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OCCLUSION

Keys for Optimal Occlusion

DR V MATSUBARA

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LEARNING OUTCOMES

- Identify pathological adaptations caused by malocclusion.
- Explain the movements of condyles during protrusion and lateral excursion of the mandible.
- Define Centric Relation, Maximum Intercuspal Position, and Centric Occlusion.
- Define and discuss the criteria for the ideal occlusion.
- Describe the three types of guidance for lateral movements of the mandible.

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SIGNIFICANCE

Dental treatments inevitably affect the occlusion

- Tooth restoration
- Tooth extraction
- Tooth movement
- Tooth adjustment

Many patients present with a form of occlusal problems

- Tooth wear (attrition, erosion, abrasion, abfraction)
- Overloading
- Fractured cusp or restoration
- Cracked tooth

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SIGNIFICANCE

- Little evidence suggesting that a change in occlusion will precipitate morphological changes within TMJs
- The most likely adaptation occur in teeth and their supporting structures

For example: tooth wear, tooth movement and fracture

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Attrition

Incisors wear

Possible causes:

- Lack of posterior tooth support
- Abrasive restorative material
- Bruxism

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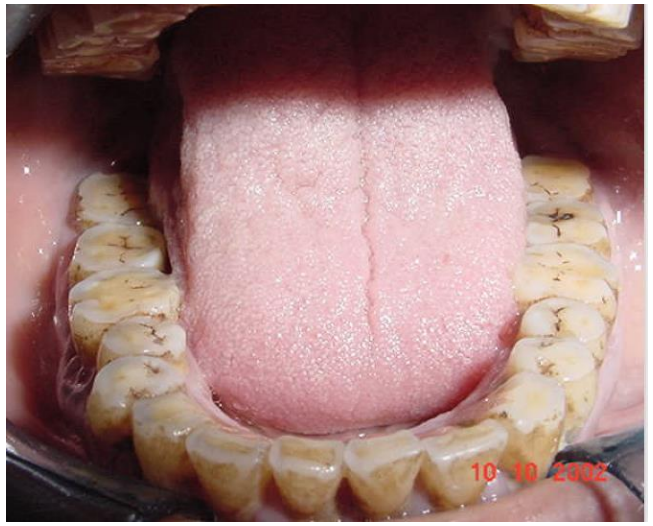
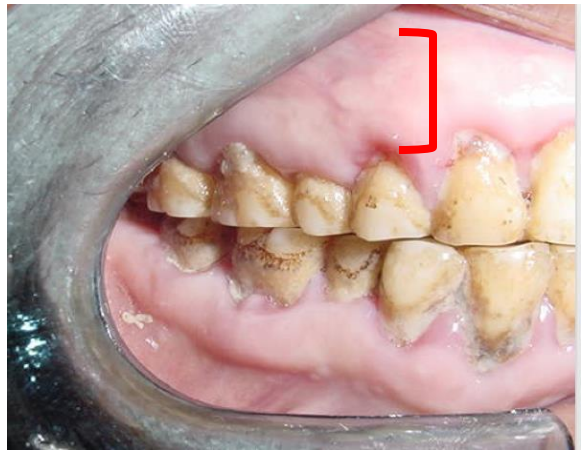
Attrition

Generalized

- Severe wear, fractured teeth
- Dentoalveolar compensation: limits vertical space for dental restoration



Attached gingiva



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Splayed teeth

Possible causes

- Loss of posterior teeth combined with periodontal problems (reduced periodontal support)
- Over contouring of palatal surface of maxillary incisors or incisal/labial surfaces of mandibular incisors.

Soreness of anterior teeth precede tooth movement

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Sore teeth

Overcompression of periodontal ligament can cause considerable pain on biting

Causes

- Premature occlusal contacts (occlusal overload)
- Occlusal interferences

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Sensitive teeth

Hypersensitivity might result from occlusal overload

Causes:

- restoration causing occlusal interferences

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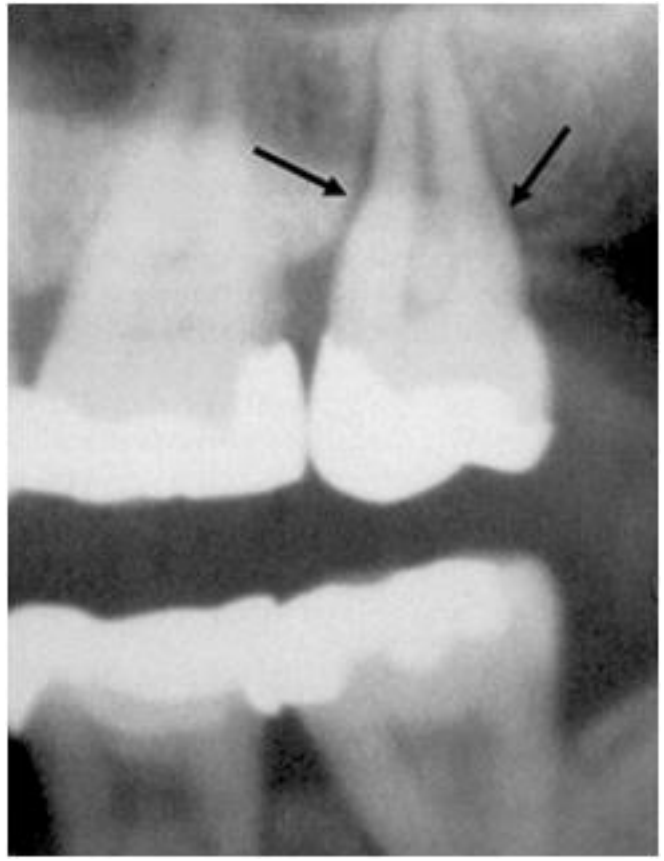
Hypermobility
Pathological adaptation

Causes
- Restoration causing occlusal interferences
- All mobile teeth should be assessed to rule out deflective contacts or occlusal overload as a factor in the cause of the mobility



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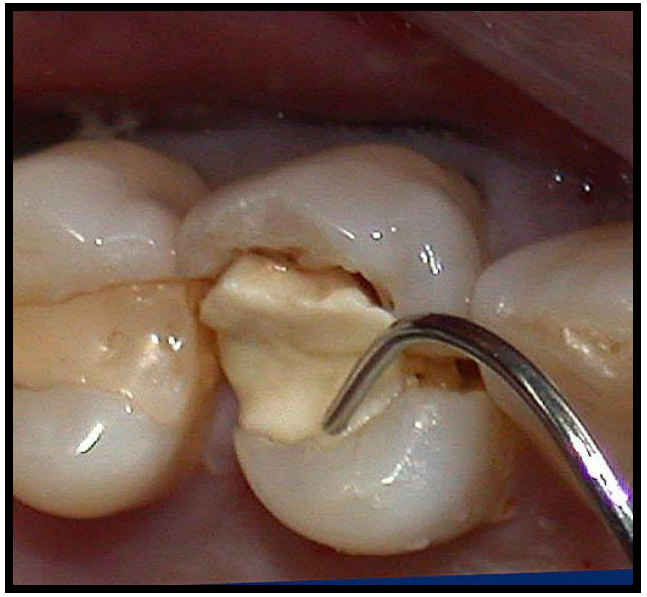
Tooth cracks

- crack lines routinely develop when a cusp is loaded with heavy occlusal forces
- Can precedes tooth fracture



Cracked tooth syndrome

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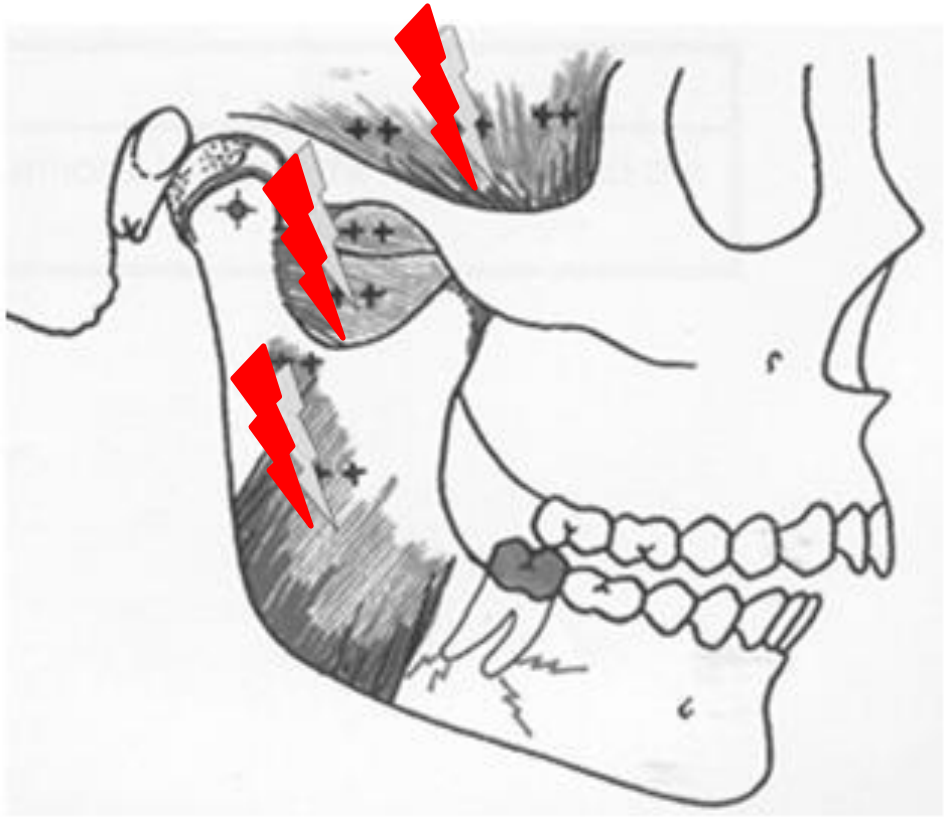
Painful musculature

Cause

- Deflective occlusal interferences that cause jaw joints to displace
- Unbalanced muscle contraction

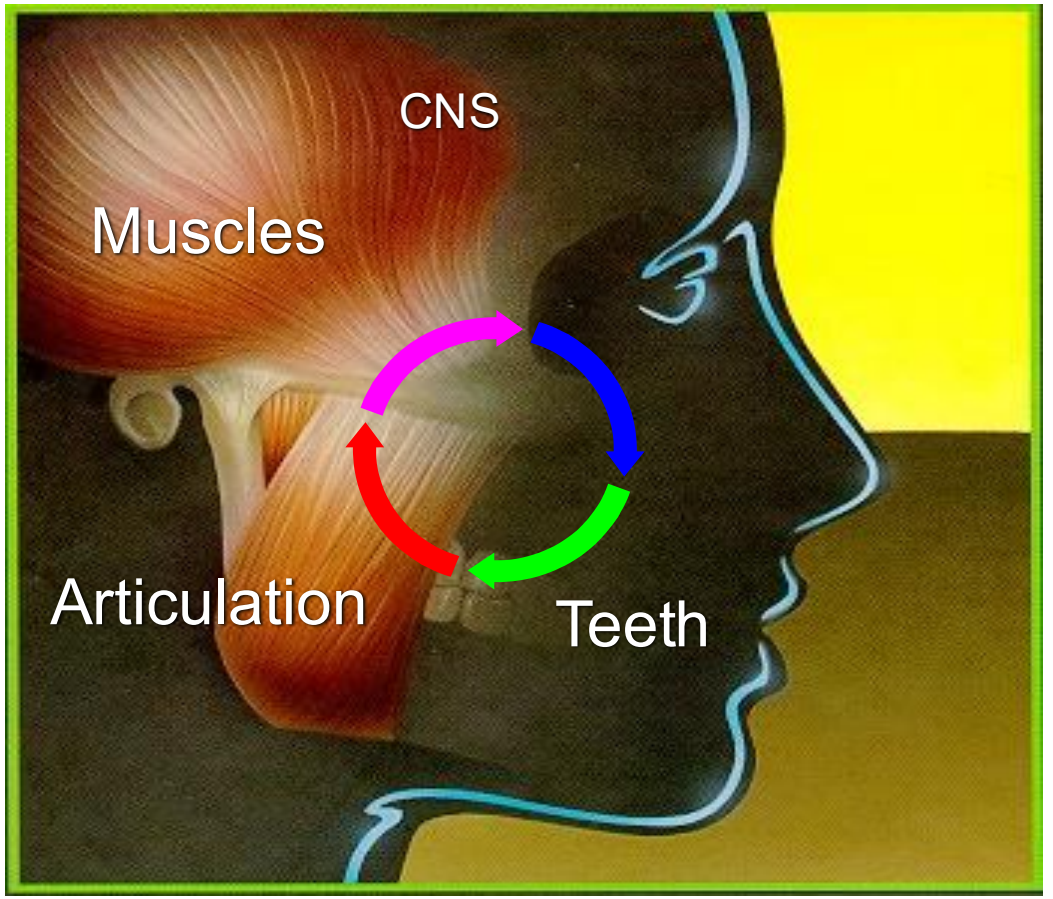


Masticatory System

Components

1. Teeth
2. Periodontal tissues
3. Articulatory apparatus

Interconnected biomechanical system



Davies and Gray; 2000

Masticatory System

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Function of each component

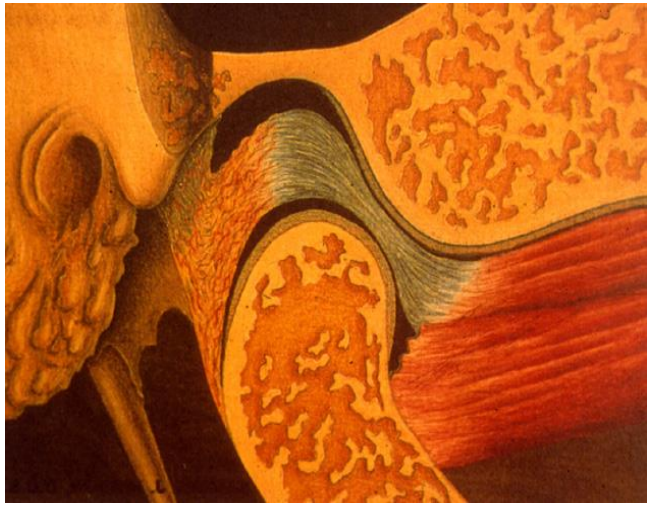
1. TMJs: guiding system
2. Dental occlusion: guiding system
3. Masticatory muscle: moving system

TMJ

Movements

1. Hinge movement:
- Rotation around the intra-condylar axis
- Within the glenoid fossa
- < 2 cm of movement

2. Translation movement:
- Gliding against articular eminence
- > 2 cm



Rotation

Translation

TMJ

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Movements

1. Hinge movement:
- Rotation around the intra-condylar axis
- Within the glenoid fossa
- < 2 cm of movement

2. Translation movement:
- Gliding against articular eminence
- > 2 cm

Movement directions

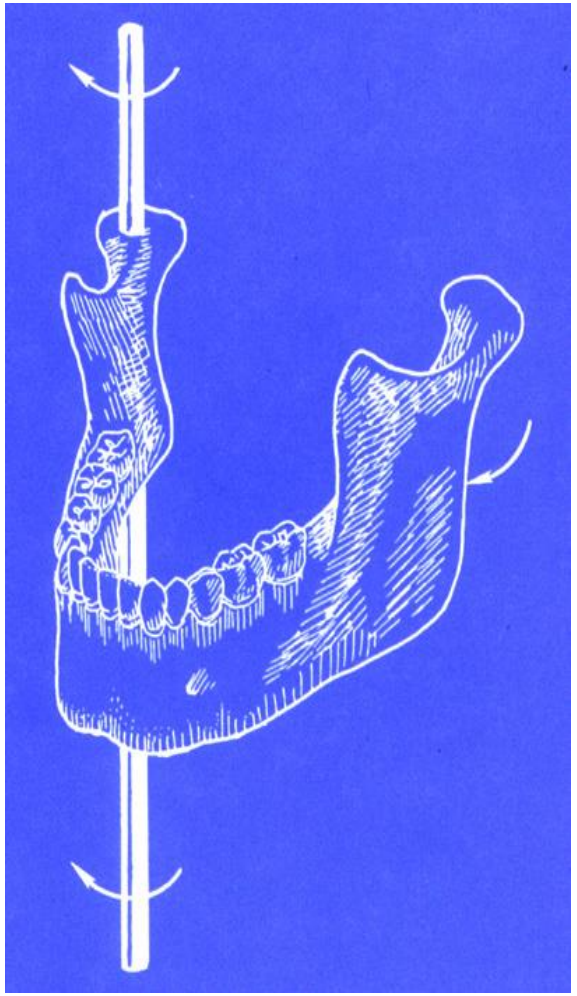
- Protrusive movement

Both condyles are in similar gliding motion

- Lateral movement

Working side: rotational movement around the vertical axis without leaving the glenoid fossa

Non-working side: gliding movement against the articular eminence



Excursive Movements

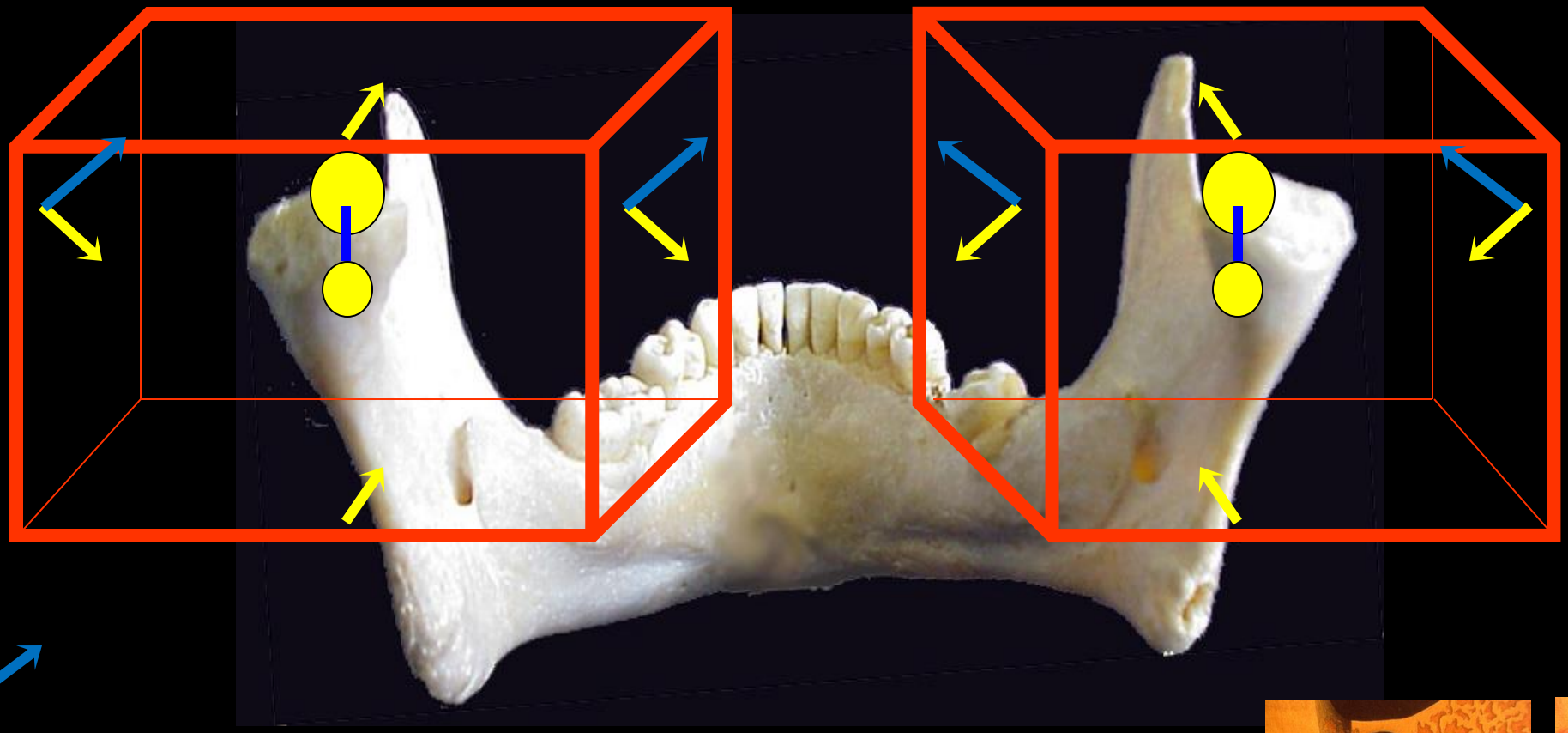
- During a lateral excursion of the mandible, the major movement within the TMJs occurs on the non-working side:

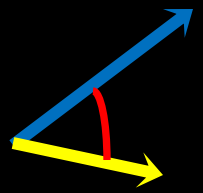
- The head of the condyle on the nonworking side moves forward, downward and medially

- The angle of downwards movement is stablished by the ‘condylar angle’

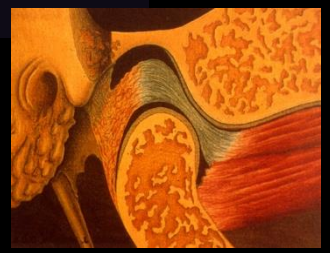
- The angle of medial movement is known as the ‘Bennet angle’

Protrusion

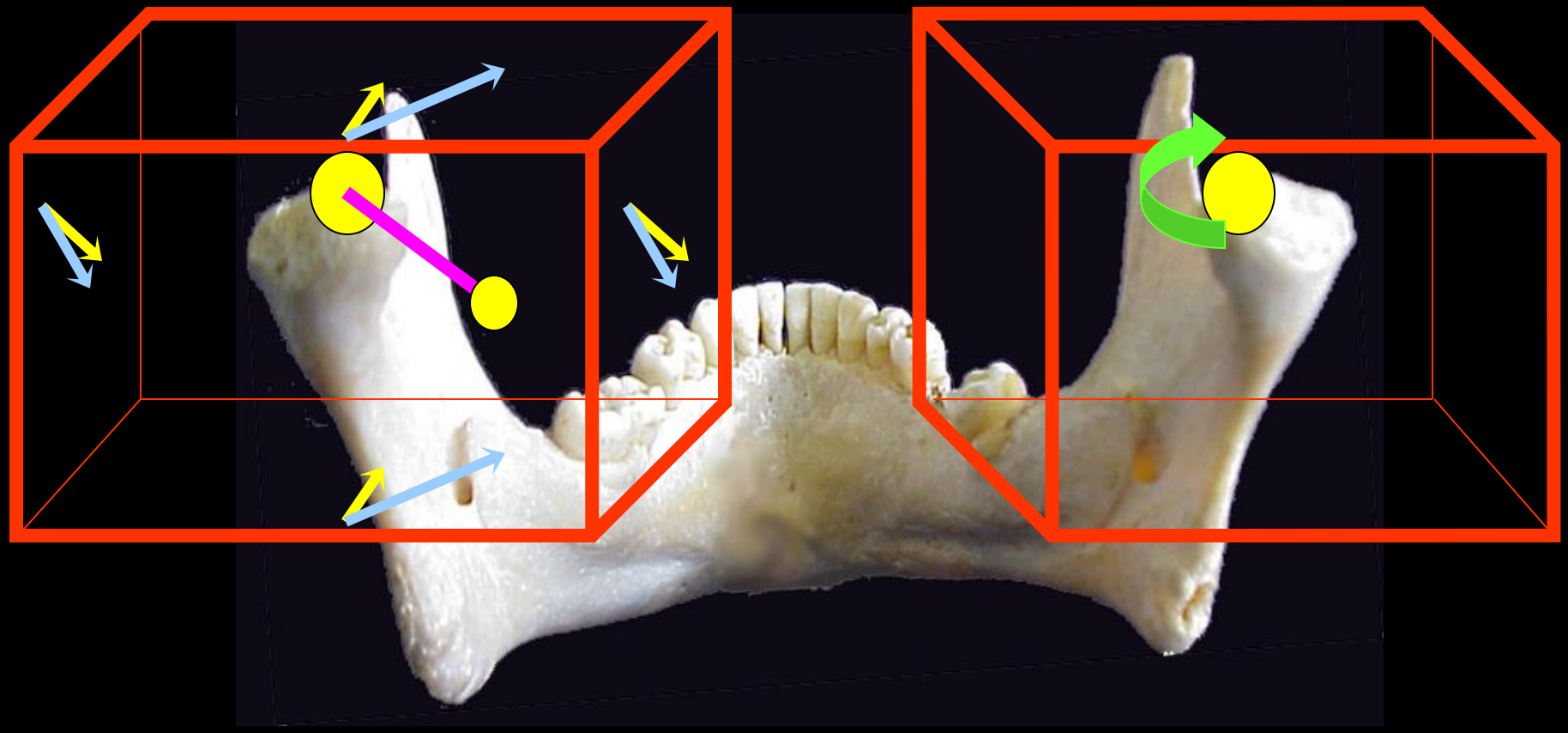




Condylar angle (guidance inclination)



Lateral excursion



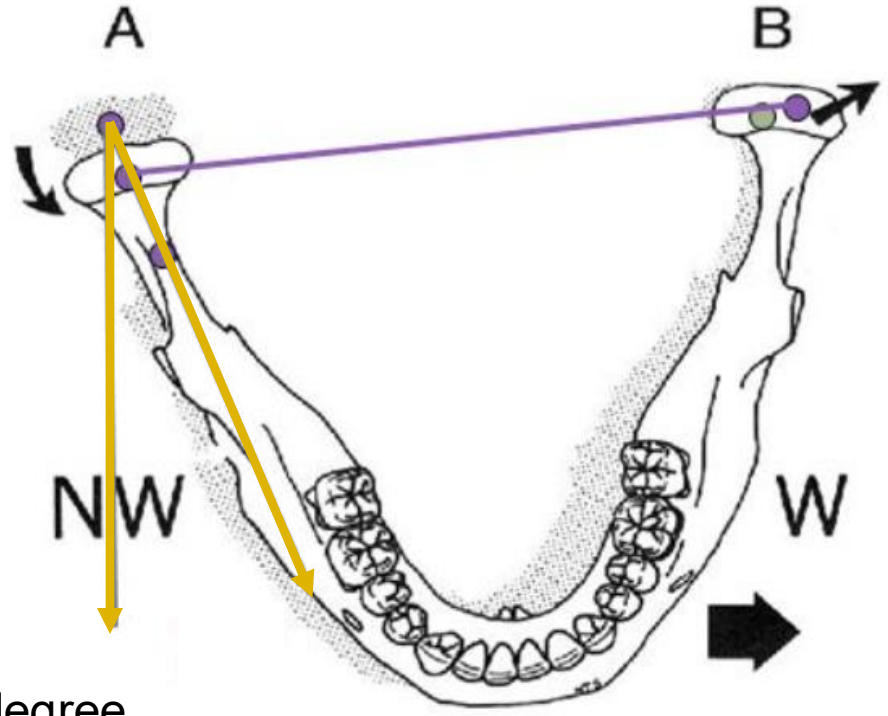
Bennet angle

Fisher angle

Bennett angle

Bennet angle: formed between the sagittal plane and the average path of the advancing condyle as viewed in horizontal plane during lateral mandibular movement.

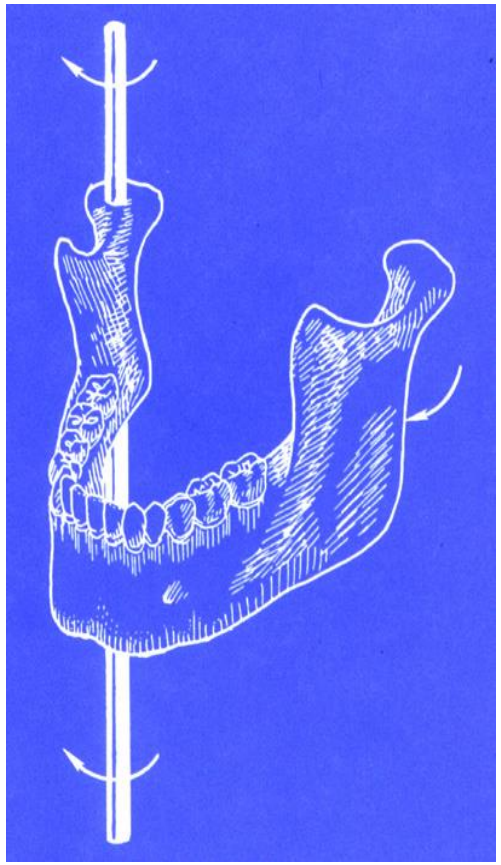
Bennet movement = LATEROTRUSION

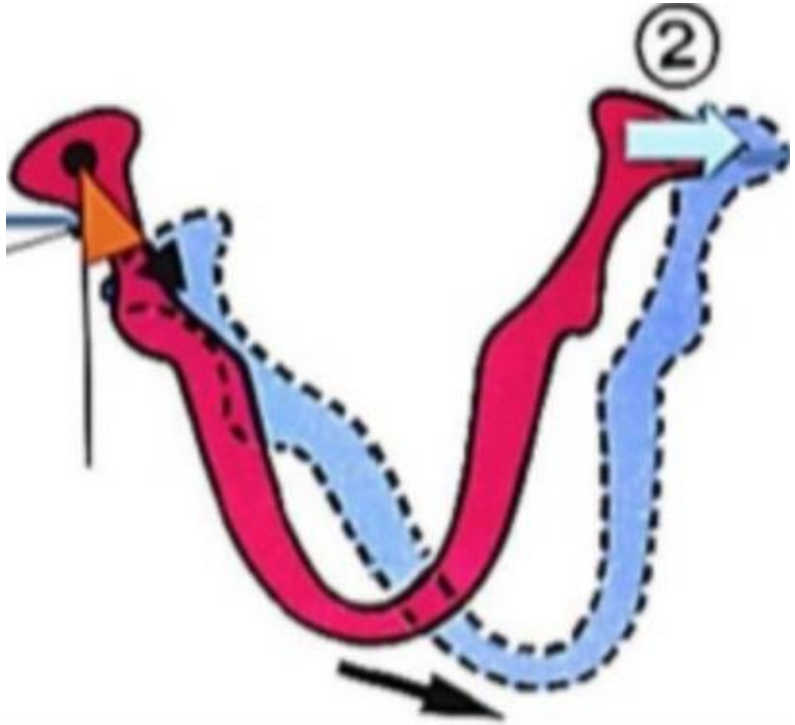


Bennett angle
Average of 15 degree

Bennett angle

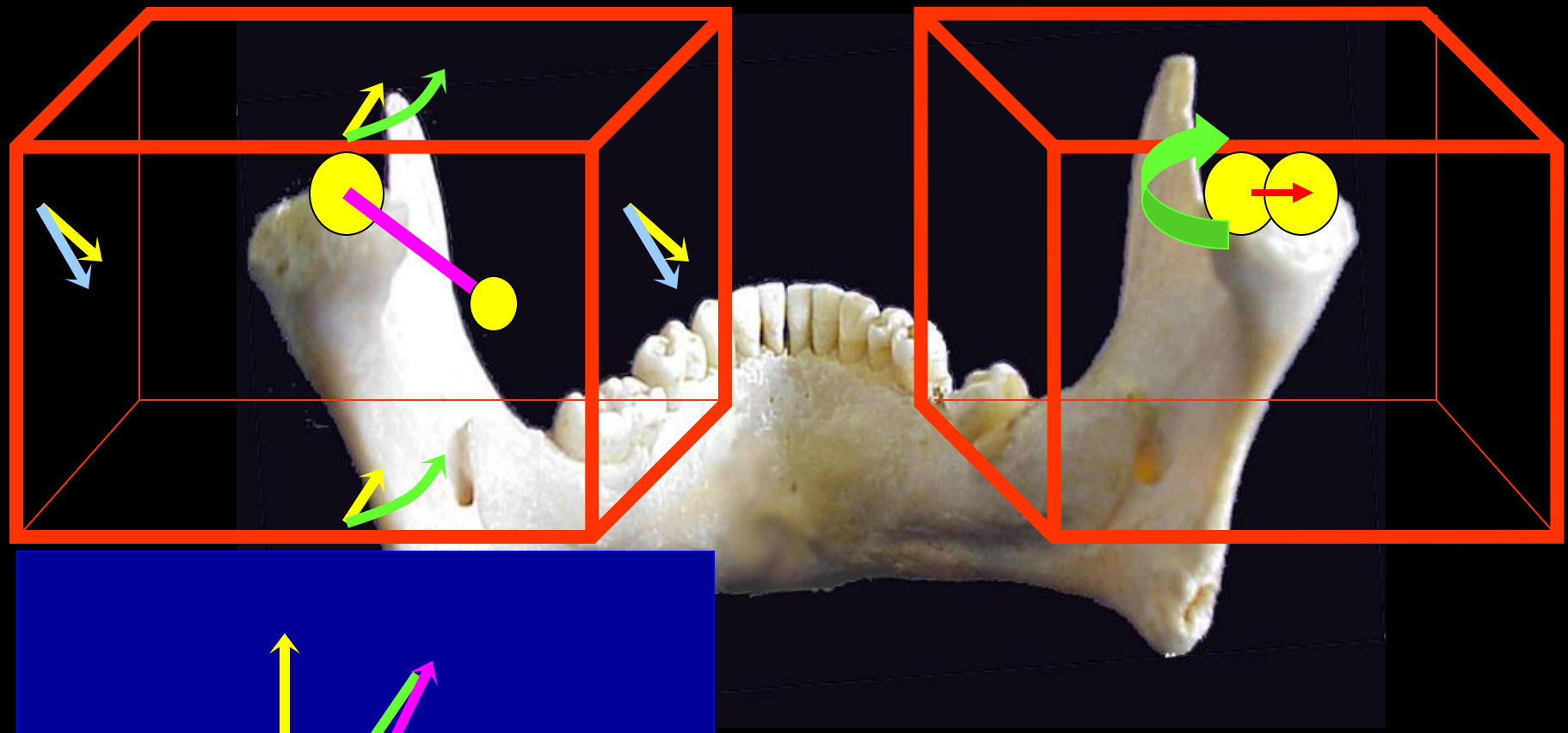
Bennett side shift (mandibular lateral translation): the medio-lateral movement of the mandible when viewed in the frontal plane during Bennet movement

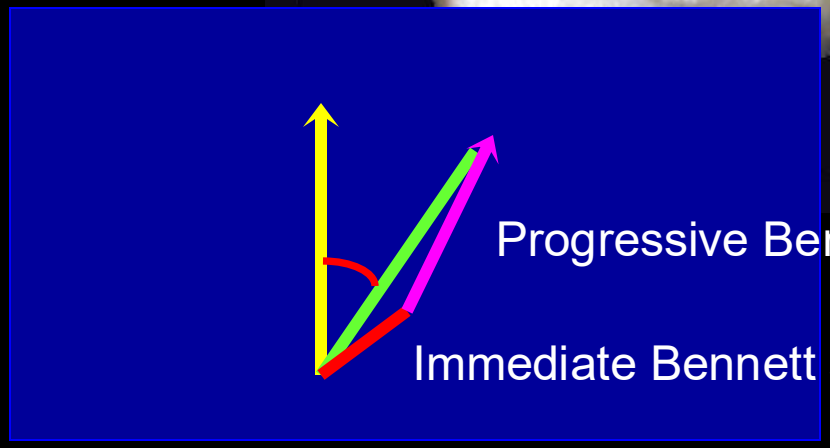




- Immediate Bennett side shift - IMMEDIATE MANDIBULAR LATERAL TRANSLATION
- Progressive Bennett side shift - PROGRESSIVE MANDIBULAR LATERAL TRANSLATION

Immediate and progressive Bennett angle





Dental Occlusion

Provided by whichever teeth touching the opposing teeth or analogs

- Static occlusion
- Dynamic occlusion

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STATIC

- Maximal intercuspation
- Centric relation/Centric occlusion
- Freedom in centric
- Extent of posterior tooth support
- Overbite and overjet

DYNAMIC

- Protrusion
- Lateral occlusion guidance
  - Canine guidance
  - Group function
  - Balanced occlusion (complete dentures)
- Working and non-working sides interferences

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STATIC OCCLUSION

Centric relation:
a maxillomandibular relationship in which the condyles articulate in the anterior-superior position against the posterior slopes of the articular eminences.

- This position is independent of tooth contact
- Reproducible

The Glossary of Prosthodontic Terms; 9th ed

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STATIC OCCLUSION

Maximum intercuspal position (MIP): the complete intercuspation of the opposing teeth independent of condylar position

- Bite of convenience
- Habitual bite (position)

Centric occlusion: the occlusion of opposing teeth when the mandible is in centric relation

- In 90% of population MIP ≠ CO

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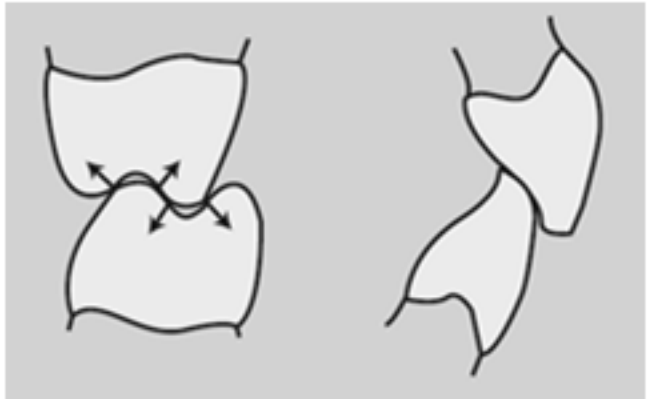
STATIC OCCLUSION



Freedom in centric

Freedom in centric occlusion occurs when the mandible is able to move anteriorly for a short distance in the same horizontal and sagittal plane while maintaining tooth contact

There is a flat region in the central fossa where opposing cusps contact that gives to the mandible freedom in eccentric movements (no interference)

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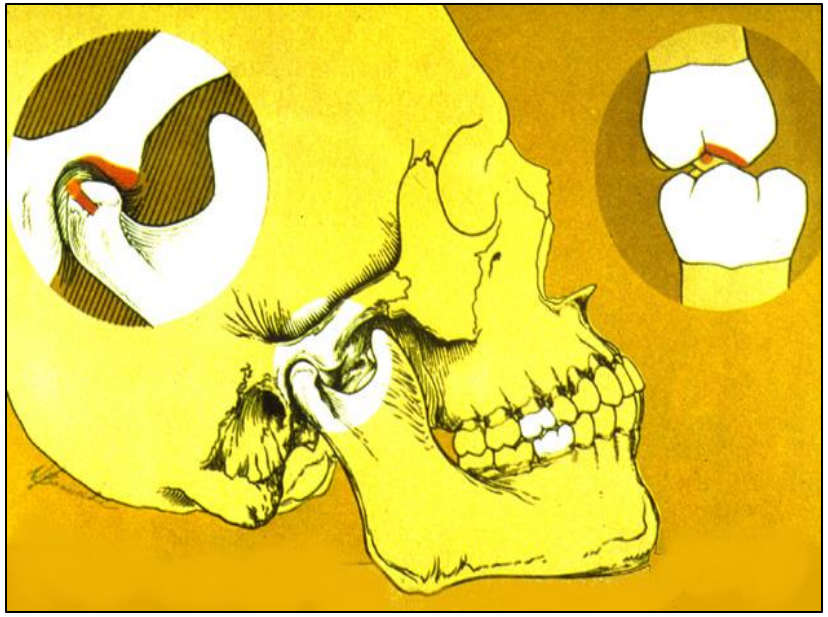
DYNAMIC OCCLUSION

Refers to occlusal contacts that are made whilst the mandible is moving relative to the maxilla



- The mandible is moved by the muscles of mastication
- The pathways along which its moves are determined by two guidance systems (TMJ and dental occlusion)

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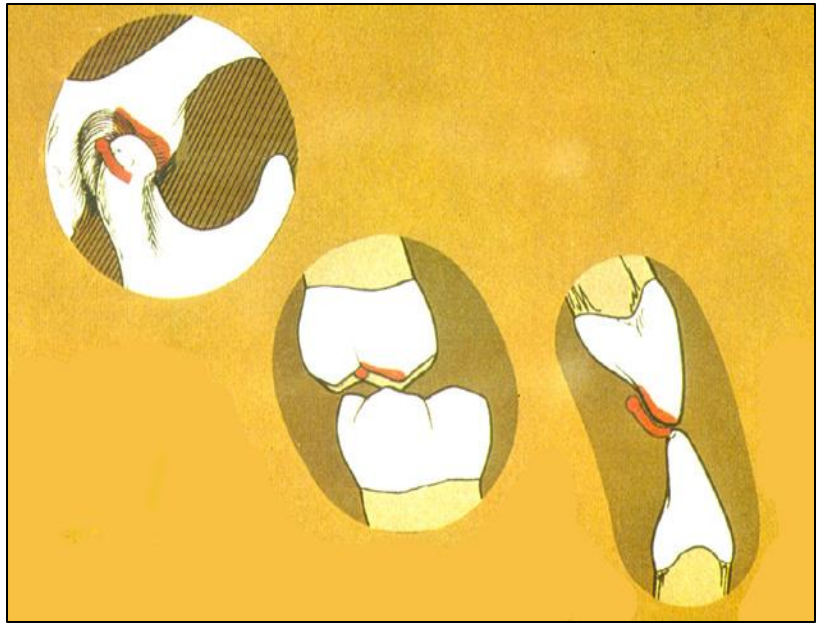
DYNAMIC OCCLUSION

- As the head of the condyle moves downwards and forwards, the mandible moves along a guidance pathway which is determined by the intraarticular disc and the articulatory surfaces of the glenoid fossa;
- If teeth are touching during a protrusive or lateral movement of the mandible then those (touching) teeth are also providing guidance to mandibular movement;
- Tooth contacts dictate the mandibular movement in occlusion.



Dental Occlusion

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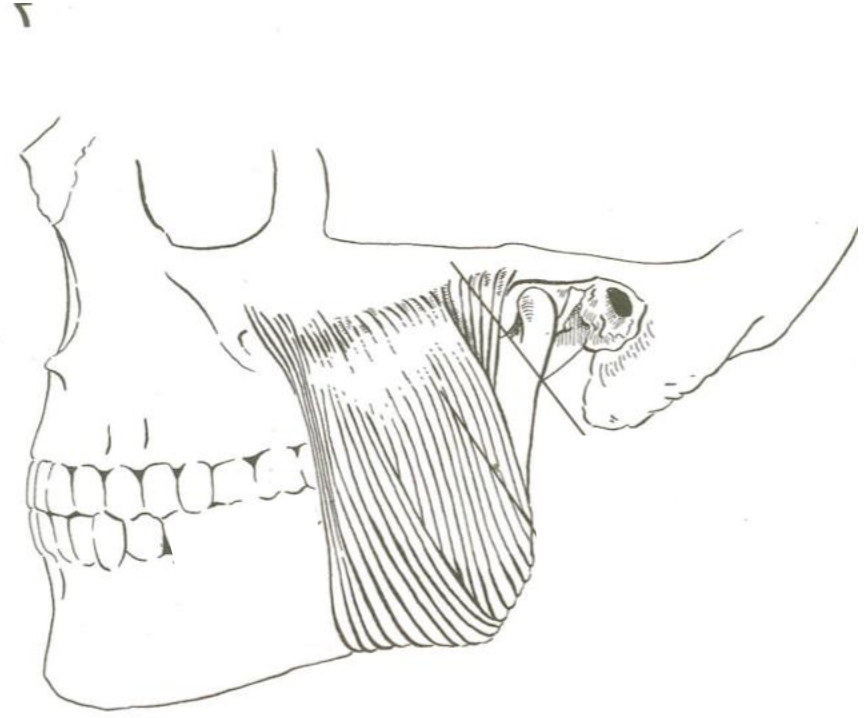
Criteria for Optimal Occlusion

1) Mandibular stability: contact of inferior and superior teeth must stabilize the mandible in centric

- Condyles are positioned within the glenoid cavity without stretching or compressing the ligament or articular disc
- Bilateral and simultaneous occlusal contacts in centric (CR/MIP)



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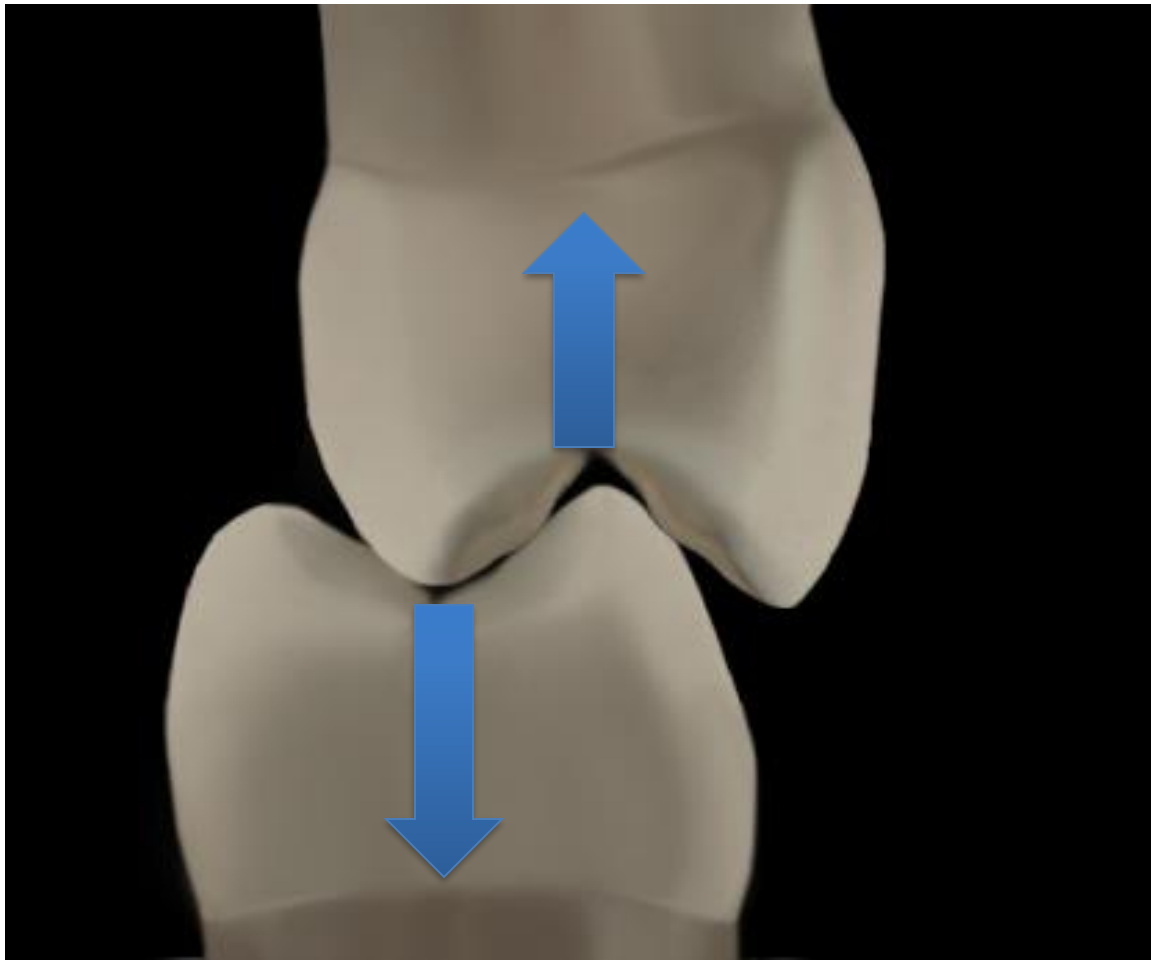
Criteria for Optimal Occlusion

2) Axial load: The occlusal load should be parallel to the long axis of the tooth

Load is distributed equally throughout the periodontal ligament



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Criteria for Optimal Occlusion

3) During lateral excursions of the mandible, there is no interference on the working side

Types of guidance:

- Canine guidance
- Group Function (total or partial)

} Dentate

- Balanced occlusion (bilaterally balanced occlusion) – Edentate

Dental Occlusion

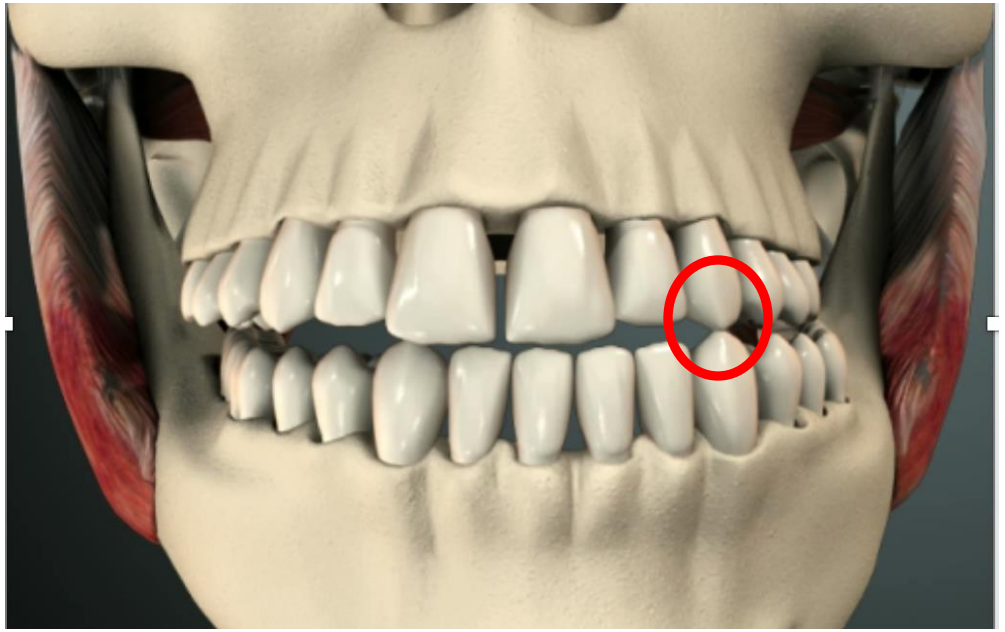
Criteria for Optimal Occlusion

Lateral occlusion guidance

Canine guided (protected) occlusion

- A form of articulation in which the vertical and horizontal overlap of canine teeth disengage posterior teeth in excursive movements of the mandible

- Complete disocclusion of posterior teeth during lateral movement



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Criteria for Optimal Occlusion

Lateral occlusion guidance

Canine guided (protected) occlusion

- Most widely accepted concept in restorative dentistry
- Easier to reproduce
- Canines are ideal guiding teeth

Not indicated if the canines are compromised

- Periodontally
- Endodontically

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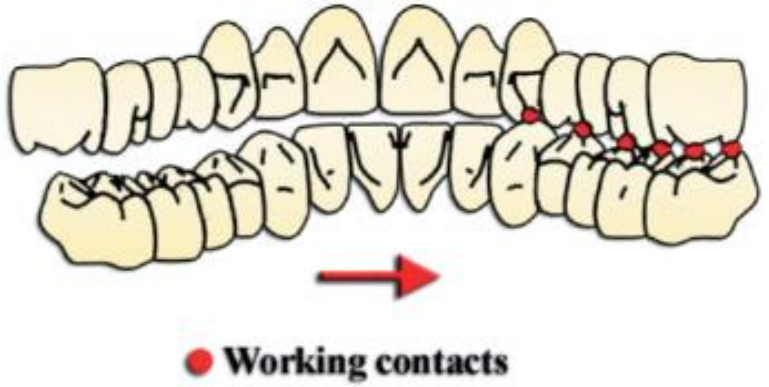
Criteria for Optimal Occlusion

Lateral occlusion guidance



Group function occlusion (unilaterally balanced occlusion)

- Distribution of lateral forces to a group of teeth;
- Multiple contacts between the maxillary and mandibular teeth in lateral movements on the working side whereby simultaneous contact of several teeth acts as a group to distribute occlusal forces
- On lateral movements, the contacts are on the buccal cusps of the working side

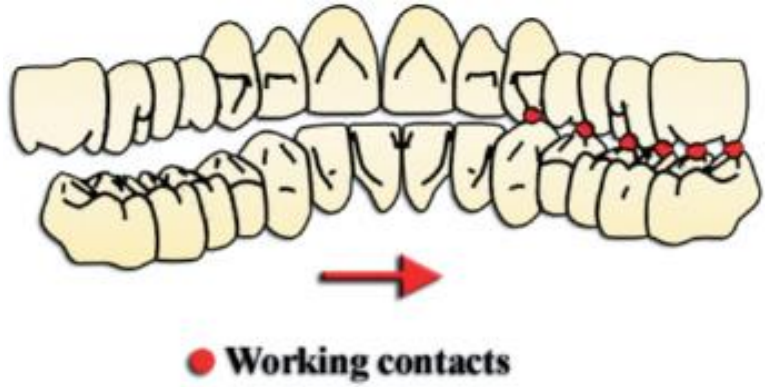
The Glossary of Prosthodontic Terms; 2005

Criteria for Optimal Occlusion

Lateral occlusion guidance

Group function occlusion

- Non-working (balancing) side – no contacts
- Widely accepted
- May cause excessive load on posterior teeth
- Difficult to establish



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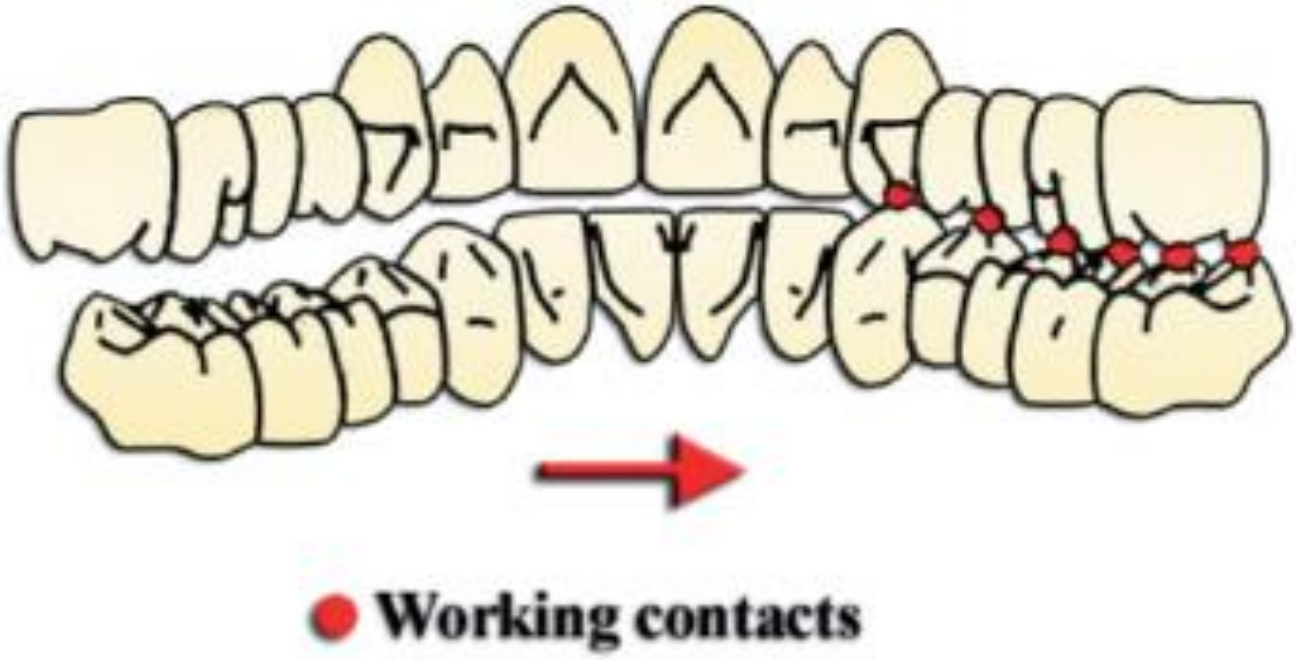
Dental Occlusion

Criteria for Optimal Occlusion

4) During lateral excursions of the mandible, there is disocclusion in the non-working side



Criteria for Optimal Occlusion

Interferences

- Working and/or non-working side interferences
- Can be observed clinically
- Increase patient awareness of the restoration
- Excessive horizontal and oblique forces will be applied on the restoration or natural teeth

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Dental Occlusion

Criteria for Optimal Occlusion

Lateral occlusion guidance

Balanced occlusion (bilaterally balanced occlusion)

- Bilateral, simultaneous, anterior and posterior occlusal contact of teeth in centric and eccentric positions
- At least 3 contact points: 2 posterior and 1 anterior

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Dental Occlusion

DYNAMIC OCCLUSION

Lateral occlusion guidance

Balanced occlusion (bilaterally balanced occlusion)

- Useful for complete denture cases to prevent tipping of the denture
- Cross arch balanced occlusion is not indicated for natural dentition

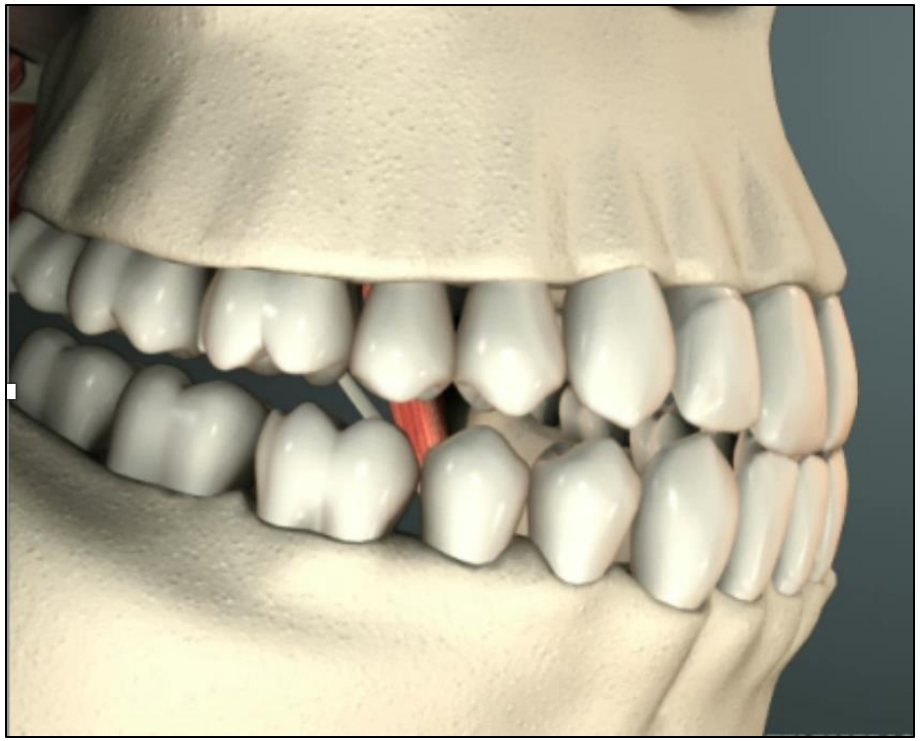
REASONS:

- Excessive wear was observed
- Presence of balancing contacts can apply horizontal and oblique destructive forces on posterior teeth
- Destructive effects on the non working side

Criteria for Optimal Occlusion

5) During protrusion, there is disocclusion of posterior teeth

- Protrusive or Anterior guidance



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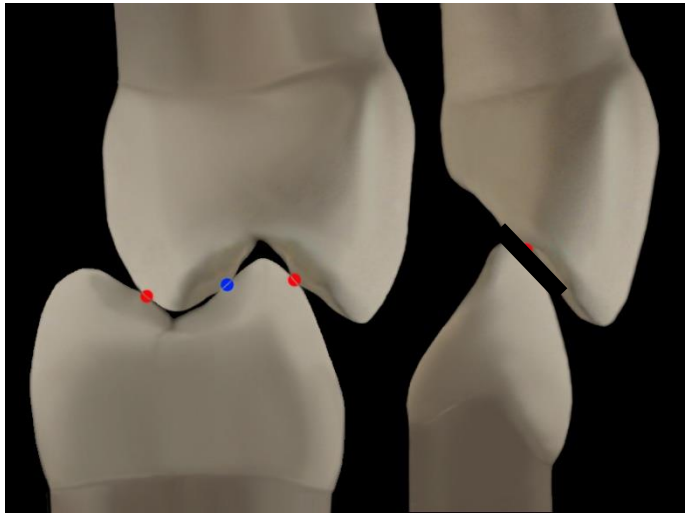
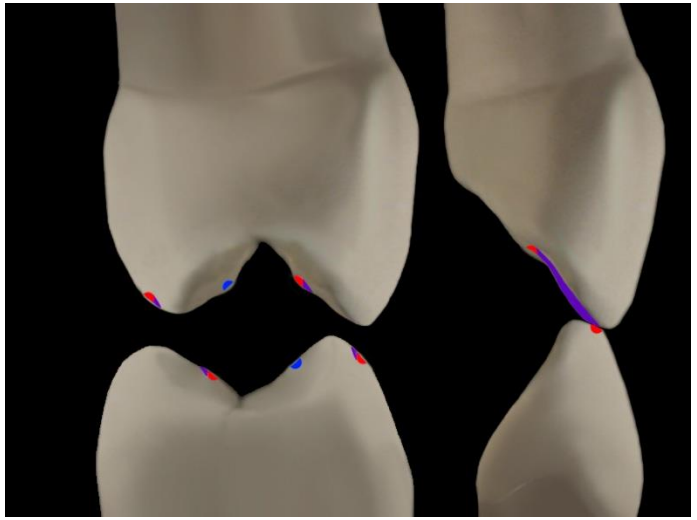
Mutually protected articulation

- An occlusal scheme in which the posterior teeth prevent excessive contact of the anterior teeth in MIP; and anterior teeth disengage the posterior teeth in all mandibular excursive movements



MIP



Laterotrusion/
Protrusion

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Criteria for Optimal Occlusion

1) Mandibular stability
2) Axial occlusal load
3) During lateral excursions: no interference in the working side
4) During lateral excursions: disocclusion in the non-working side
5) During protrusion: disocclusion of posterior teeth

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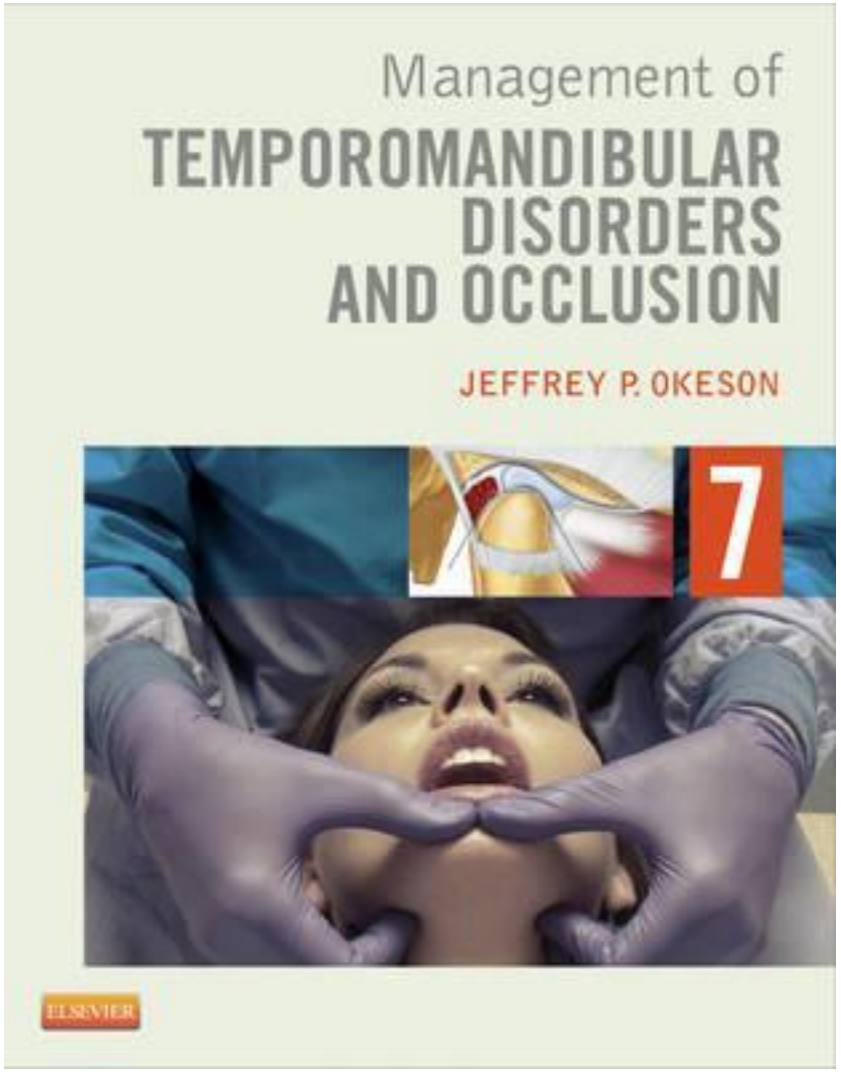


Thank you!!