MANDIBULAR MOVEMENTS

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Reader
VIDS

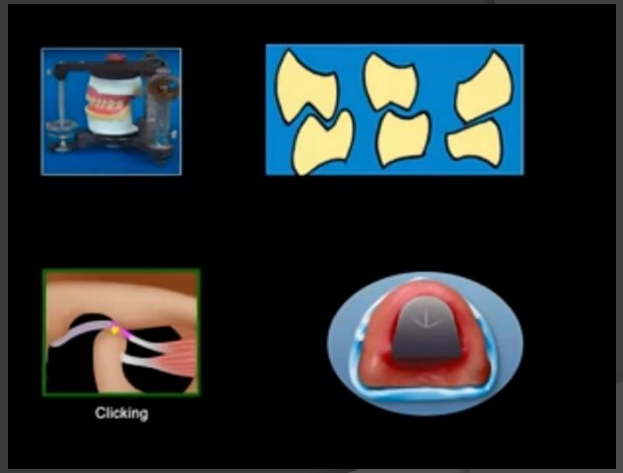
Introduction

- Mandibular movement occurs as a complex series of interrelated three dimensional rotational and translational activities.

It is determined by the combined and simultaneous activities of both TMJs.

Significance of mandibular movements

- ✔ To design, to select and to adjustment of articulator
- ✔ To develop tooth form for tooth restorations
- ✔ To understand basic principles of occlusion
- ✔ Diagnosis of TMJ disorders
- ✔ To alter the vertical dimension
- ✔ Gothic tracing for recording horizontal jaw relation



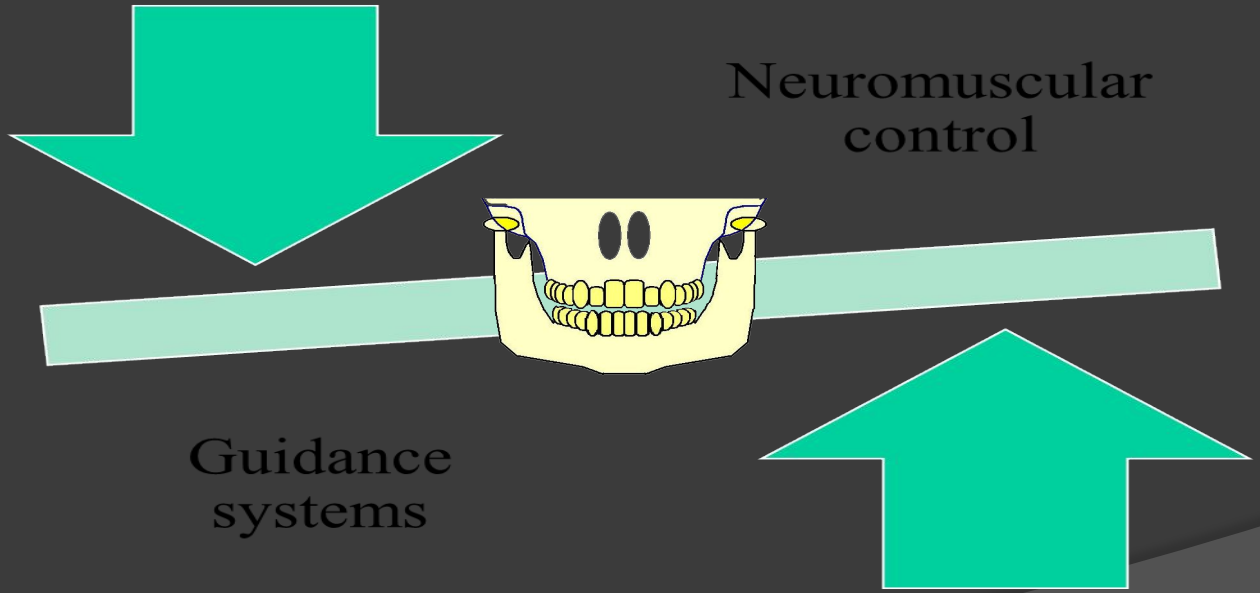
- Mandibular movements are influenced by

✔ anatomy of TMJ
✔ actions of muscles of mastication
✔ opposing tooth contact

and

✔ neuromuscular regulation .

Factors influencing mandibular movements

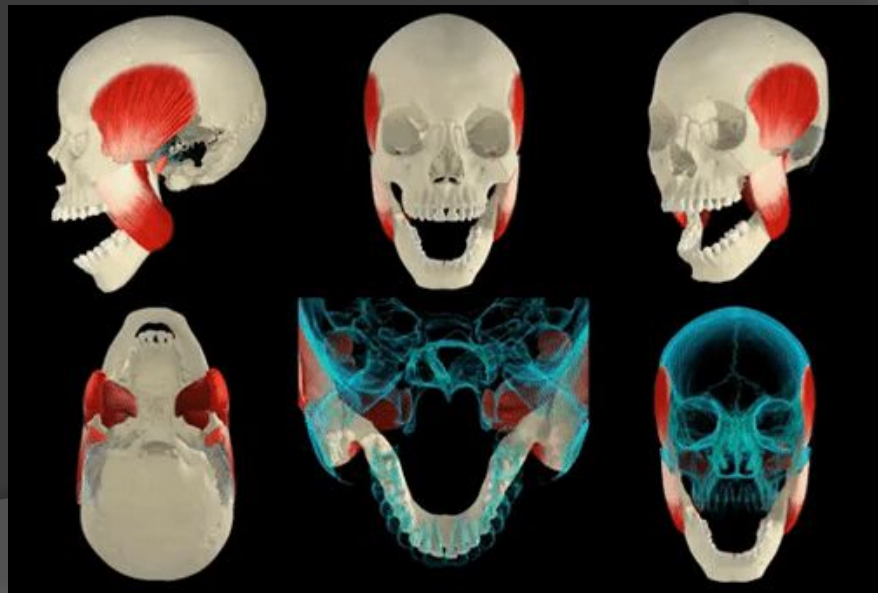


Neuromuscular control

The mandible is controlled not only as a result of

- ✔ voluntary movement,
- ✔ reflexes

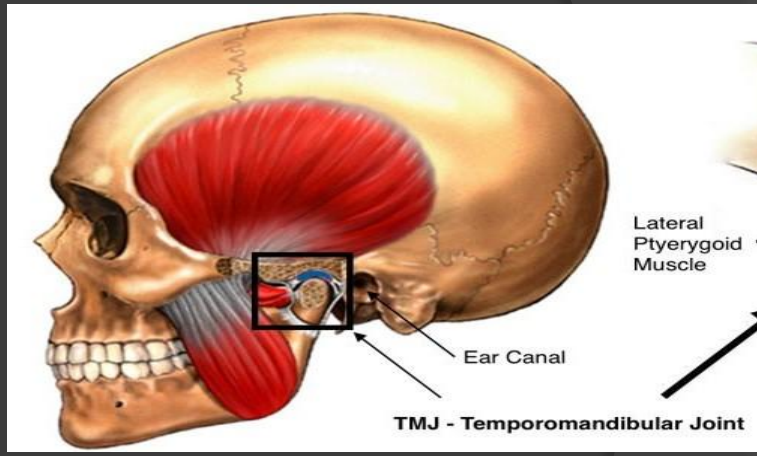
(jaw closing reflex and jaw opening reflex)



Guidance

Posterior

Anterior



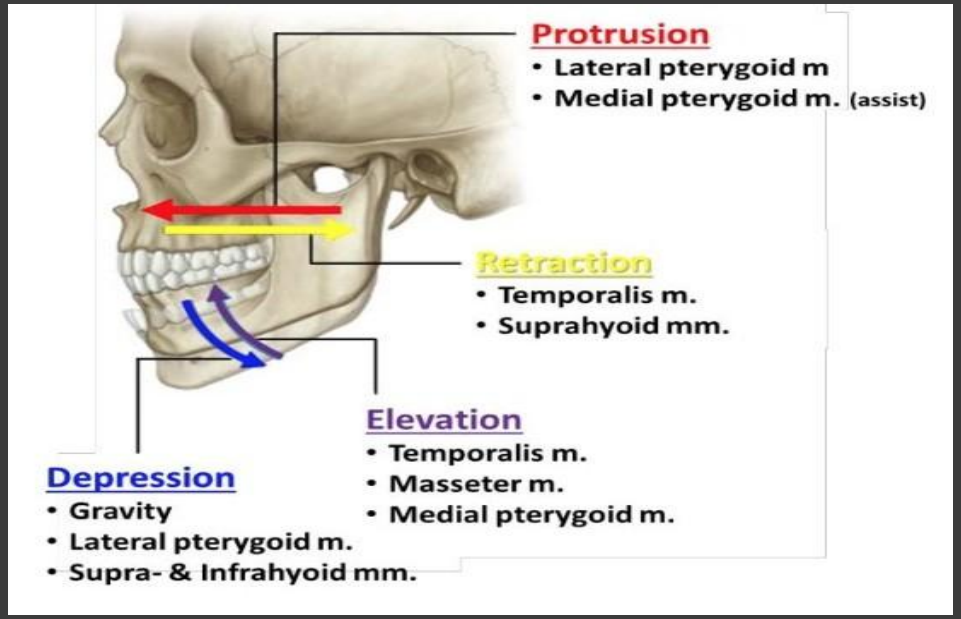
Posterior Guidance- The TMJ

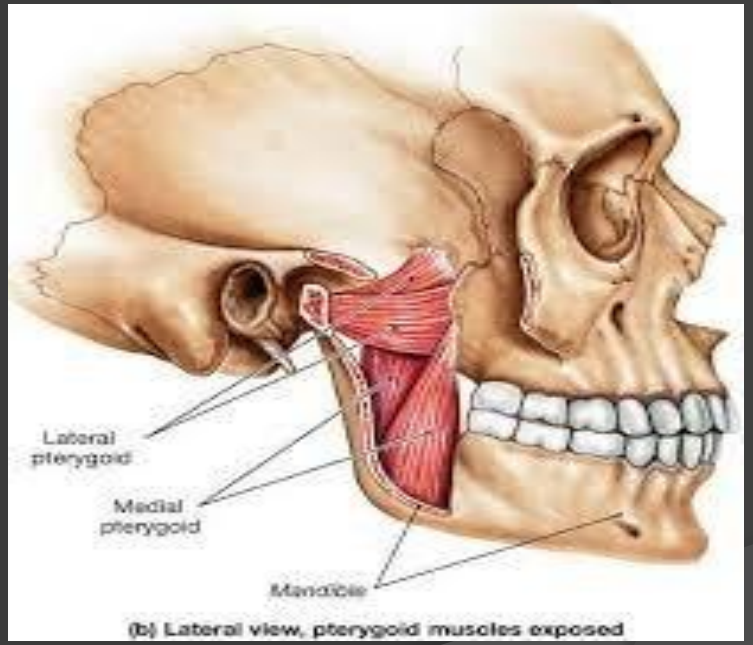
- ✔ the head of the condyle,
- ✔ the intra-articular disc and
- ✔ the glenoid fossa

Anterior Guidance- teeth

- ✔ which ever teeth touch during the excursive movements of the mandible, from occlusion
- ✔ dynamic occlusion.

The Muscles of Mastication

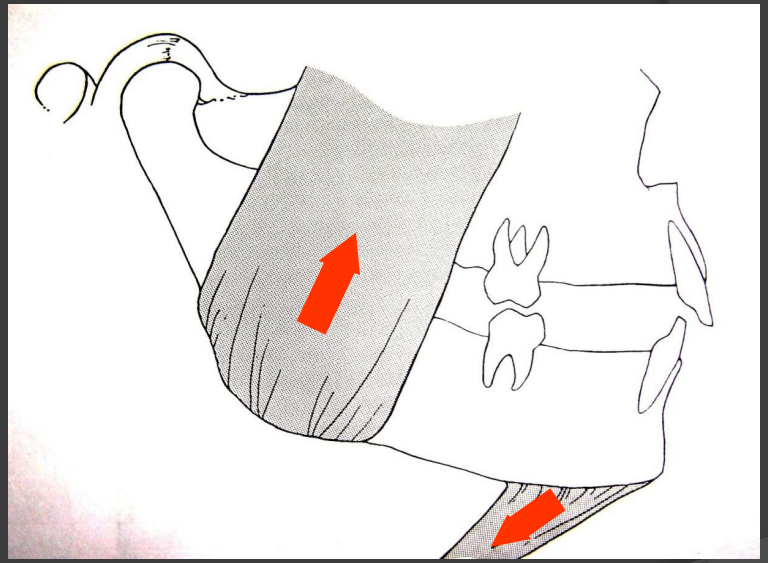




Lateral movements: Medial and Lateral Pterygoids of each side acting alternately.

The vertical positioning of the mandible in function is controlled :

by a dynamic balance of muscles that require co-ordinated contraction and release of antagonistic muscles.



As the elevator muscles contract, the depressor muscles must release allowing the mandible to be hinged closed around its condylar axis.

TYPES OF MANDIBULAR MOVEMENTS

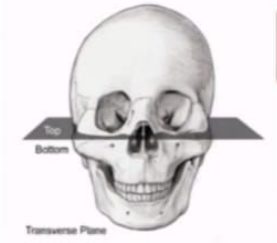
A. Based on condylar movement

1. Rotation
2. Translation

Rotation based on Dimension Involved in the Movements.

3 Reference planes of skull -

Horizontal or Transverse

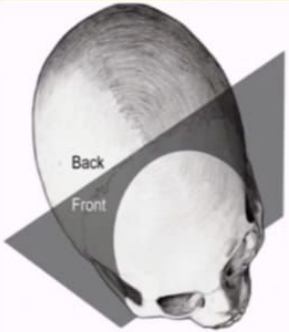


Divides face into upper and lower parts

Sagittal

Divides face into right and left parts

Frontal or Coronal

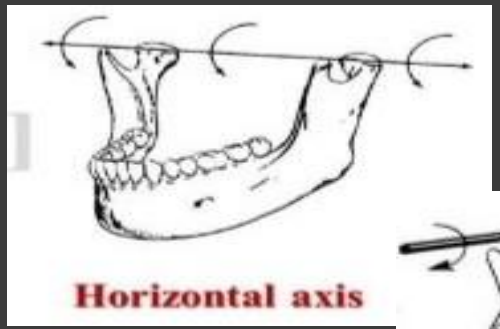


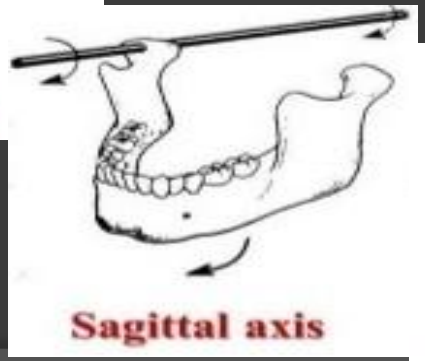
Divides face into anterior and posterior parts

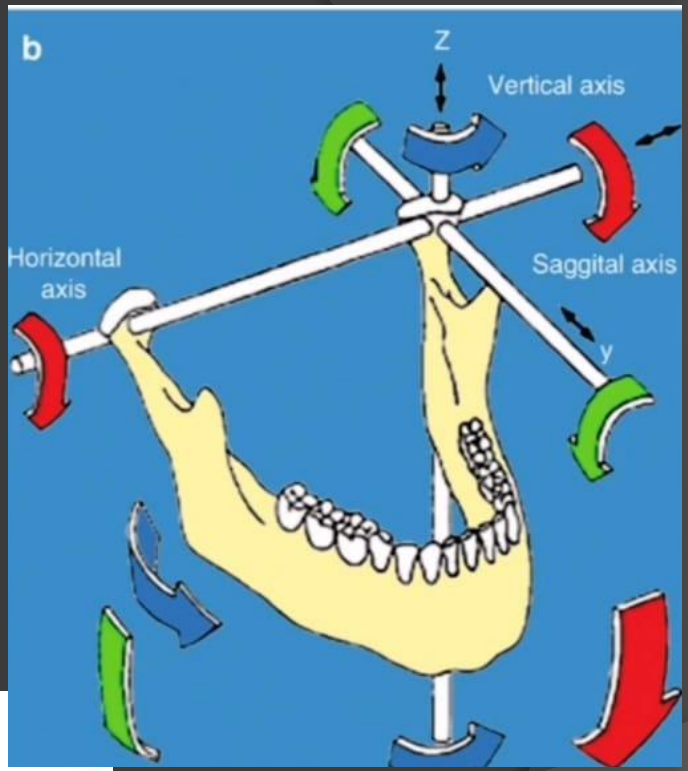
Rotation based on Dimension

Involved in the Movements.

1. Rotation around the transverse or hinge axis.
2. Rotation around the anteroposterior or sagittal axis.
3. Rotation around the vertical axis







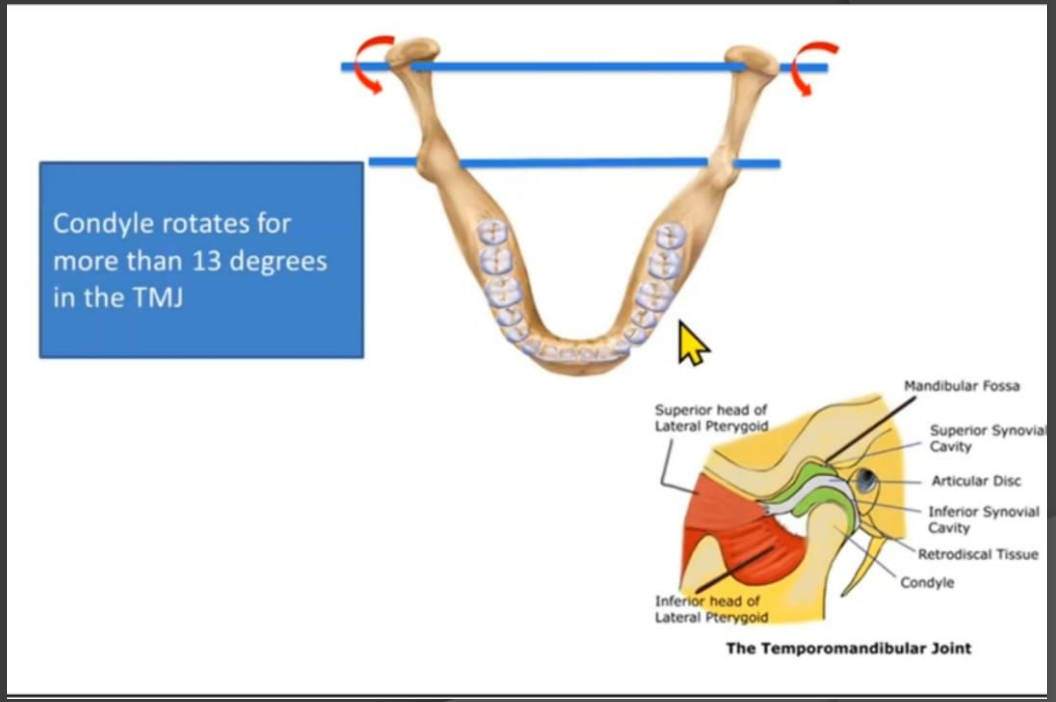
Rotation around the Transverse or Hinge Axis/ horizontal axis

♣

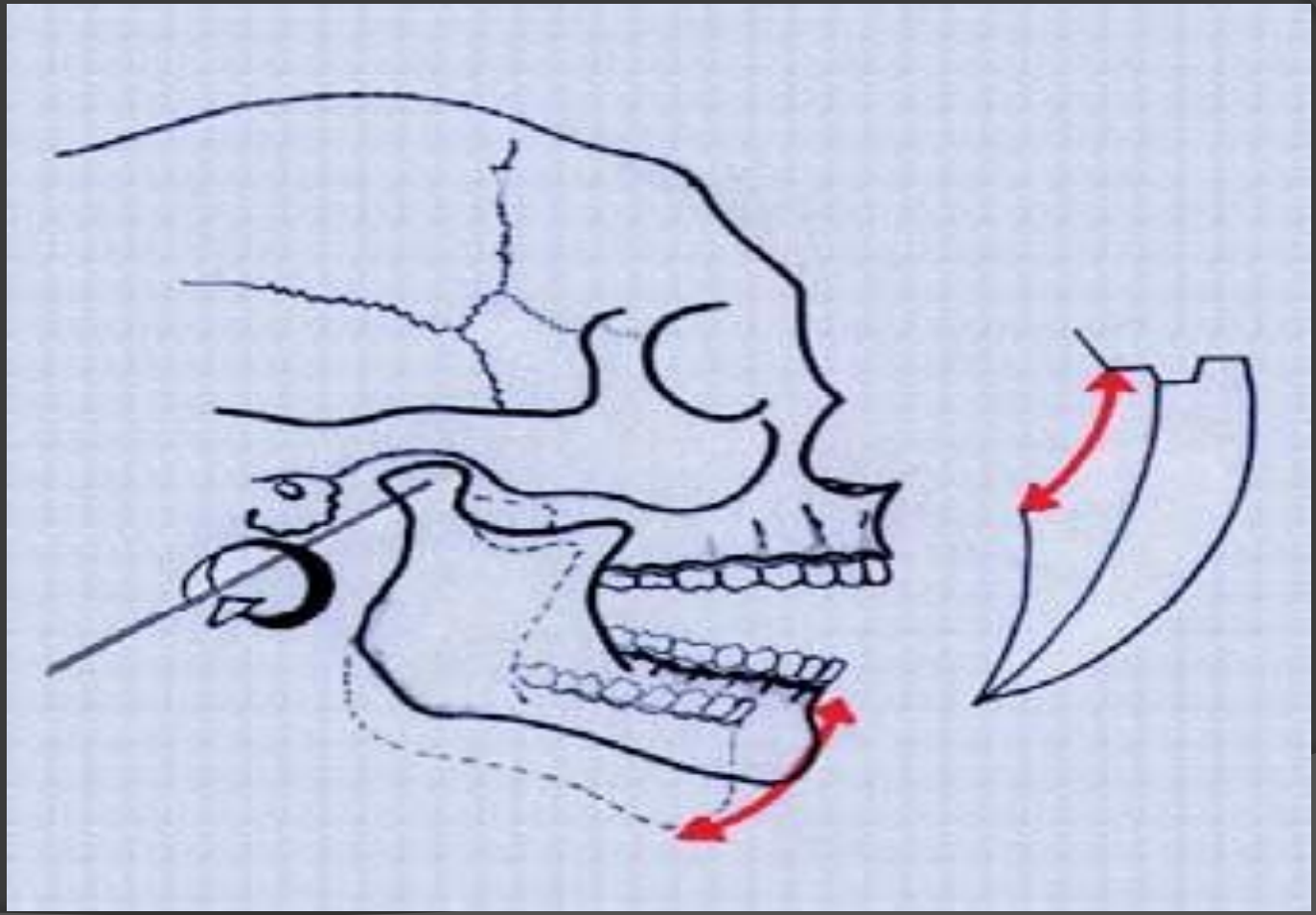
- ✔ opening and closing motion
- ✔ hinge movement

♣✔ Centre thru condyles

- ✔ Mandibular foramen

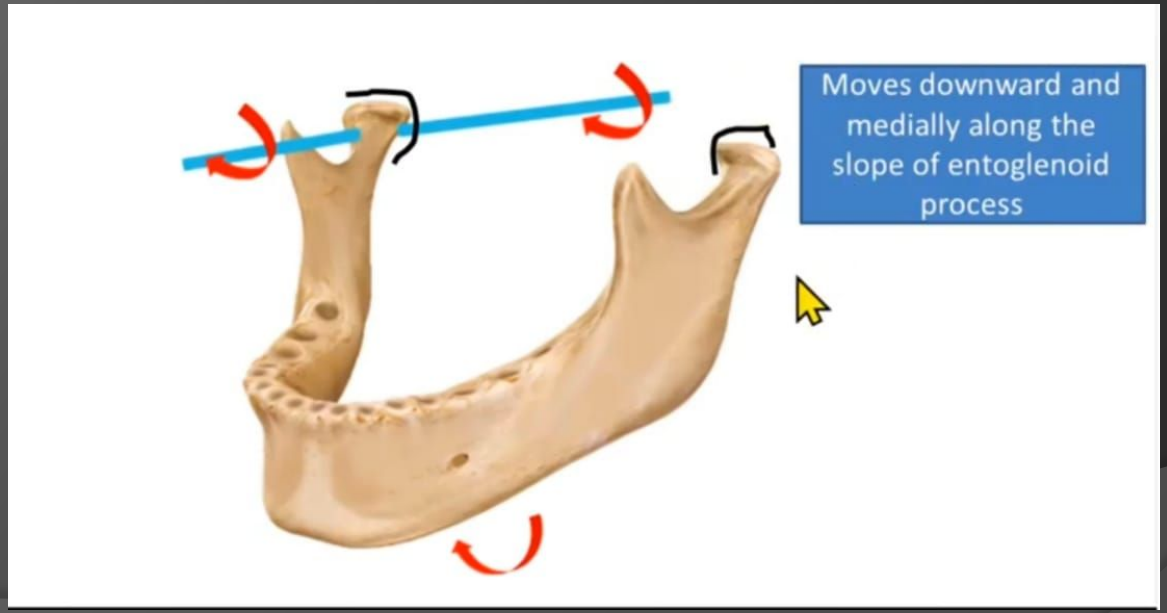


"Pure" rotational movements occurs.



Rotation around the anteroposterior or Sagittal Axis

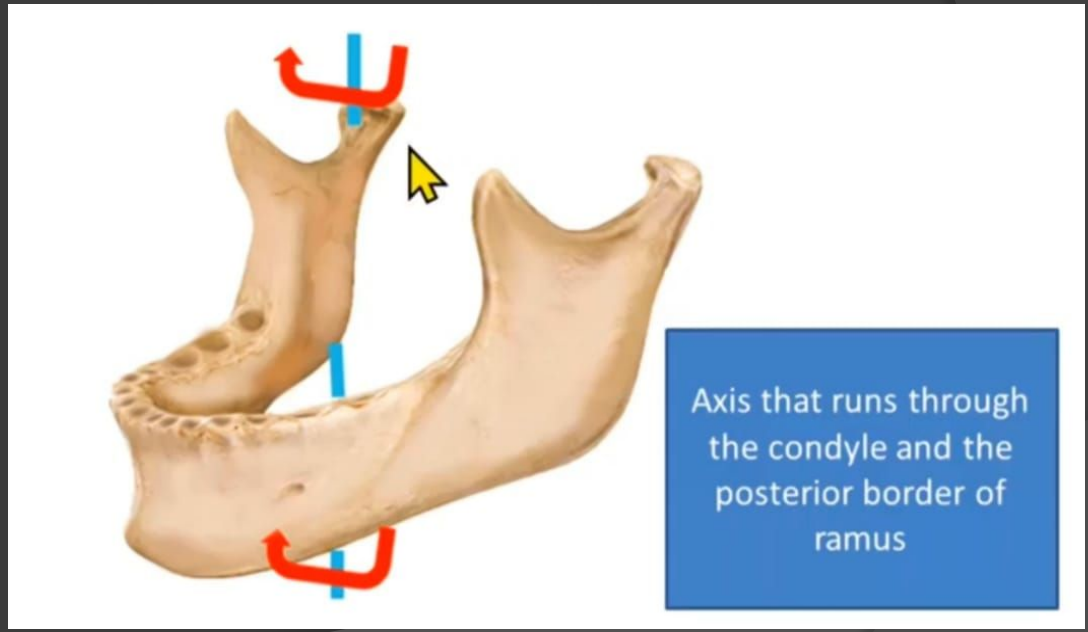
The anteroposterior axis is an imaginary axis running along the mid sagittal plane. The mandible shows slight rotation around this axis.



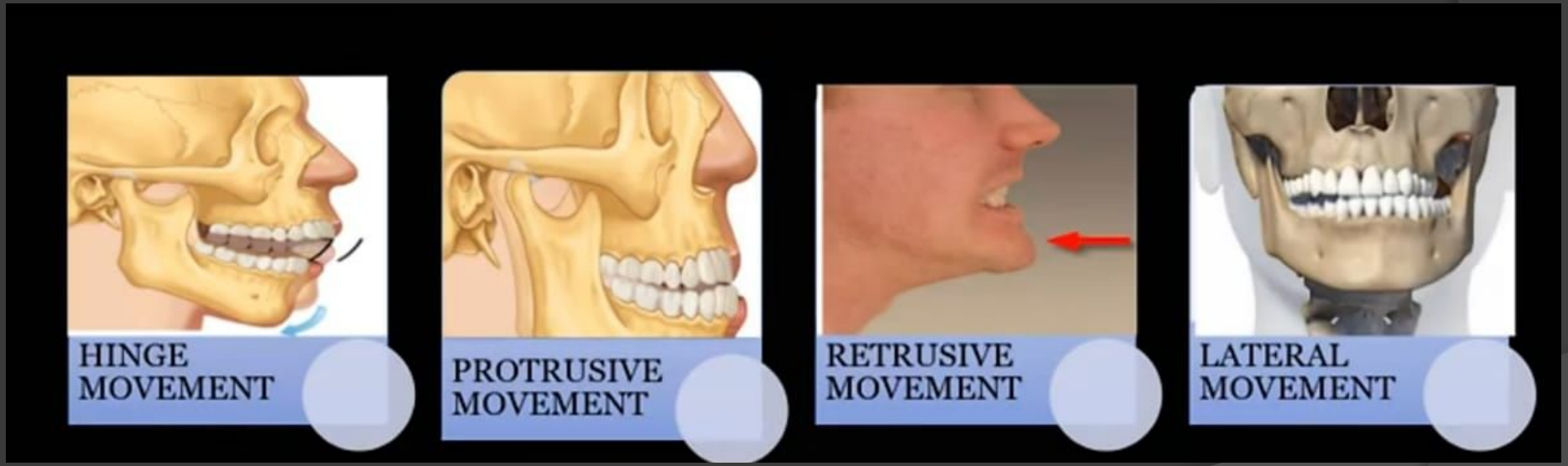
Rotation Around the Vertical Axis

The vertical axis runs through the condyle and the posterior border of the ramus of the mandible.

The mandible rotates around this vertical axis during the lateral movements.

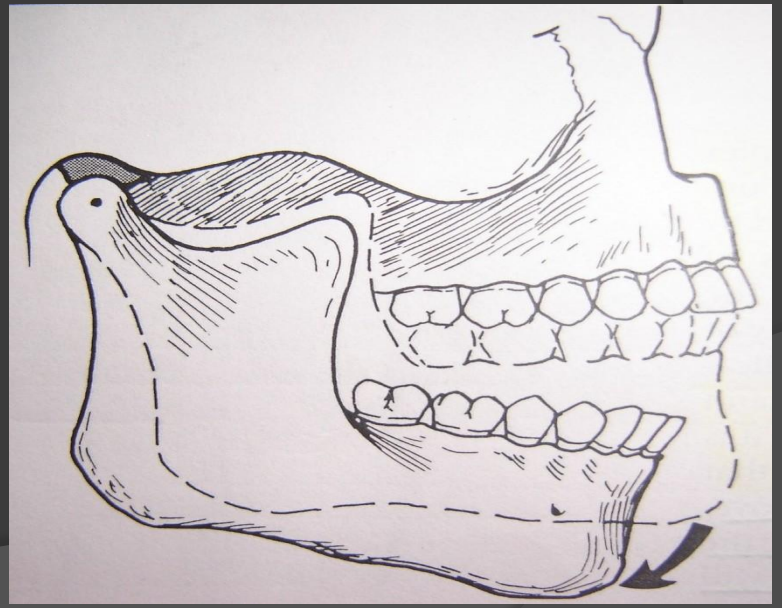


Based on type of movement



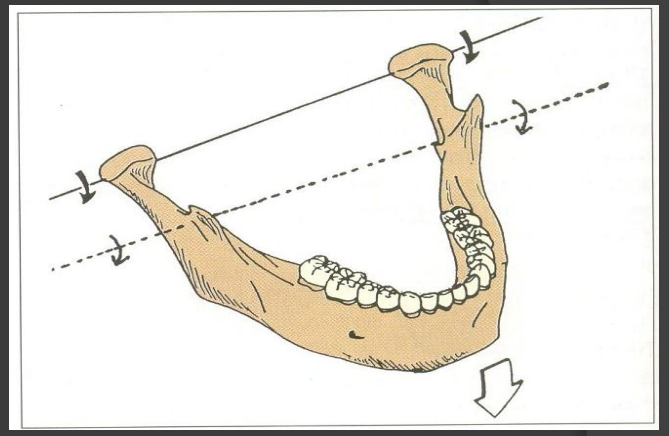
Hinge Movement

- purely rotational- mouth opening to about 20 to 25 mm.
- The amount of mouth opening 10-13º rotation

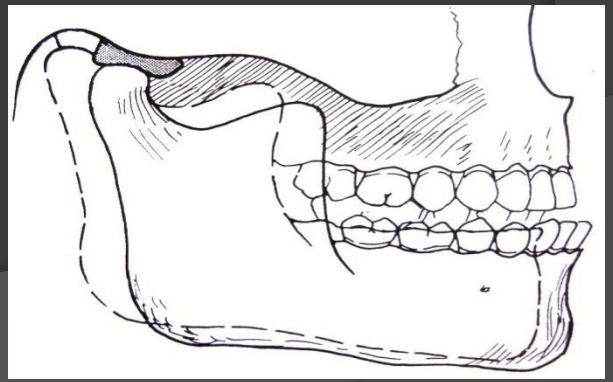


Protrusive movement

- Once the condyle rotation exceeds 13º the transverse hinge axis mentioned above shifts to the level of the mandibular foramen.



- The mandible moves forwards and downwards while rotating in its new hinge axis.

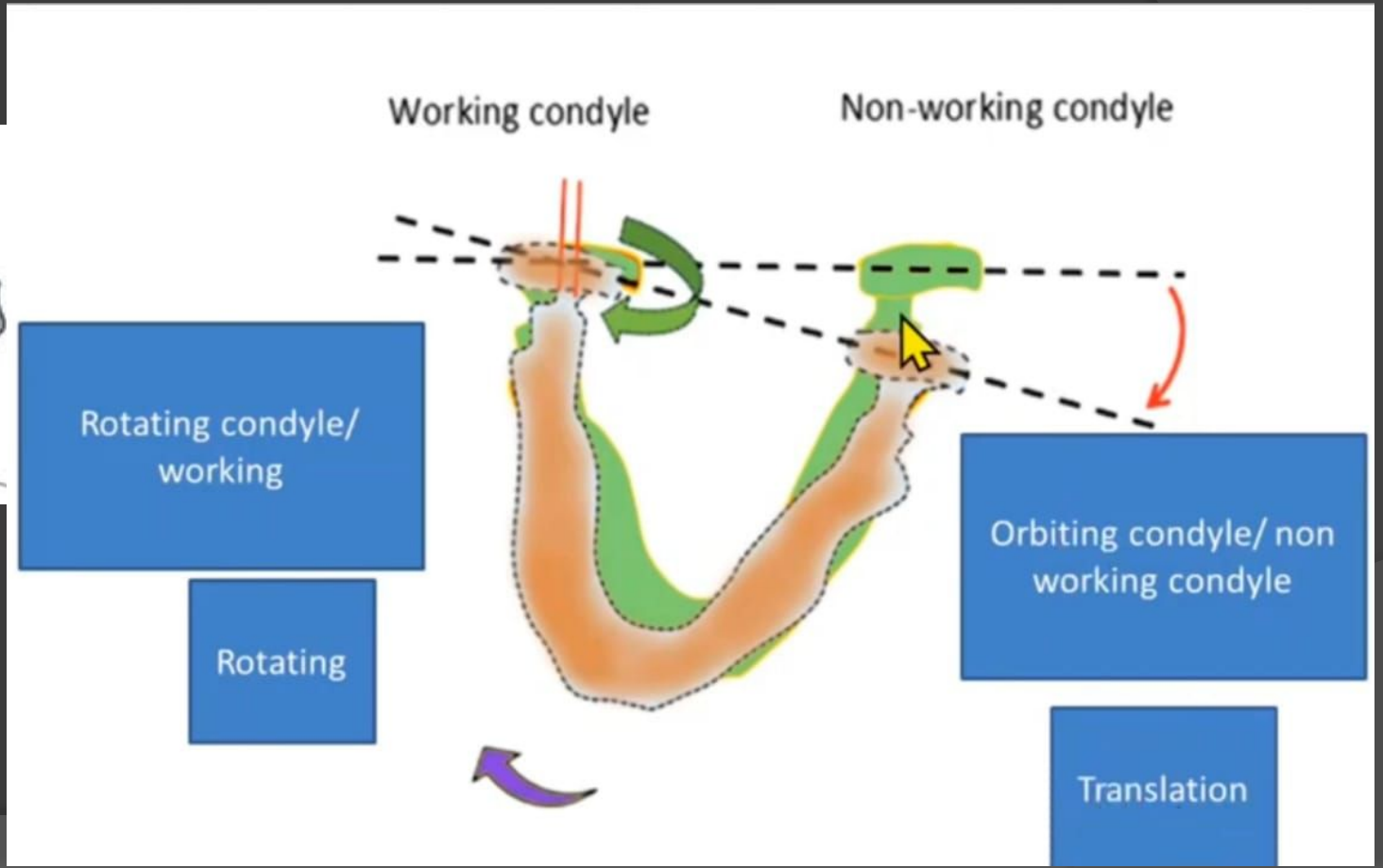


Retrusive Movement

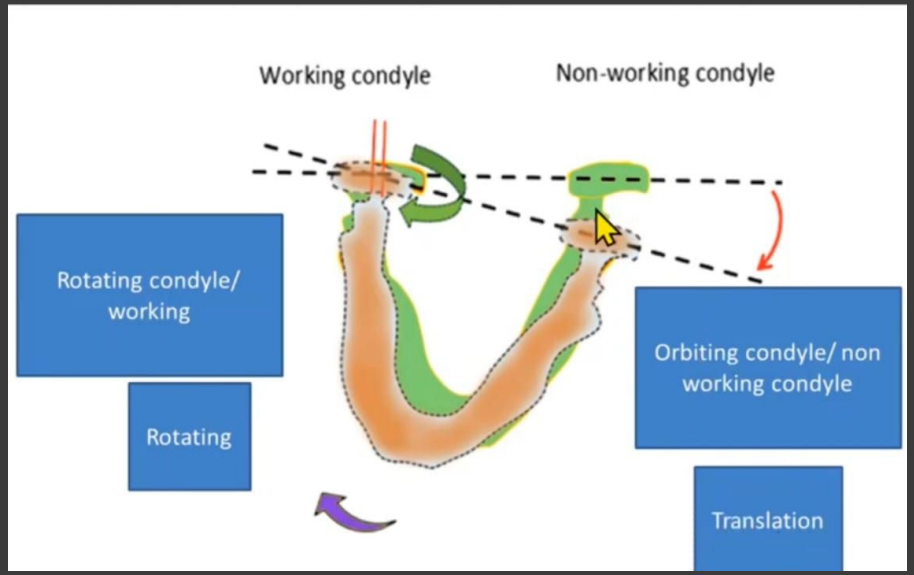
This occurs when the mandible is forcefully moved behind its centric relation.

(about 0.5 mm) - strained position.

Lateral Movements

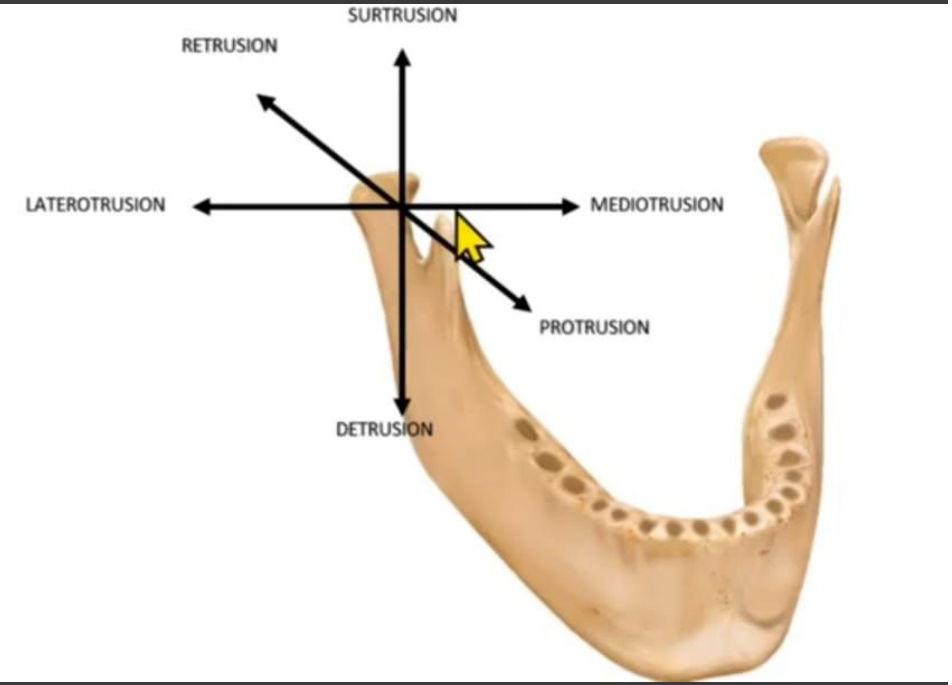


Lateral Movements

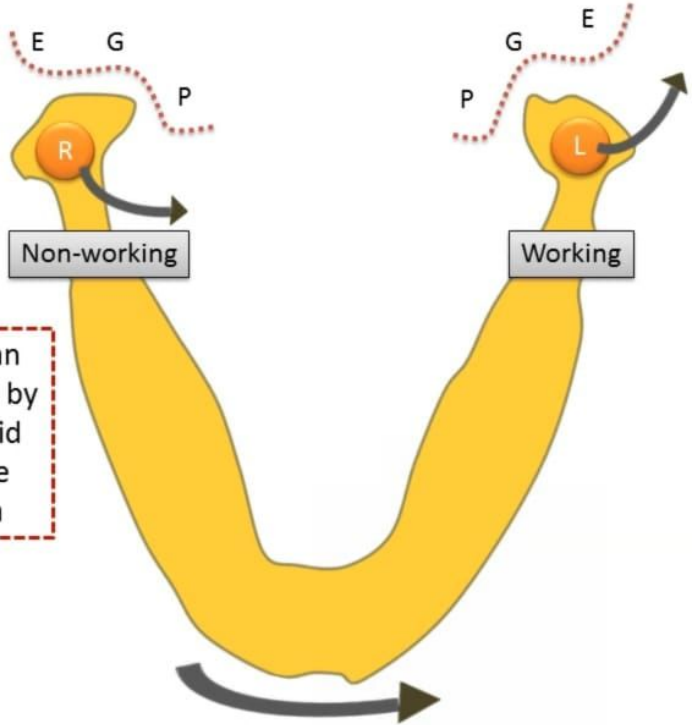


RIGHT CONDYLE /working/ laterotrusive condyle- rotates and moves outward/laterally and upwards

LEFT CONDYLE /non-working/ mediotrusive/ balancing condyle/ orbiting condyle- translates forward, downward and medial direction



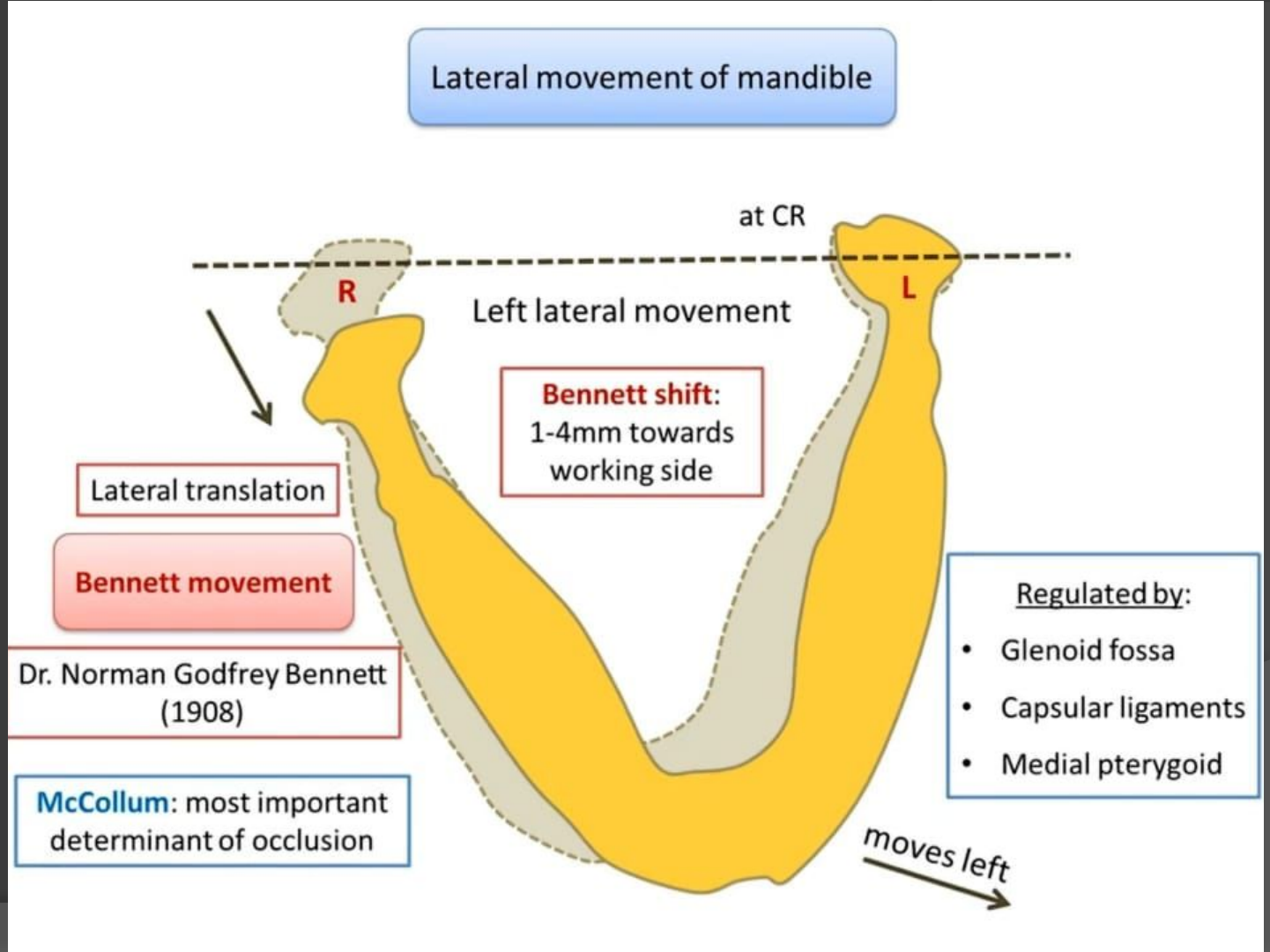
Lateral movement of mandible



Moves along an arc determined by the entoglenoid process of the glenoid fossa

- movement of non working condyle as mediotrusion = Bennett's movement/
- bennett shift

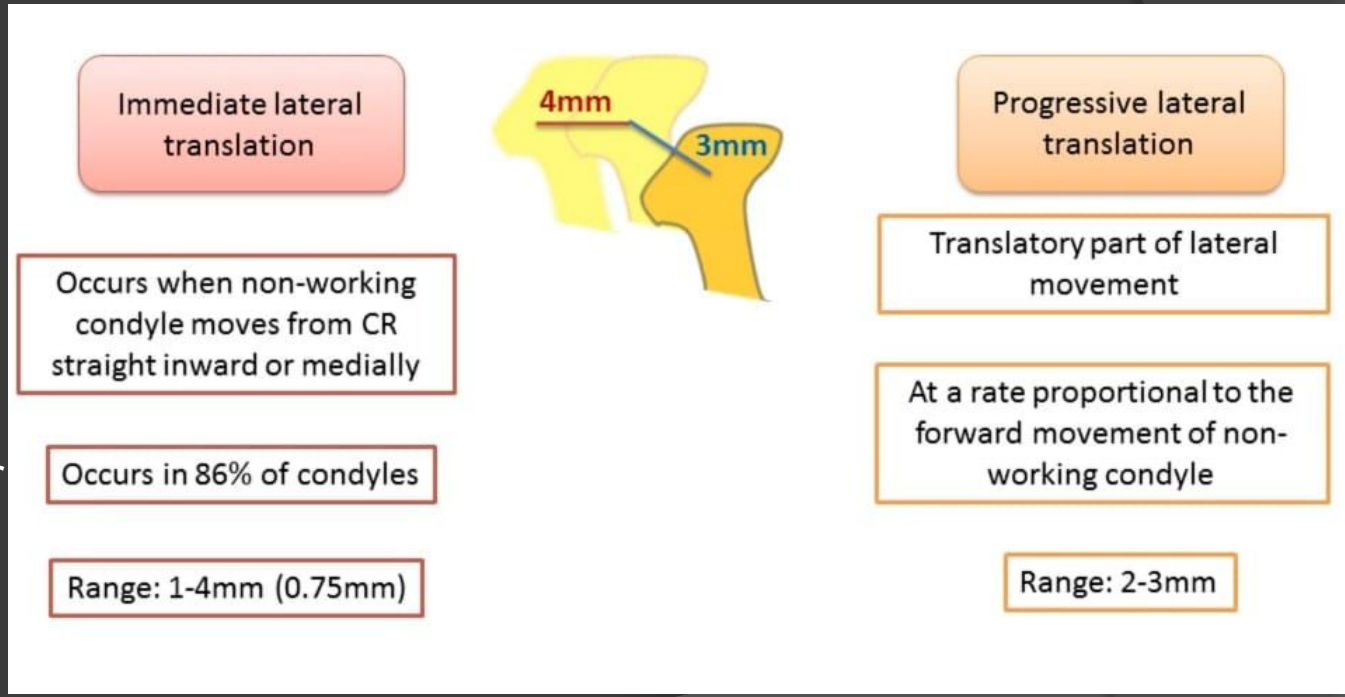
- named after Norman Bennett



BENNET SHIFT- divided into two components.

- Immediate lateral mandibular translation / immediate side shift (ISS)
- Before forward movement

- Progressive mandibular lateral translation / progressive side shift (PSS).

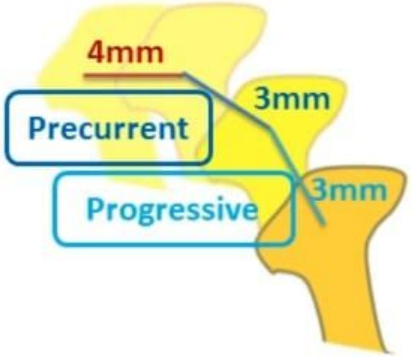


Precurrent shift: when the major quotient of lateral shift occurs in the first 2-3 mm of forward movement.

Progressive shift: lateral translation that continues linearly after 2-3 mm of forward movement of non working condyle

Lateral movement of mandible

If major part of Bennett movement occurs during the first 4mm of anterior movement of non-working condyle: **Distributed side shift**

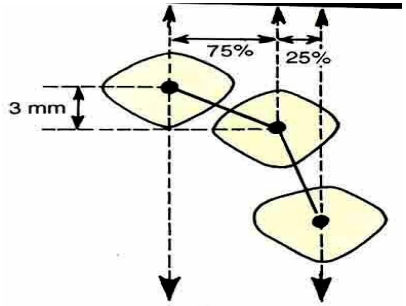


Progressive lateral translation

Translatory part of lateral movement

At a rate proportional to the forward movement of non-working condyle

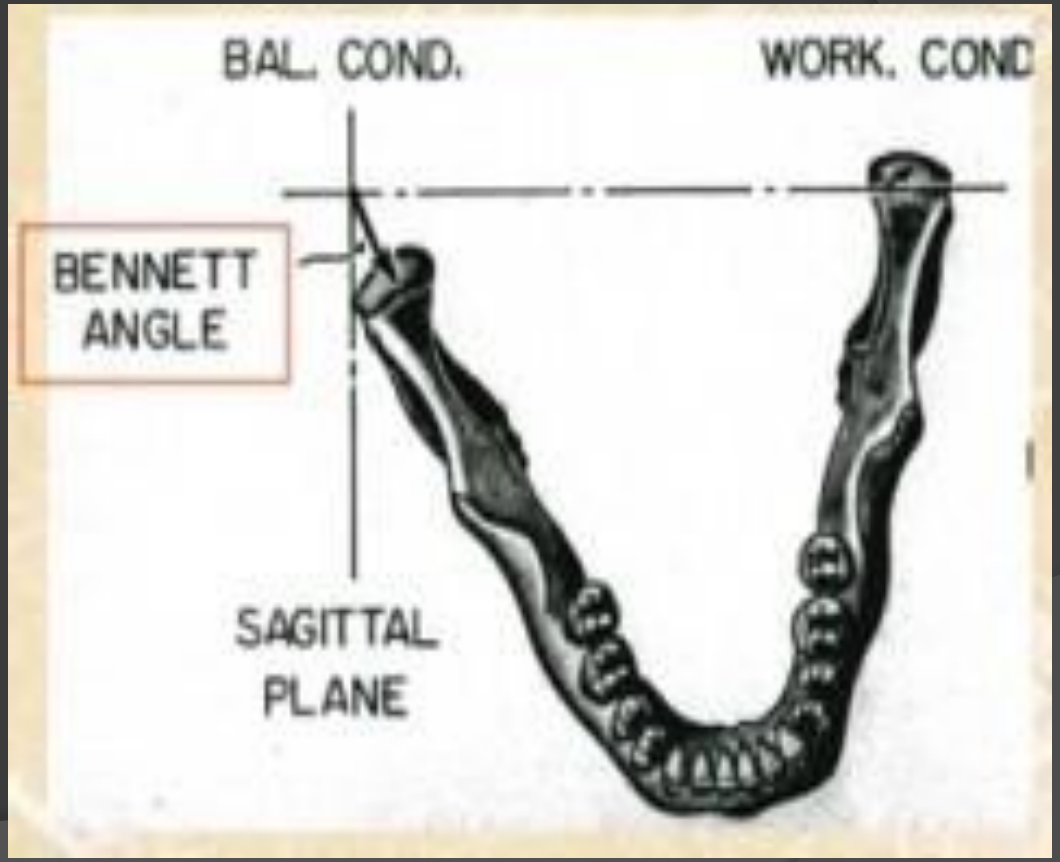
Precurrent	Progressive
75%	25%
Rapid	Gradual
	Does not change with time



Bennett Angle

- The angle by the saggital plane and advancing condylar path during lateral mandibular movement movement on balancing side is knows as “Bennett’s angle”.

- 2 to 44 degrees with a mean value of 16 degree (Hobo, Mochizuki).



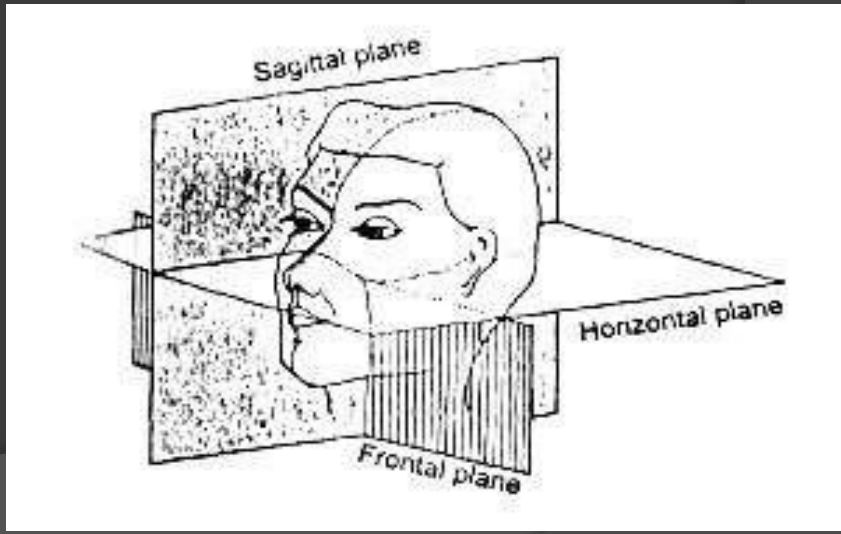
Based on the extent of movement.

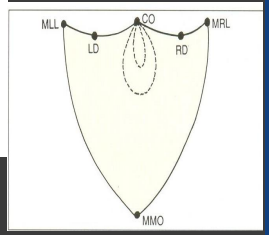
Border movements.

1. Extreme movements in the horizontal plane.
2. Extreme movements in the sagittal plane.
3. Extreme movements in the coronal plane.

- ❑ Envelope of motion.

Intra-border movements

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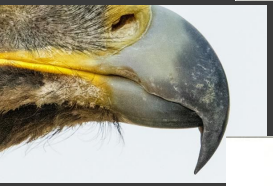

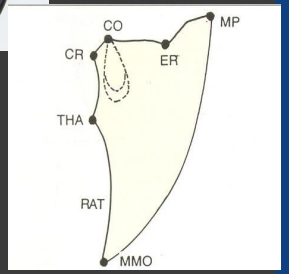
CO
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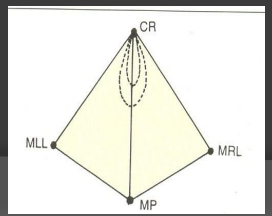
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Intra-border movements.

Functional movements

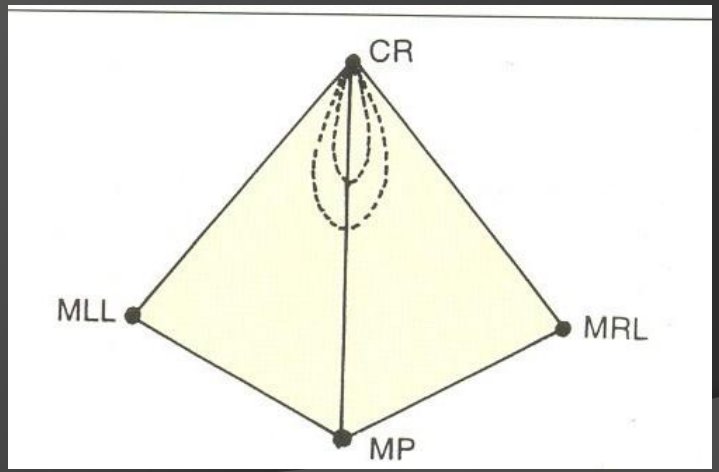
- Chewing cycle
  - Swallowing
  - Yawning
  - Speech

Para Functional movements

- Grinding
  - Bruxism
  - Clenching

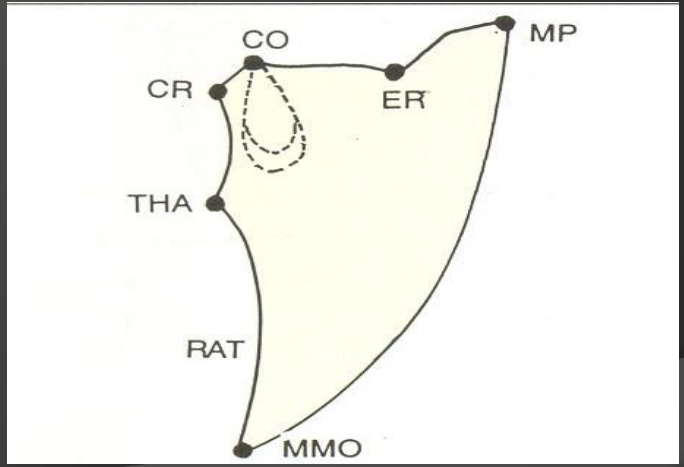
Extreme Movements in Horizontal plane

Border movements recorded in the horizontal plane produced a characteristic “Diamond tracing’.



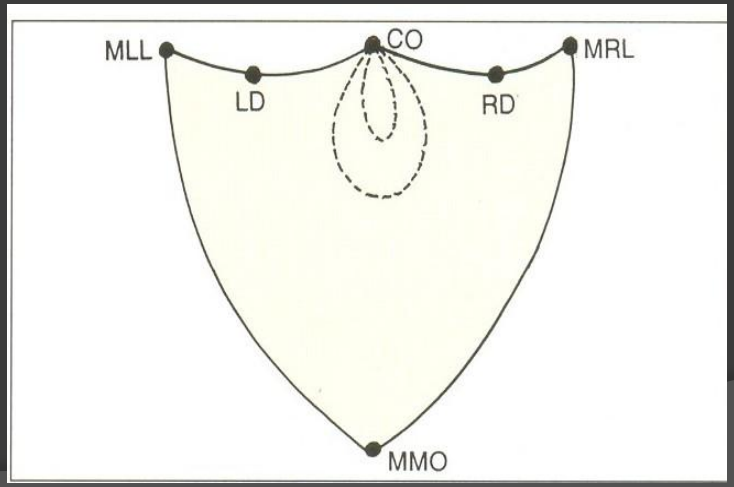
Extreme movements in the sagittal plane

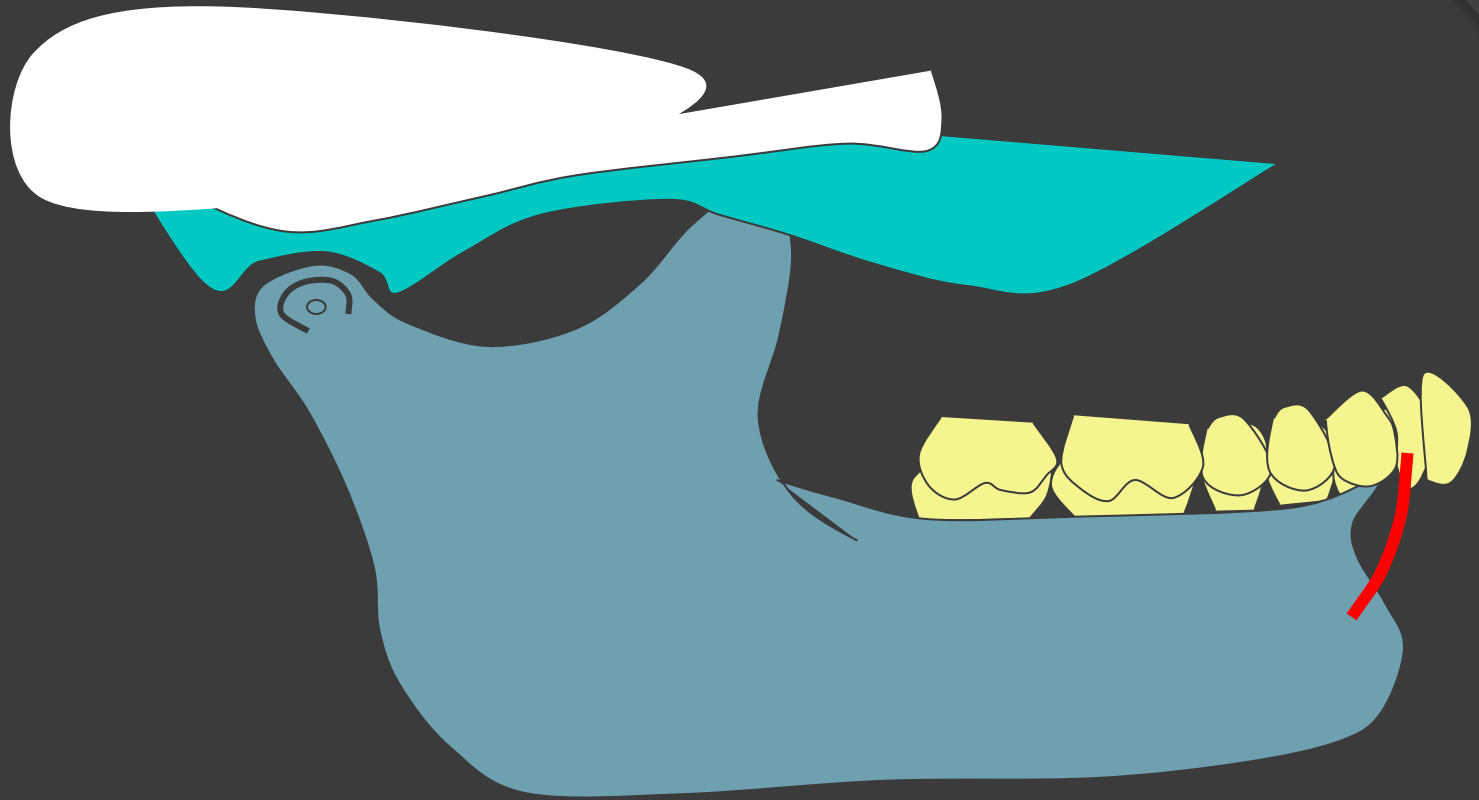
A characteristic ‘Beak tracing’ is formed while recording border movements in the sagittal plane.

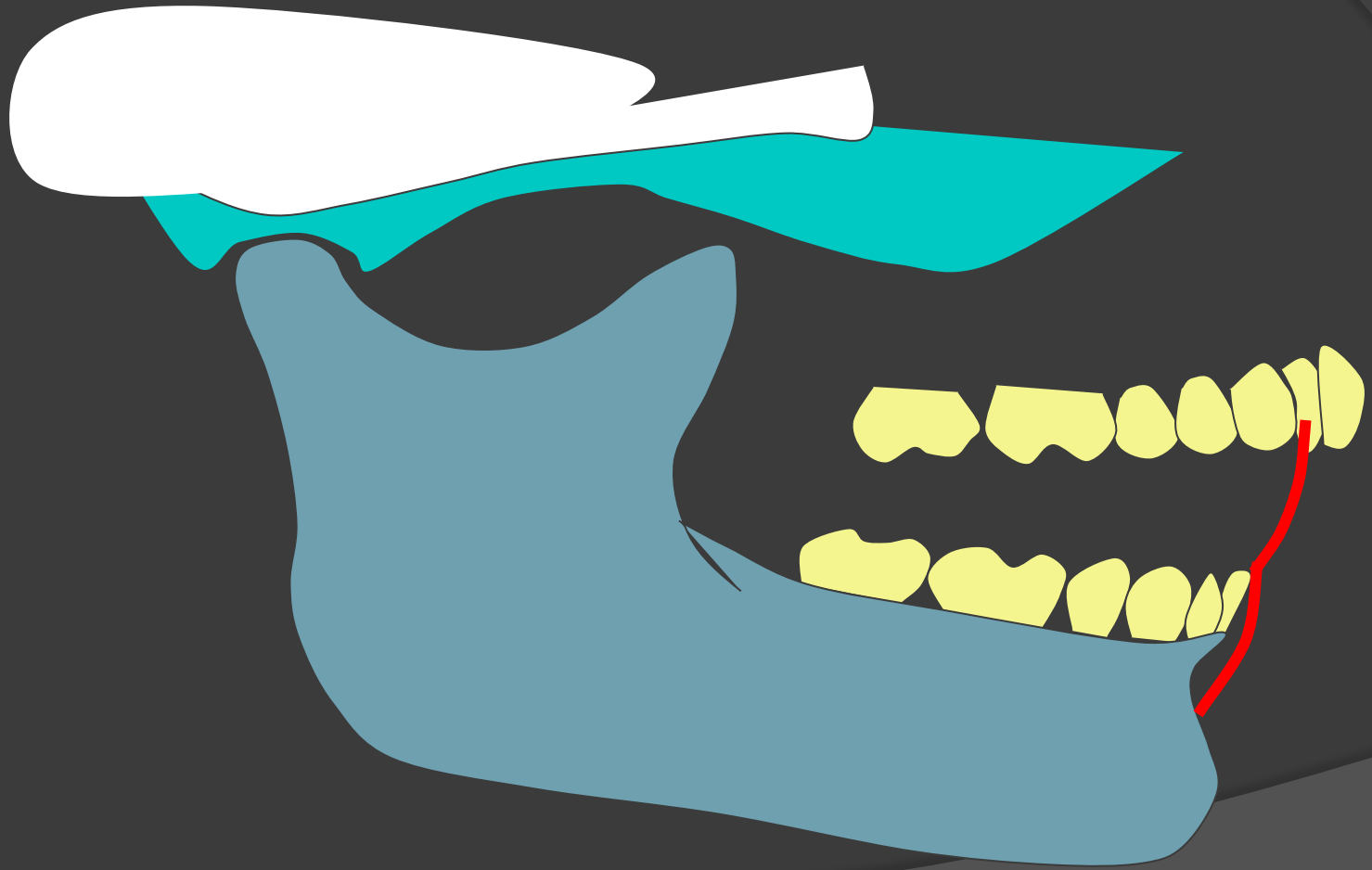


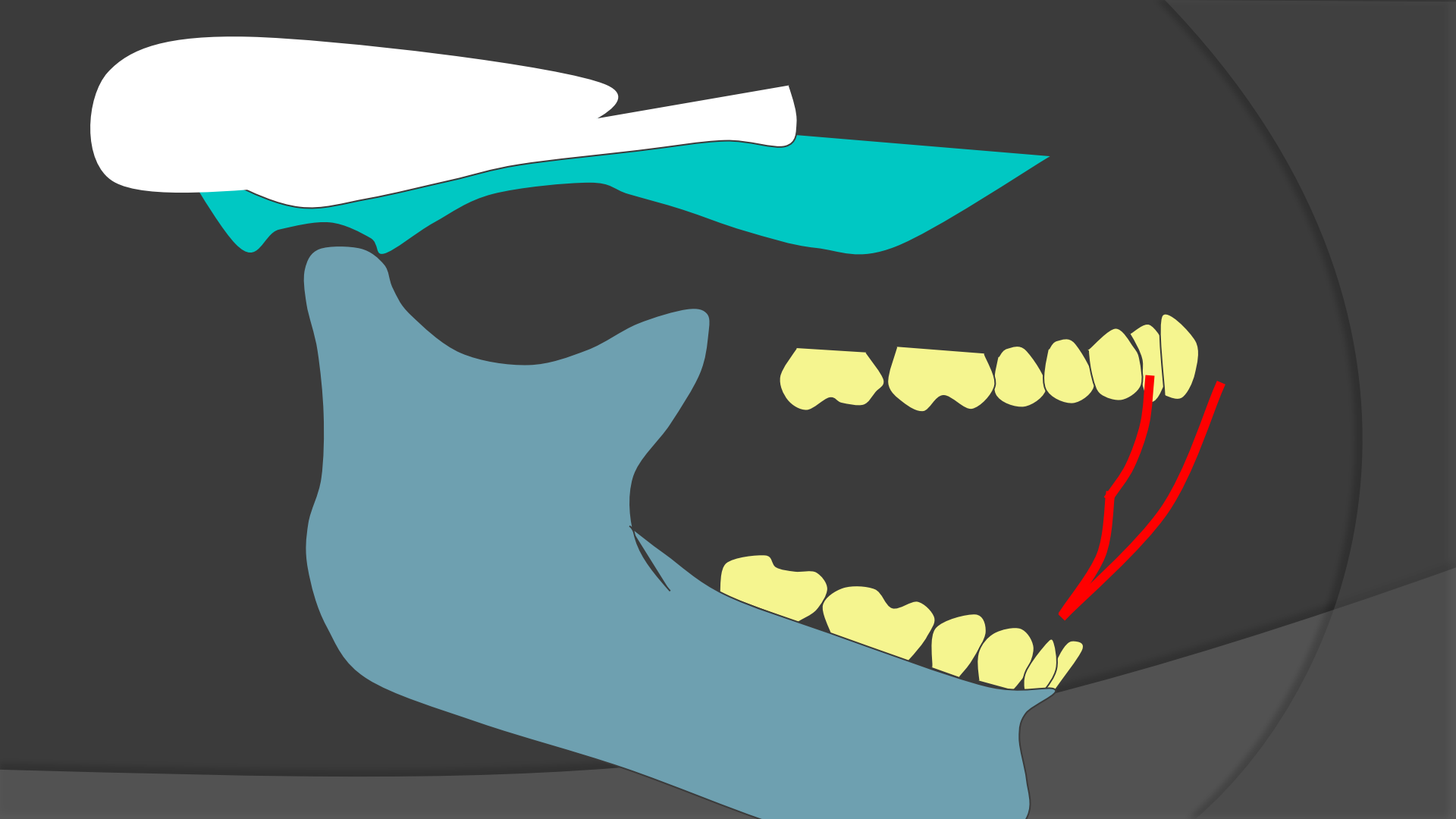
Extreme movements in the Coronal Plane

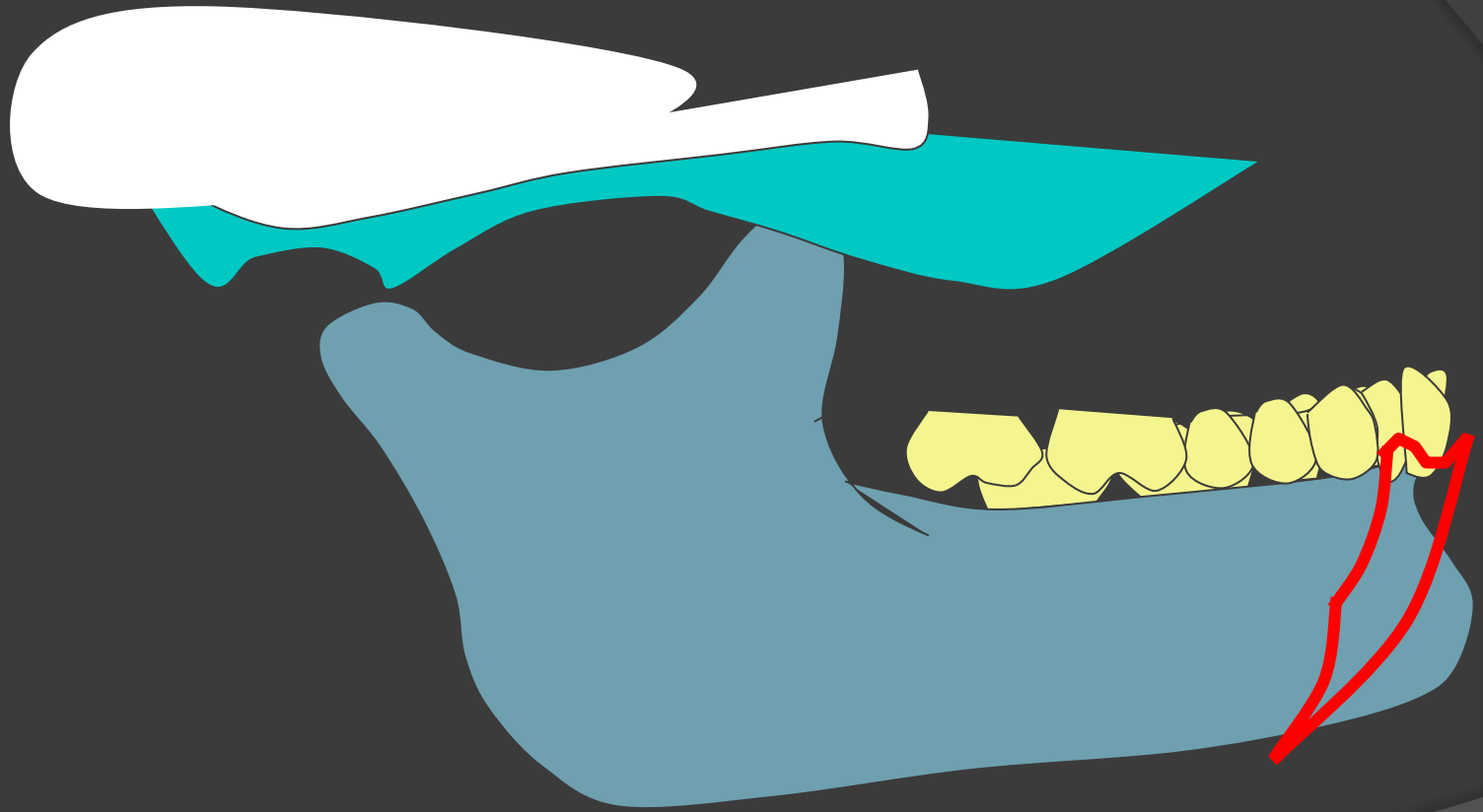
Border movements produced in this plane produce a characteristic ‘Shield tracing’.





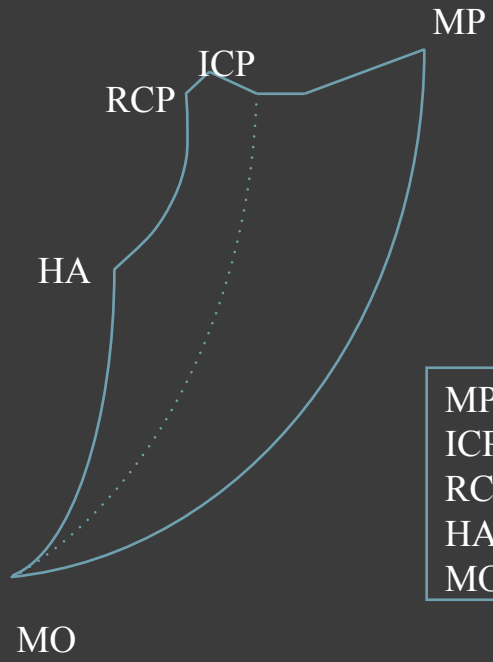






Posselt's Figure

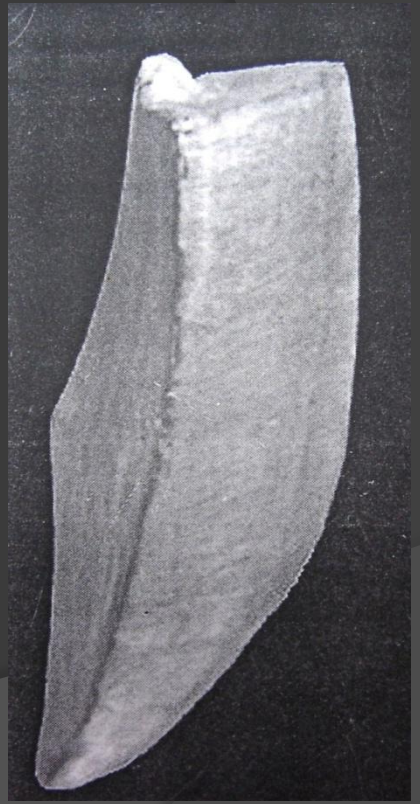
Posselt's Figure

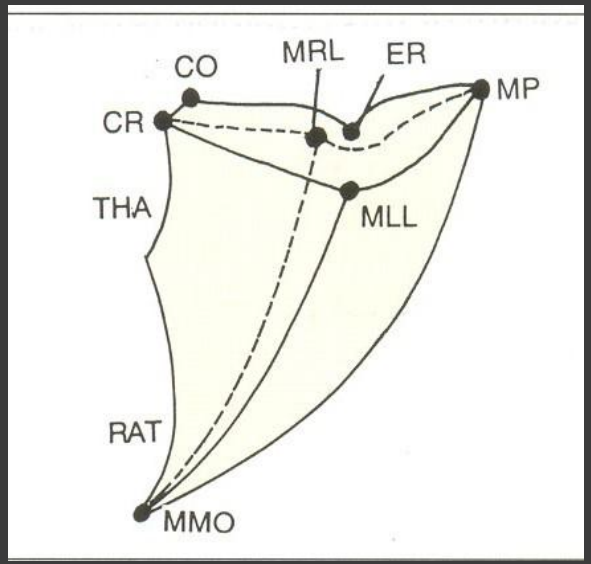


MP = Maximal protrusion
ICP = Intercuspal position
RCP= Retruded Contact position
HA = Hinge axis
MO = Maximum opening

Envelope ofMotion

- This three dimensional limiting space is called the envelope of motion.
- It was first described by Posselt in 1952.
- The envelope of motion is longest and widest superiorly and narrows down to a point near the maximum mouth opening position.
- Hence, as the jaw separation increases, space for movement decreases to a zero at the maximum mouth opening position.

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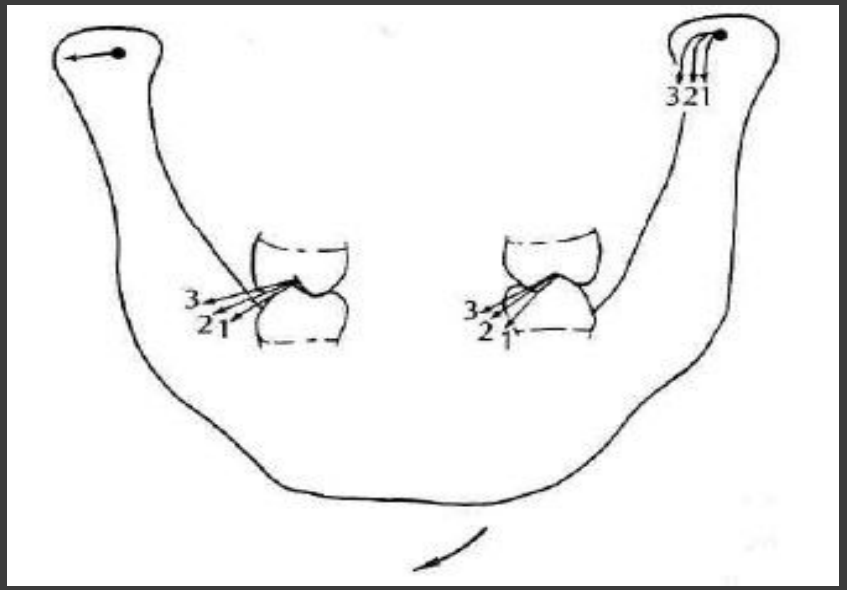
Clinical significance

Generally the posterior cusps are developed to disocclude during eccentric mandibular movements but to contact in the intercuspal position.

Effect of mandibular lateral translation movement on cusp height

- Effect of the amount of lateral translation moveme cusp height
- Effect of the direction of lateral translation movem cusp height
- Effect of the timing of lateral translation movemen cusp height

Effect of the ***amount*** of lateral translation movement on cusp height

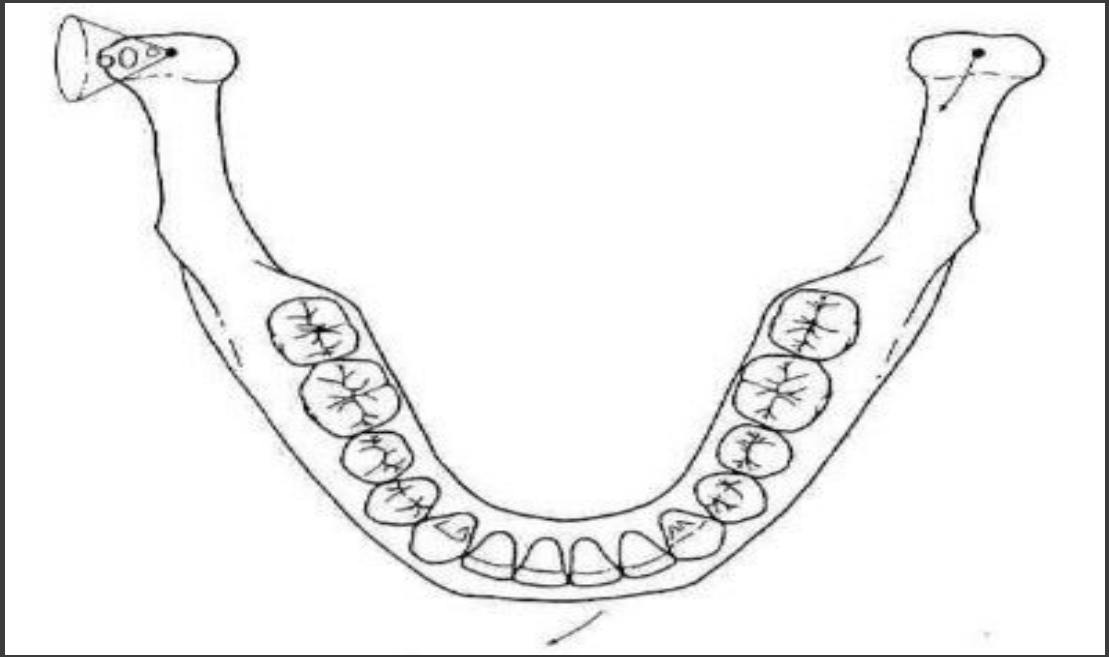


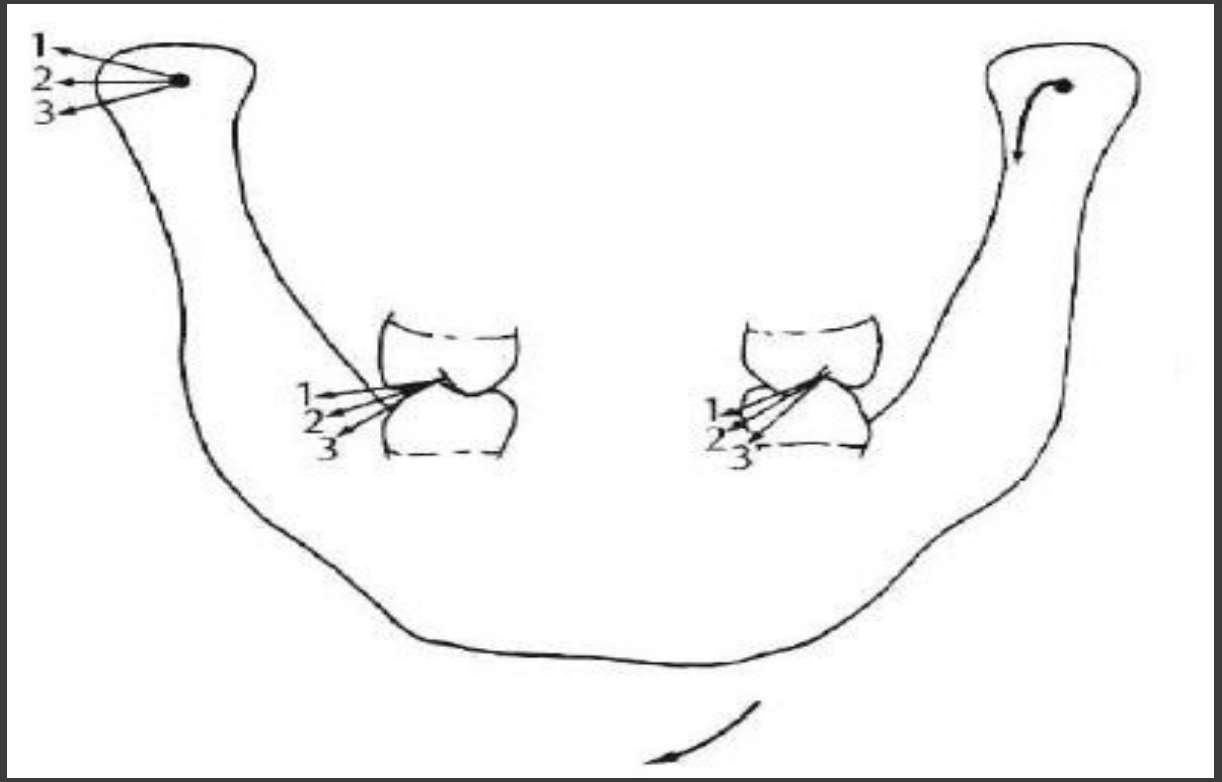
Effect of the *direction* of lateral translation movement on cusp height

Determined by the morphology and ligamentous attachments of the TMJ undergoing rotation

Movement occurs within a 60-degree (or less) cone whose apex is located at the axis of rotation

More superior the lateral translation movement, the shorter is the posterior cusp

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2
3
1
2
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1
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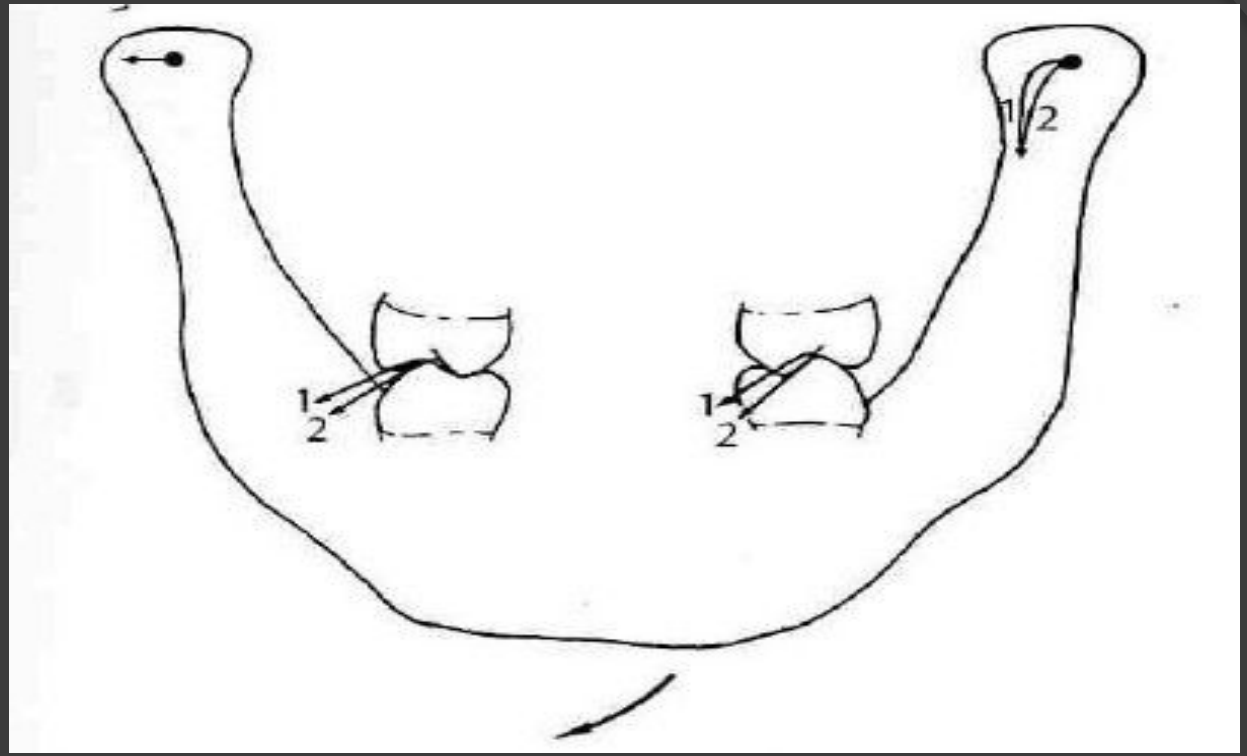
3

Effect of the *timing* of lateral translation movement on cusp height

- lateral translation movement Occurs early, a shift is seen even before the condyle begins to translate from the fossa. This is called an immediate lateral sideshift

- It occurs in conjunction with an eccentric movement, the movement is known as a progressive lateral translation movement or progressive sideshift.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Conclusion

The baseline for border movements is the centric relation position of the mandible.

Functional movements of the mandible terminate and originate from centric.

Much data on mandibular movement has been gathered over the past years. This should help us to provide an accurate and extensive study of jaw motion.

This would enable the prosthodontist to build and test prosthetic appliances in an actual functional relationship as it occurs in the mouth

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