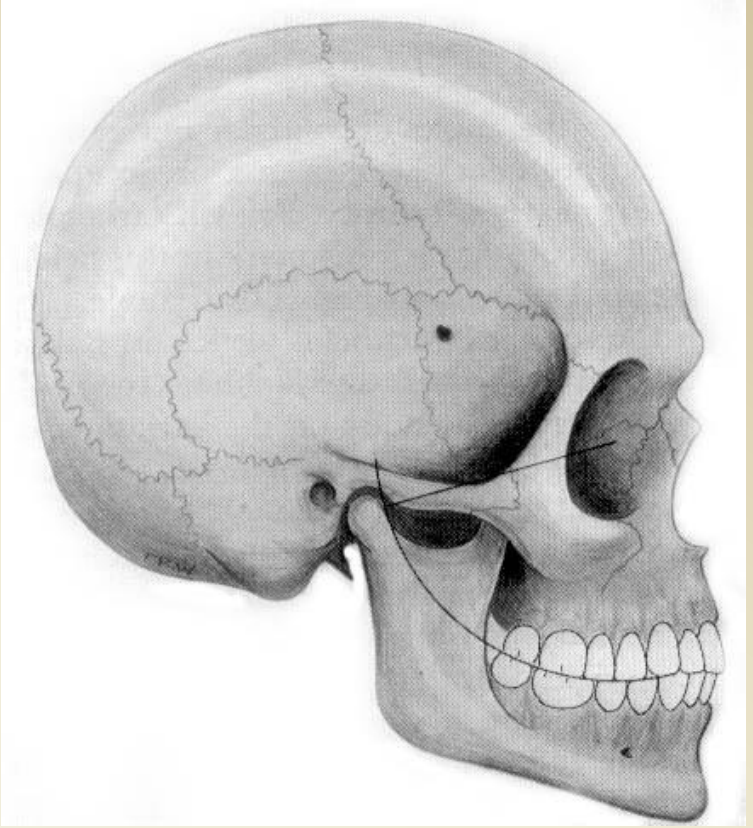
The anatomic curvature of the occlusal alignment of the lower teeth beginning at the tip of the lower cuspid and following the buccal cusps of the natural bicuspids and molars continuing to the anterior border of the ramus

Curve of Wilson

The buccal cusps of the lower posterior teeth are slightly higher than the lingual cusps, and a line drawn through the buccal and lingual cusps of the teeth on the other side forms a lateral curve called the *curve of Wilson*







Monson's curve

It is a curve in which each cusp and incisal edge touches or conforms to a segment of a sphere 20 cm (eight inches**) in diameter with its center the glabella.**

The compensating curve of the artificial occlusion corresponds to a combination of these curves in natural teeth. It is considered one of the most important factors in establishing balanced occlusion

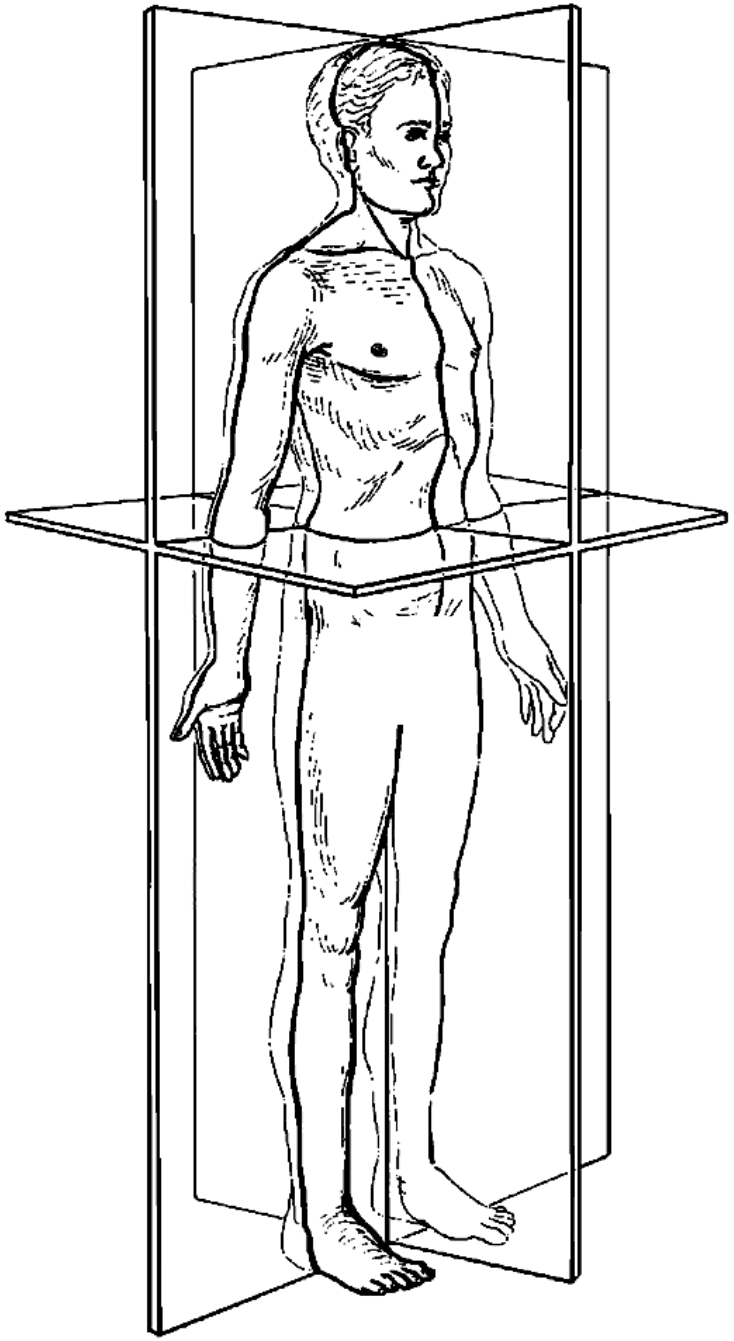
Condyler Positions and its Movements

Cardinal planes of motion

- 3 basic or traditional planes

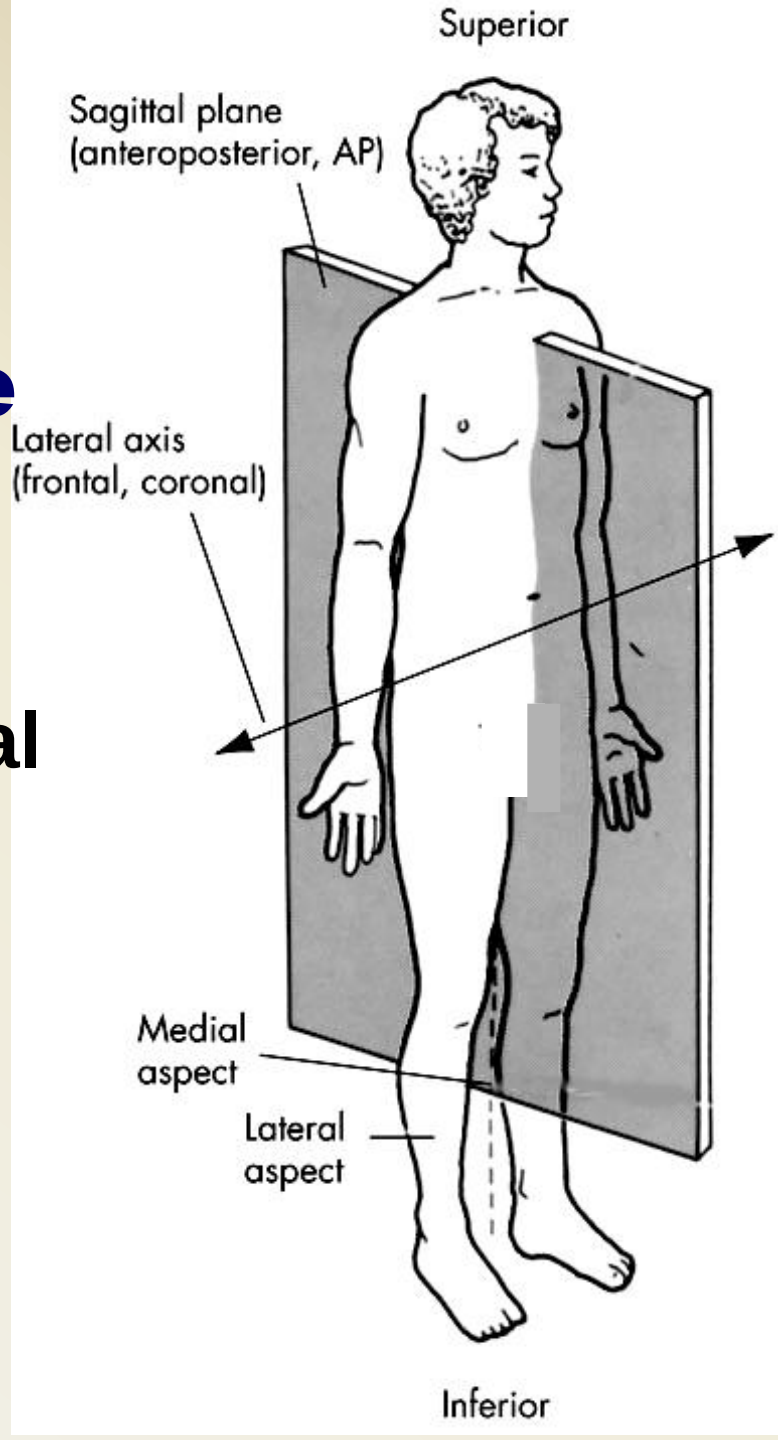
→in relation to the body, not in relation to the earth

- Anteroposterior or Sagittal Plane
- Lateral or Frontal Plane
- Transverse or Horizontal Plane



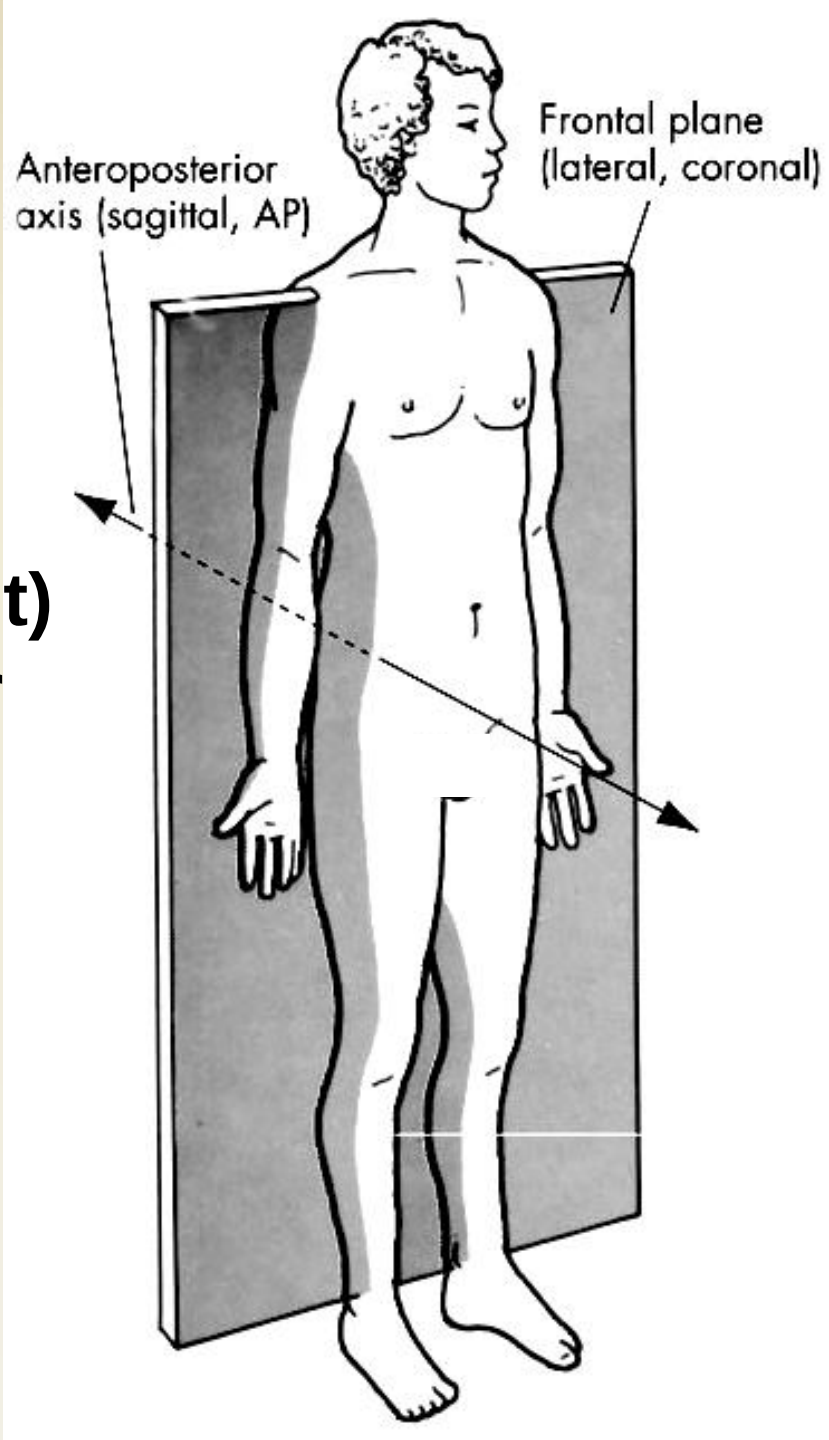
Cardinal planes of motion

- **Anteroposterior Plane**
  - divides body into equal, bilateral segments
  - It bisects body into 2 equal symmetrical halves or a right & left half



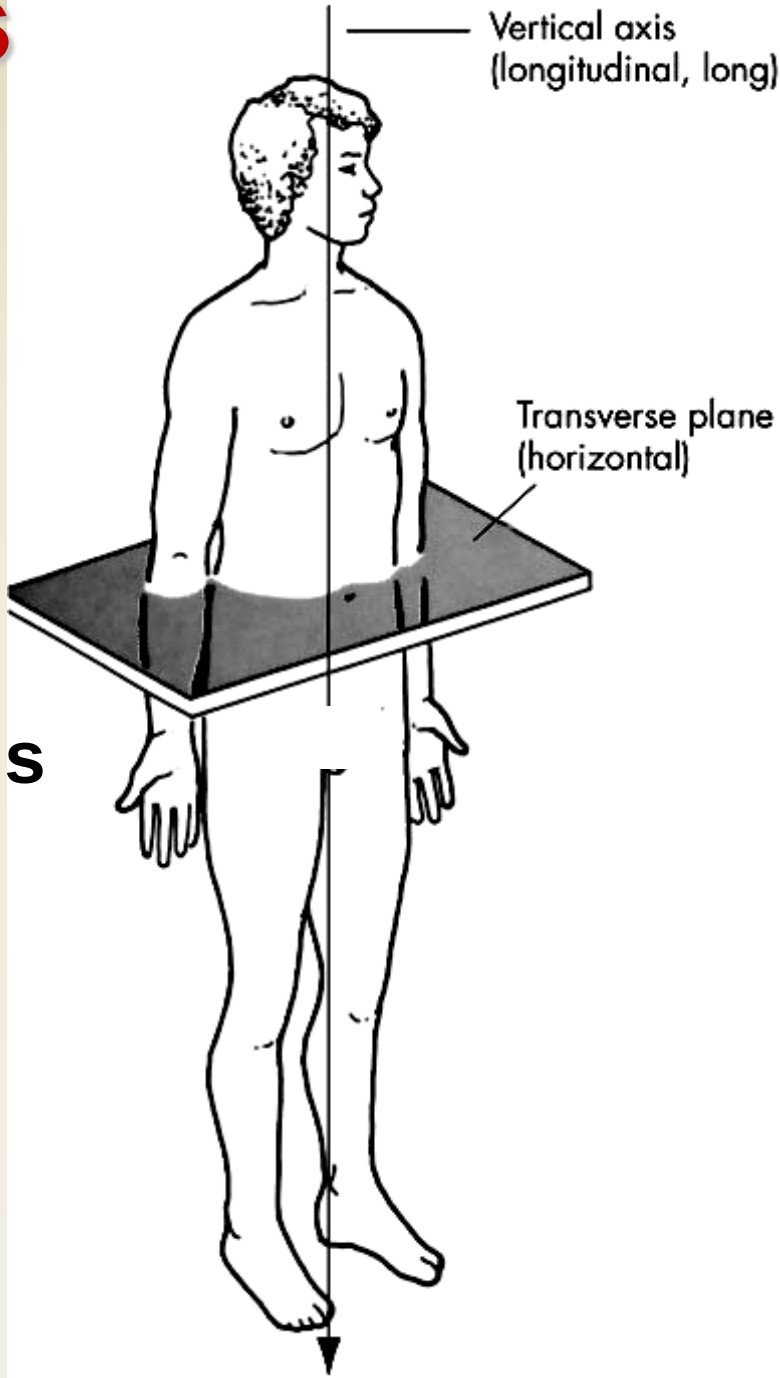
Cardinal planes of motion

- **Lateral Plane**
  - divides the body into (front) anterior & (back) posterior halves
  - Ex. Jumping Jacks



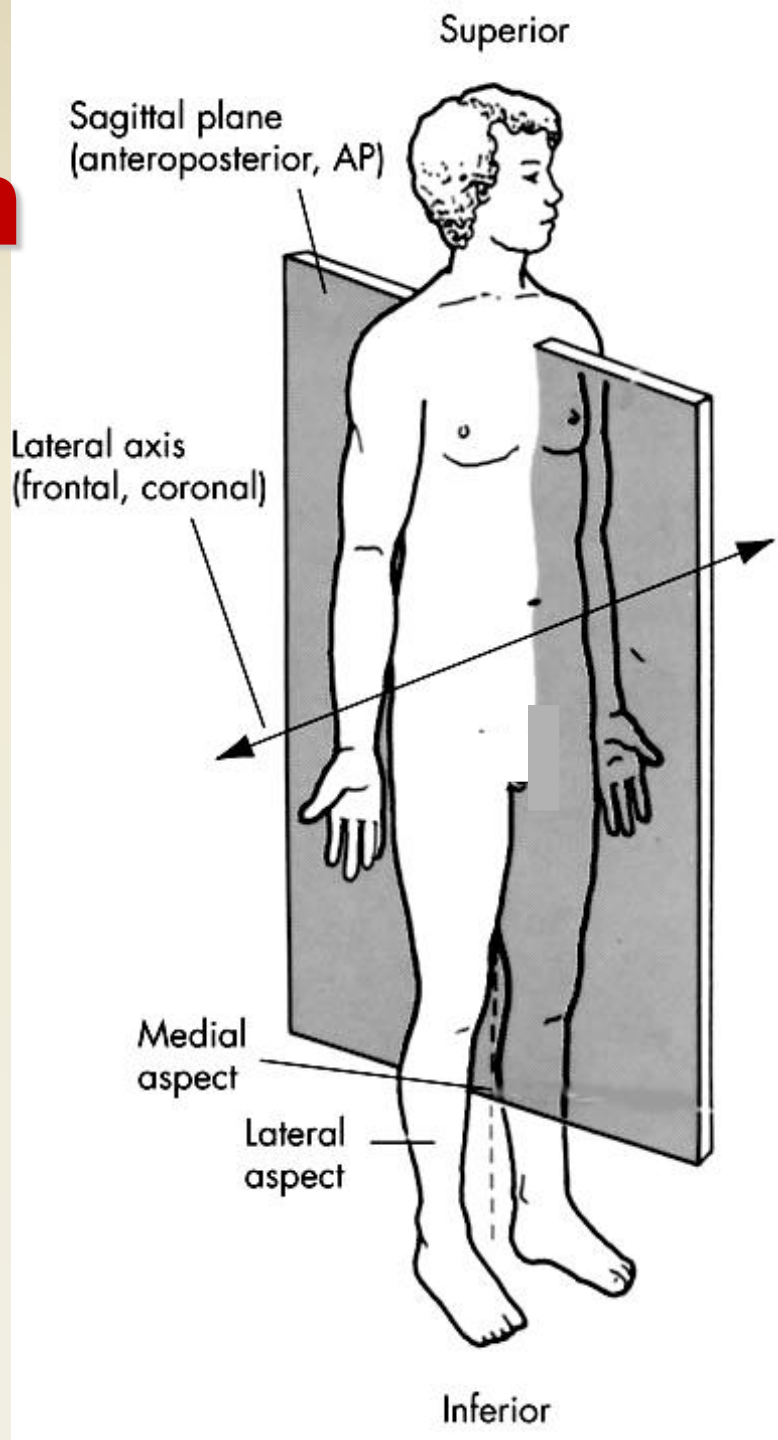
Cardinal planes of motion

- **Horizontal Plane**
  - divides body into (top) superior & (bottom) inferior halves when the individual is in anatomic position
  - Ex.Spinal rotation to left or right



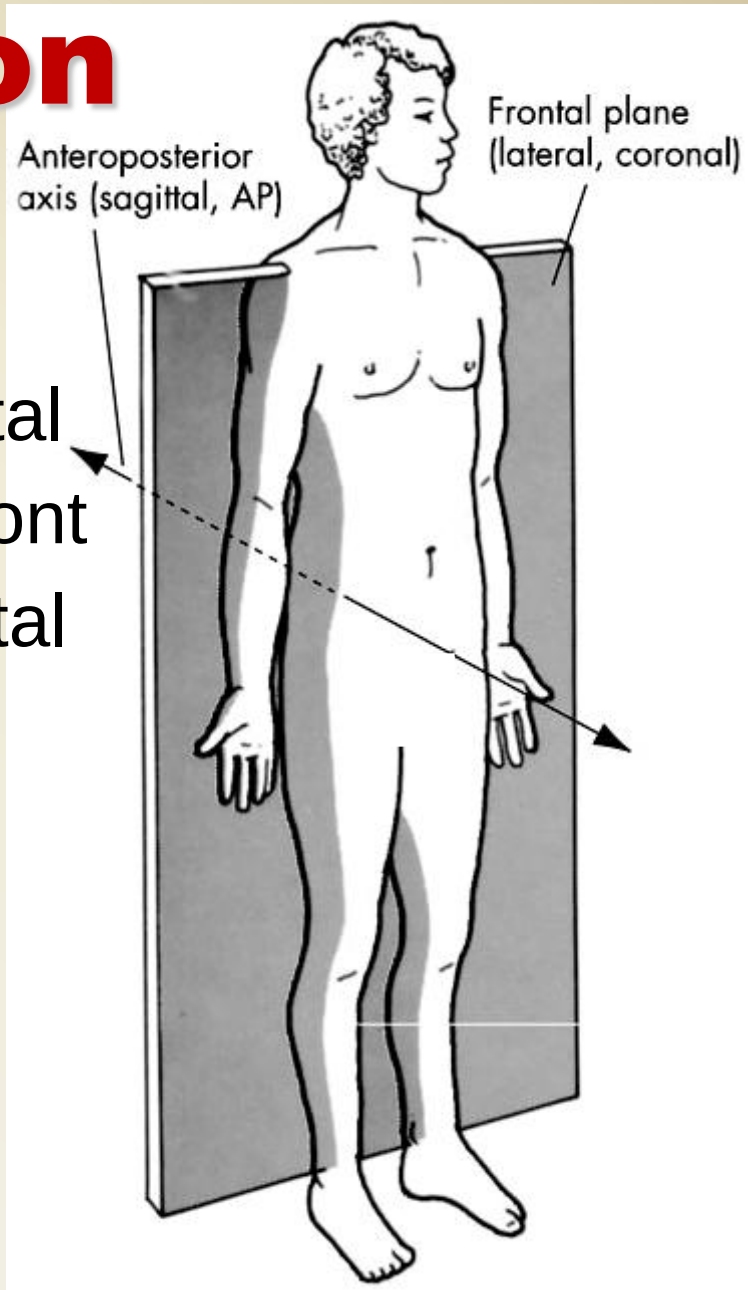
Axes of rotation

- **Lateral axis**
  - Has same orientation as frontal plane of motion & runs from side to side at a right angle to sagittal plane of motion
  - Runs medial / lateral



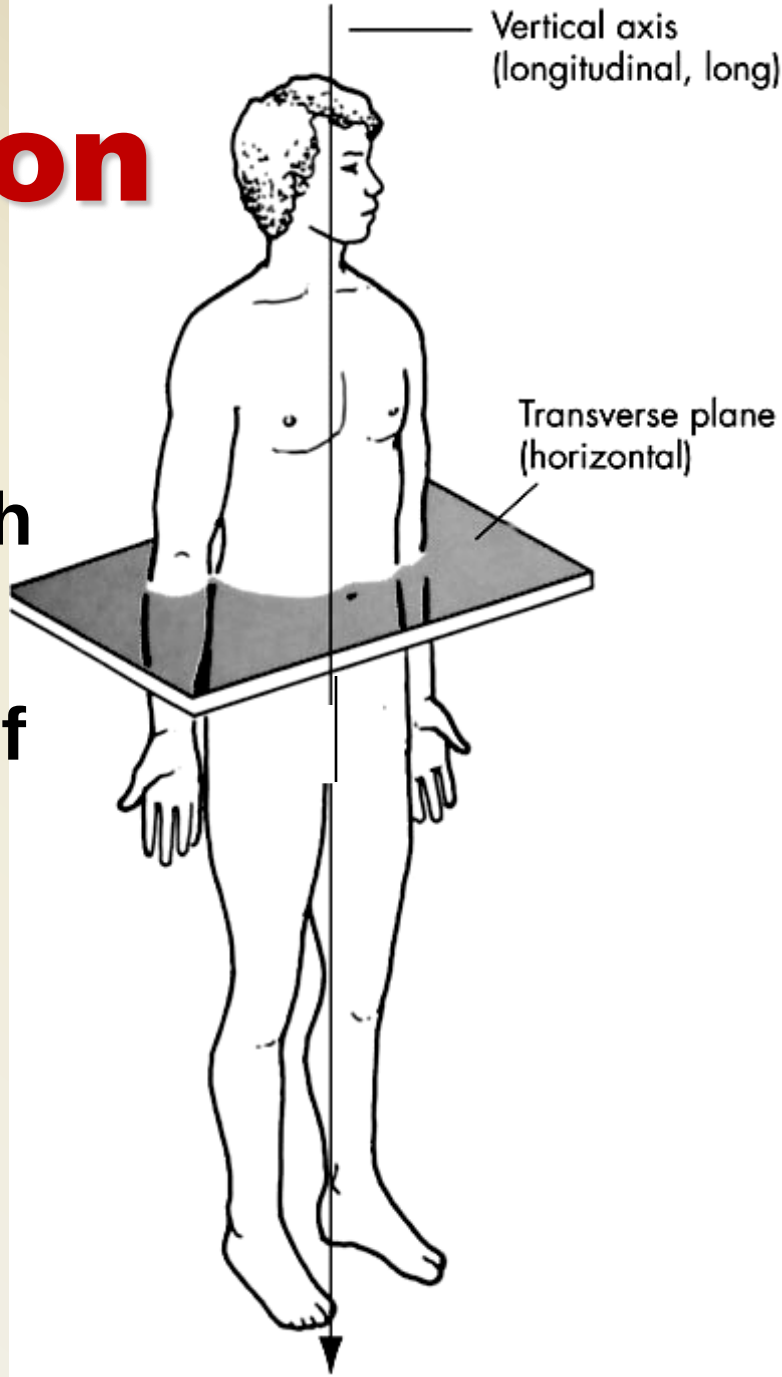
Axes of rotation

- **Anteroposterior axis**
  - Has same orientation as sagittal plane of motion & runs from front to back at a right angle to frontal plane of motion
  - Runs anterior / posterior

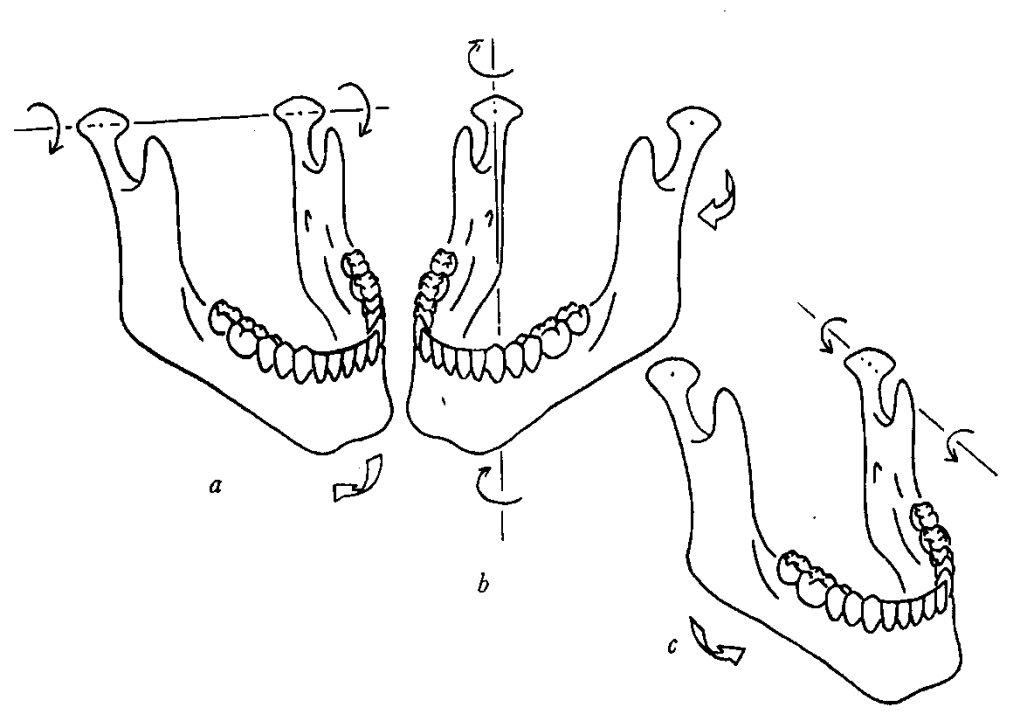


Axes of rotation

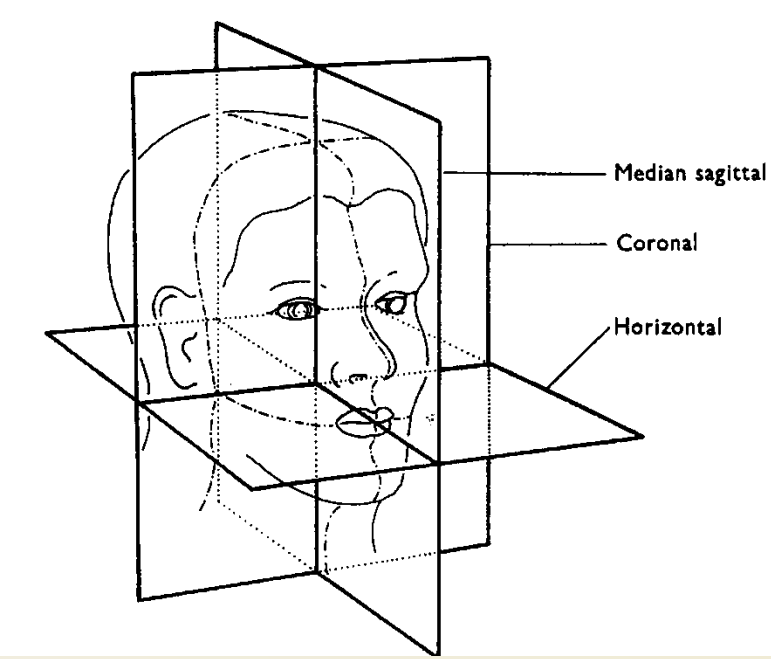
- **Vertical axis**
  - Runs straight down through top of head & is at a right angle to transverse plane of motion
  - Runs superior/ inferior



Three-dimensional movements



The three planes of the skull



- For movement to occur in a plane, it must turn or rotate about an axis as previously mentioned
- The axes are named in relation to their orientation

THE BASIC MOVEMENTS OF THE MANDIELE

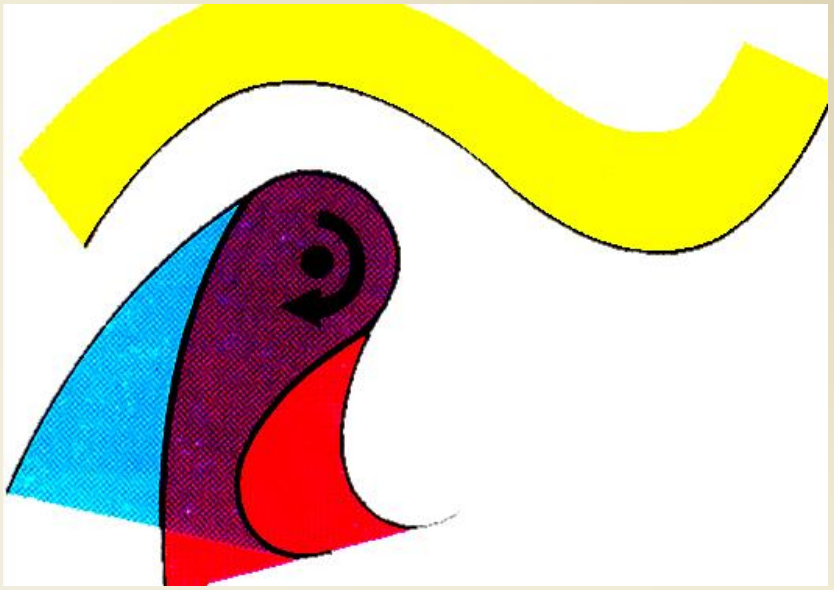
Rotation **occurs when the mandible makes a hinged movement.**

Translation **occurs when the mandible moves into a protrusive or lateral position, or a combination of the two**

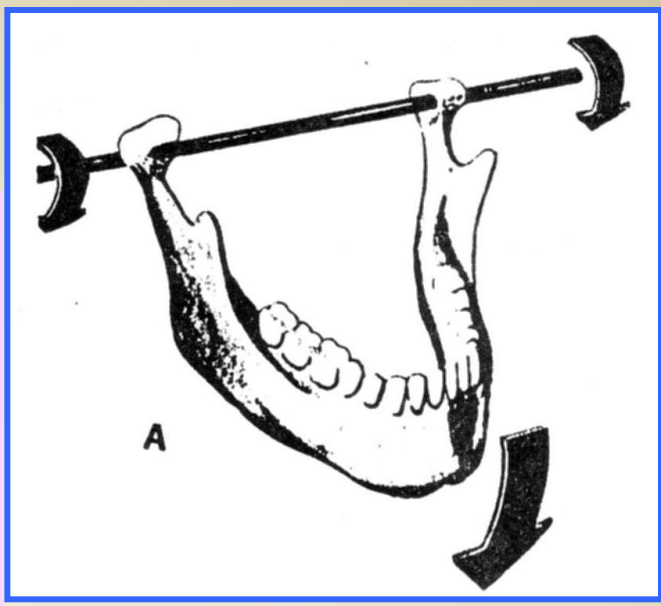
Rotational Movement

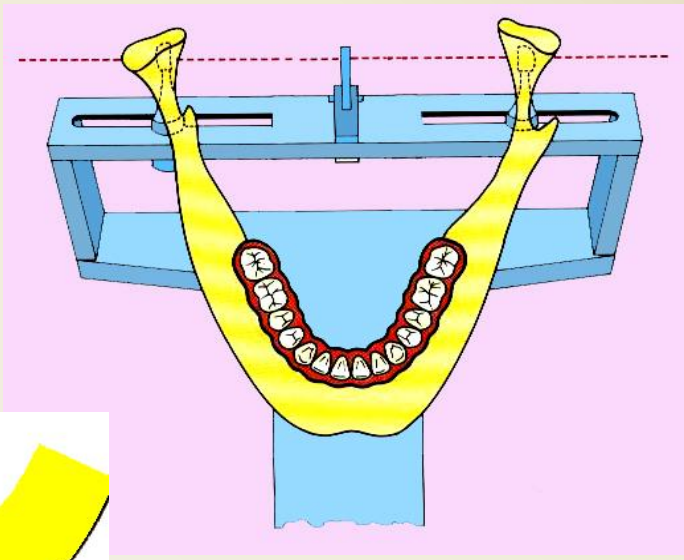
- **It Is a Simple Hinge Movement**

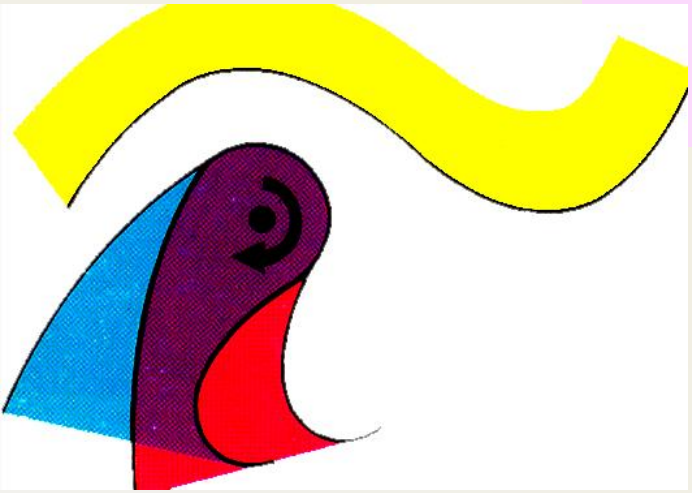
  Occurs during the early opening and late closing movement of the mandible



Terminal hinge axis

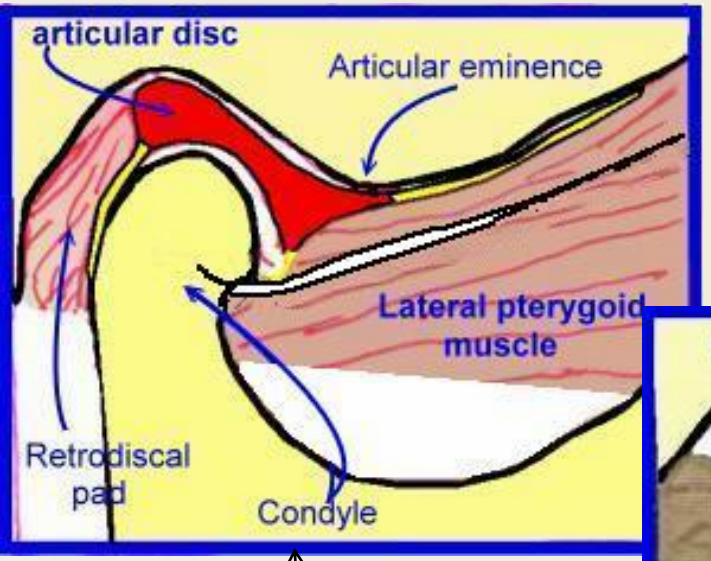




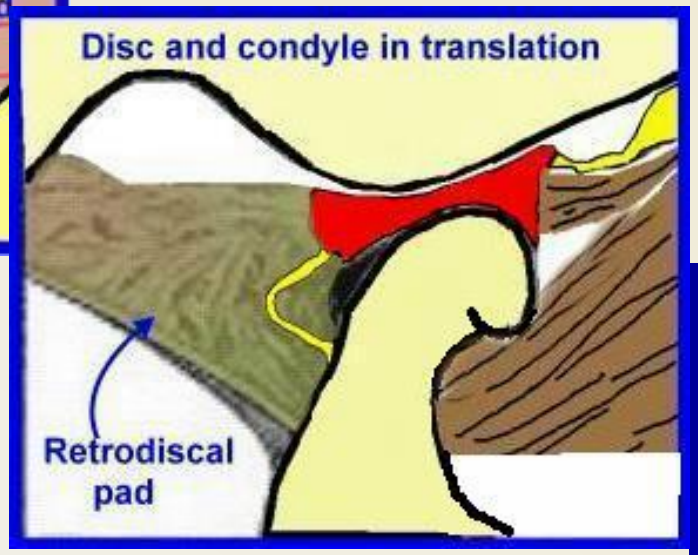


It is an imaginary line around which the condyles rotate during early opening and late closing.

Translatory Or Gliding Movement



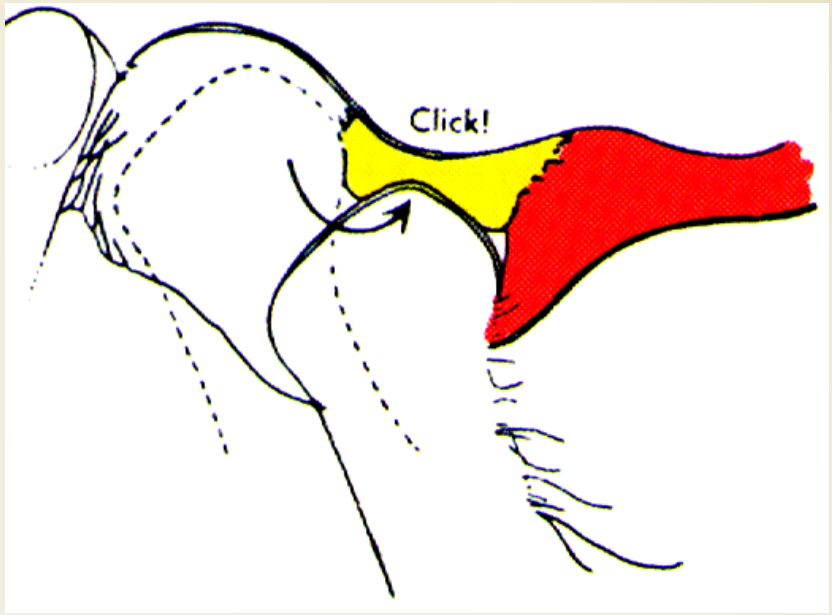
Translation movements

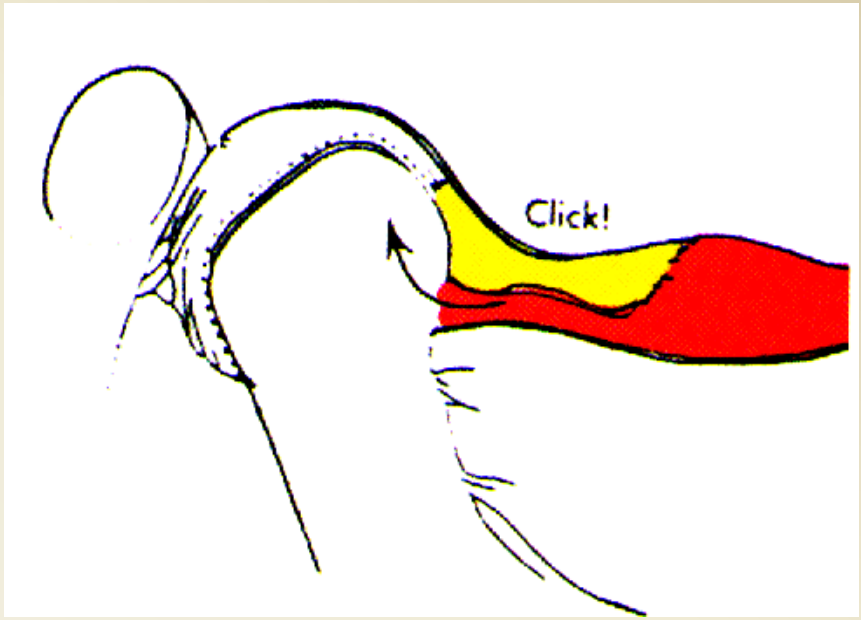


Rotation movements

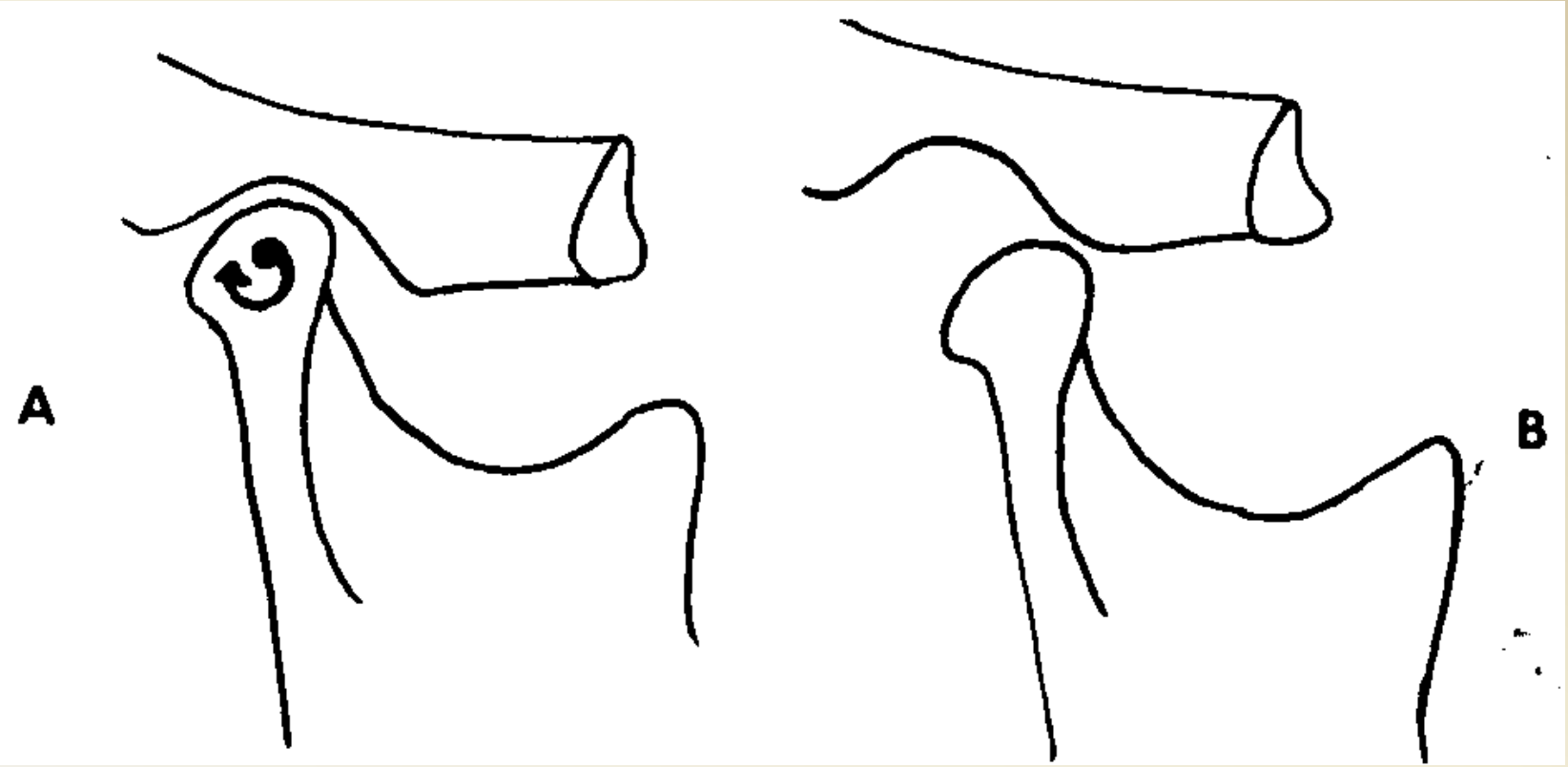
Translatory movement of the mandible takes place in the upper compartment of the T.M.J between the superior surface of the articular disc as it moves with the condyle.

Reciprocal Click



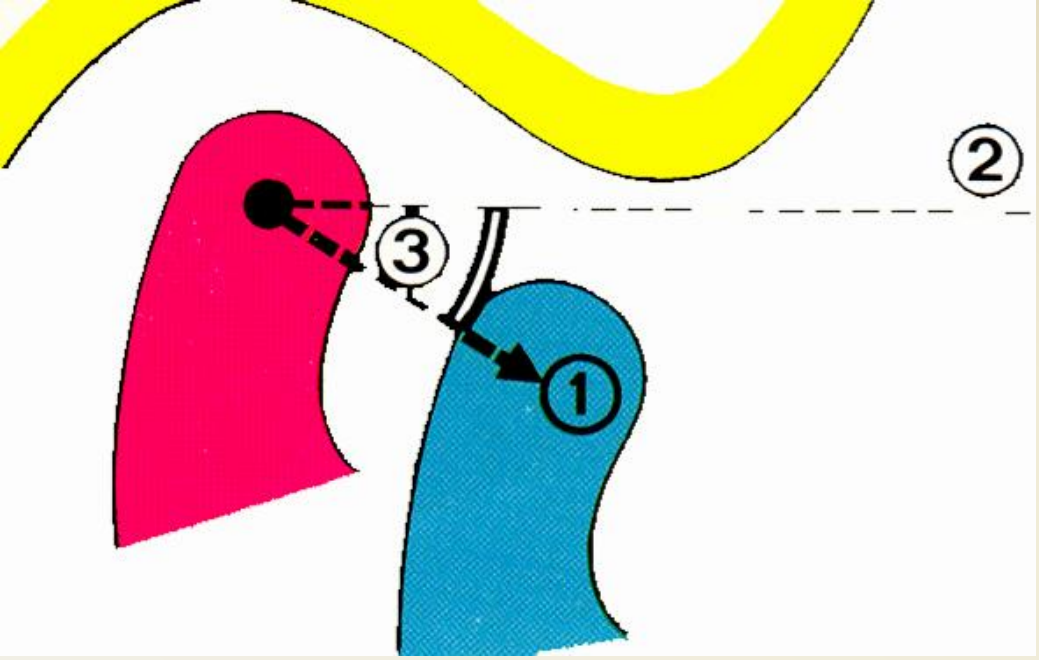


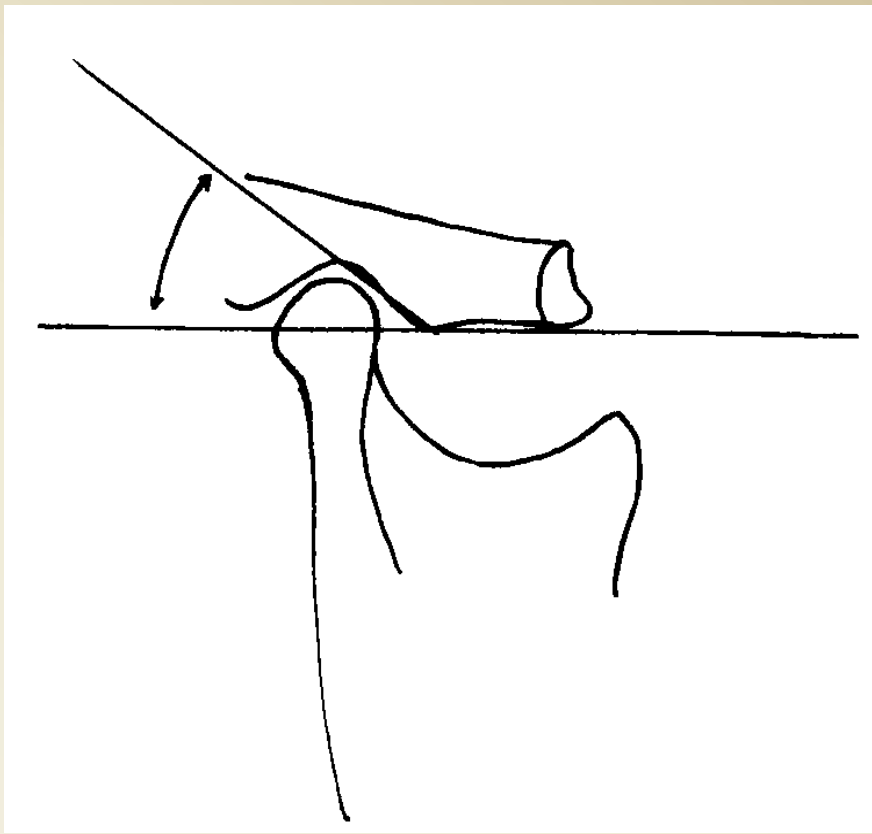
Articular disc as it moves with the condyle



A- Rotation occurs when the head of the condyle rotates around an imaginary axis

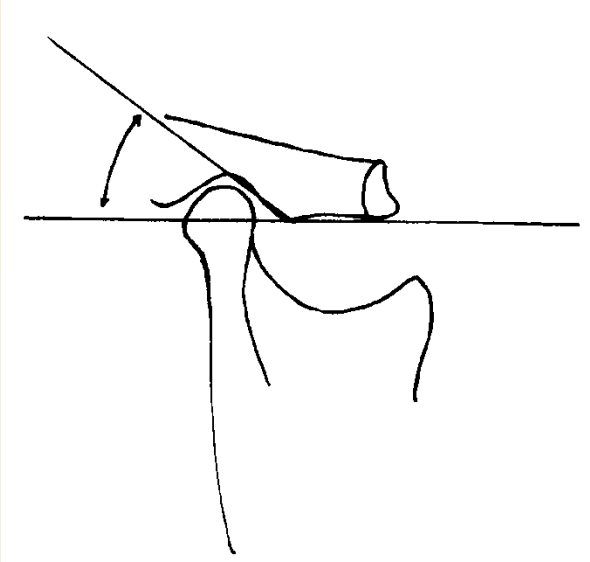
B. Translation is the bodily movement of the head of the condyle

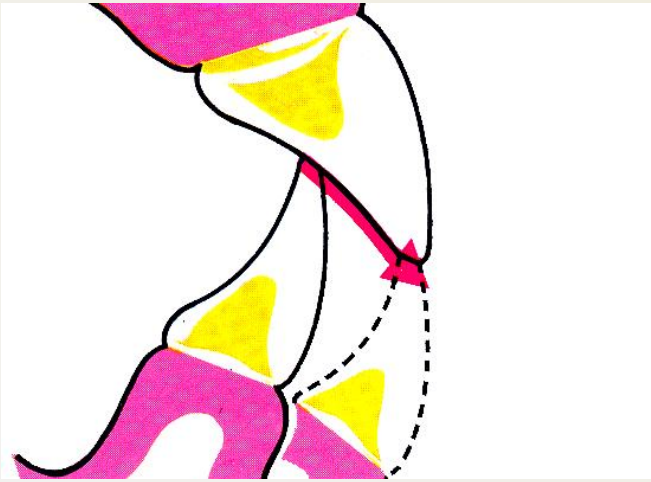




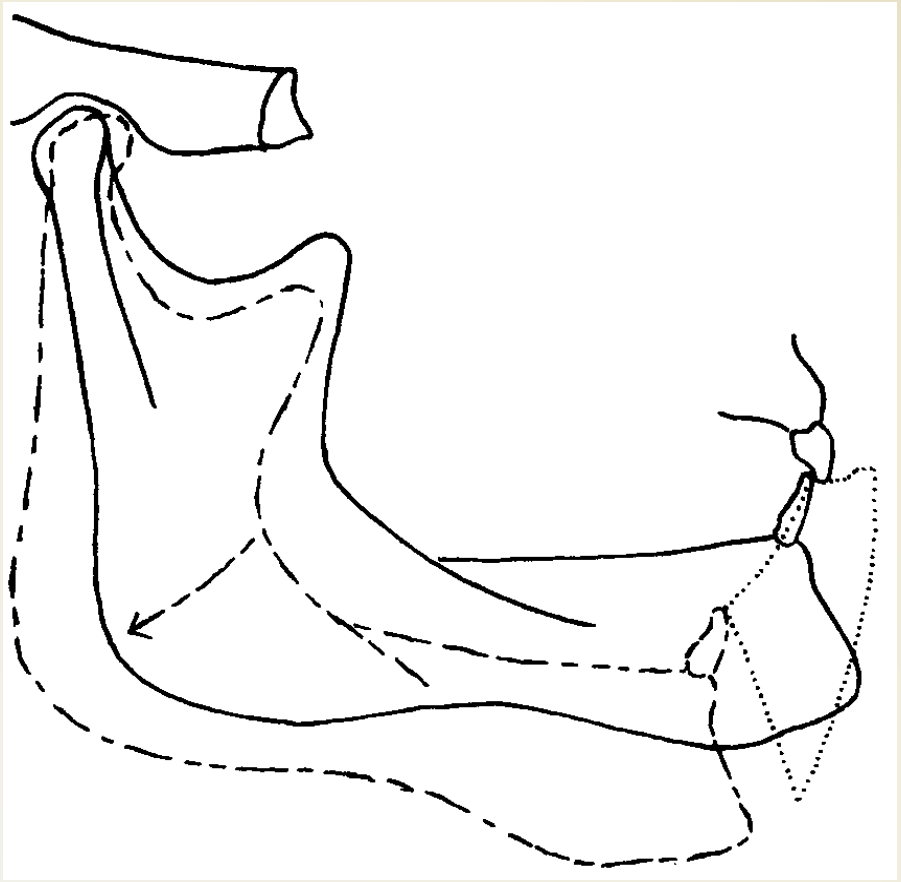
The angle formed by the steepness of the articulator surface that is related to a horizontal plane is called the sagittal inclination (*Condylar inclination)*

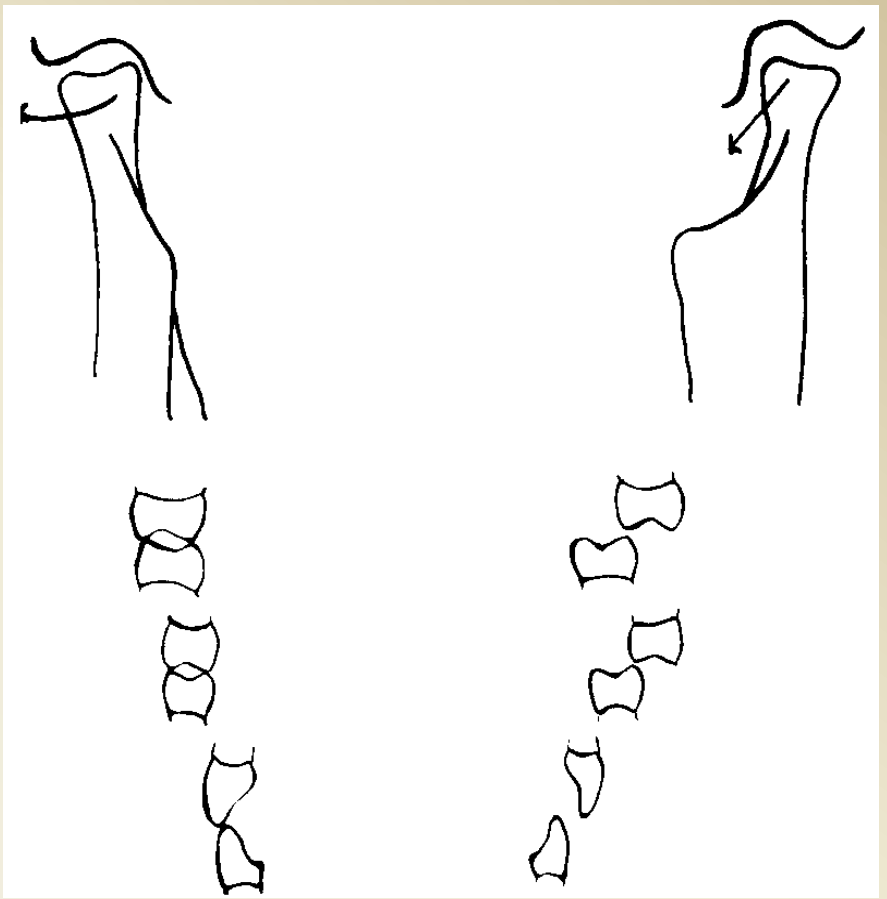
The inclination of the condylar paths varies in different individuals and from side to side in the same person… It depends upon:





1. The shape of the glenoid fossa.
2. The variation of the thickness of the articular disc in its different parts.
3. The relation of the condyle to the disc during movement.
4. The extent of mandibular protrusion

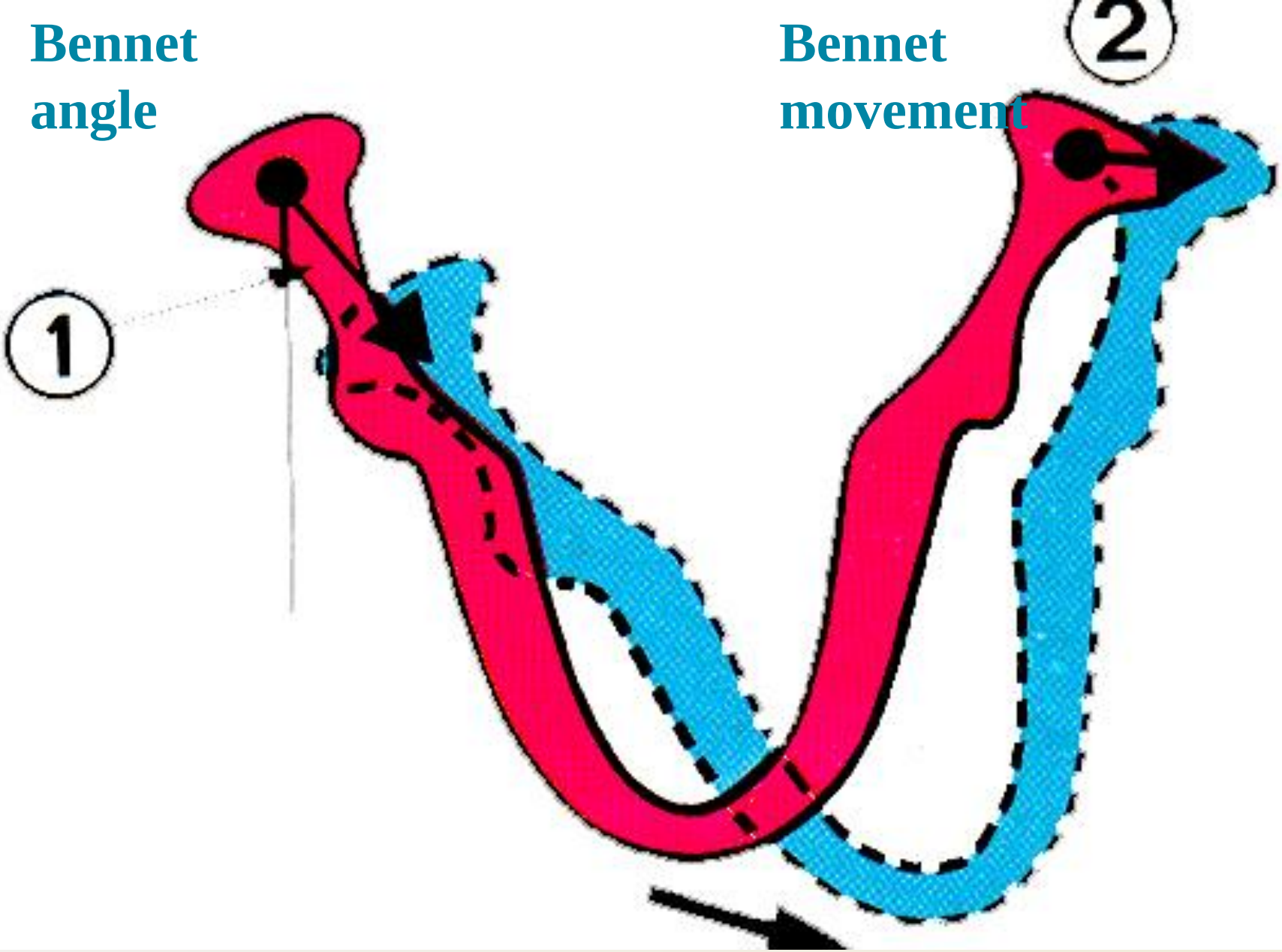




<u>The condylar guidance</u>: refers to the path of the condyle follows in the TMJ when the mandible moves into protrusive or lateral movements

Bennet angle

Bennet movement




Thank You