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OCCLUSION
CLINICAL EXAMINATION

Acknowledgements to Dr Matsubara for slides

Occlusion

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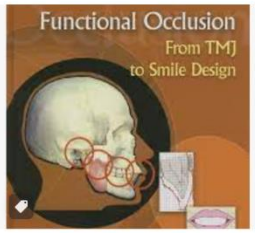
LEARNING OUTCOMES

- Importance of occlusal analysis for prosthetic treatment (indications)
- Discuss clinical parameters of occlusion: TMJ, muscles of mastication, dental occlusion
- Know how to assess TMJ, masticatory muscles, parafunctional habits, fremitus
- Differentiate Confirmative and Reorganized approaches of prosthetic treatment.

Why is Occlusion Important?

occlusion \a-klōō´shun\ *n* (1645)**: 1.** the act or process of closure or of being closed or shut off; **2.** the static relationship between the incising or masticating surfaces of the maxillary or mandibular teeth or tooth analogues; *comp,* ARTICULATION, CENTRIC OCCLUSION, COMPONENTS OF OCCLUSION, ECCENTRIC OCCLUSION, LINE OF OCCLUSION, LINEAR OCCLUSION, MONOPLANE OCCLUSION, PATHOGENIC OCCLUSION, SPHERICAL FORM OF OCCLUSION

FROM: *Glossary of Prosthodontic Terms*



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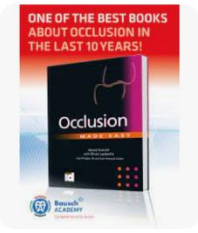
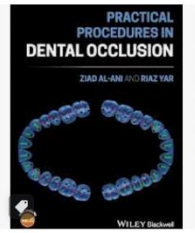
Functional Occlusion: From T...



www.occlusion-made-...
Occlusion Made Easy



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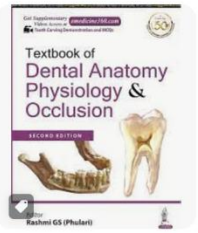
Dental Occlusion ...



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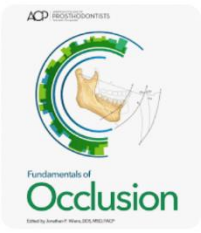
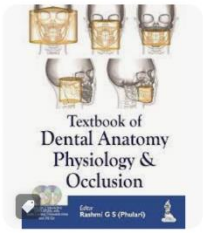


American College of Pr...
Fundamentals of Occl...



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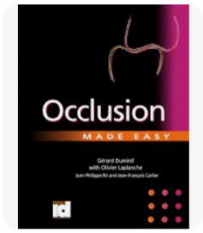

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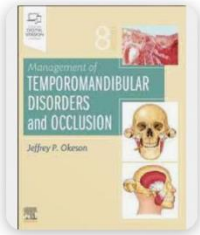
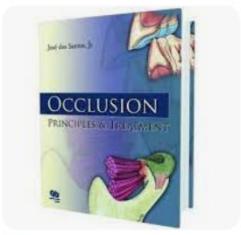
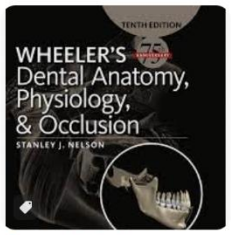
Occlusion Made Easy ...



Jeffrey P Okeson, DMD



AbeBooks



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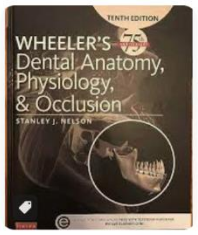

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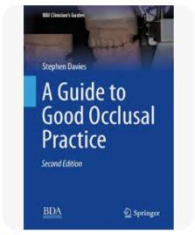
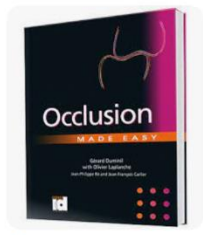
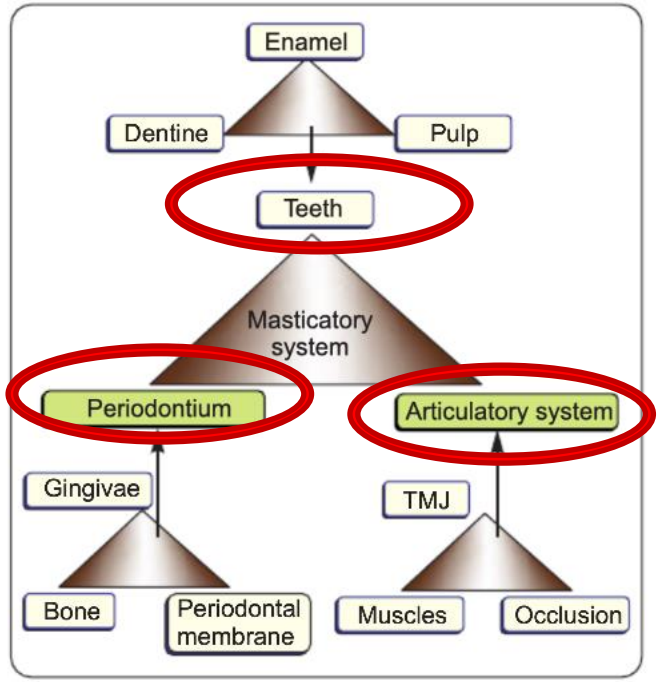


SpringerLink



Dr. Jean Bausch Gmb...

SO MANY TEXTBOOKS!



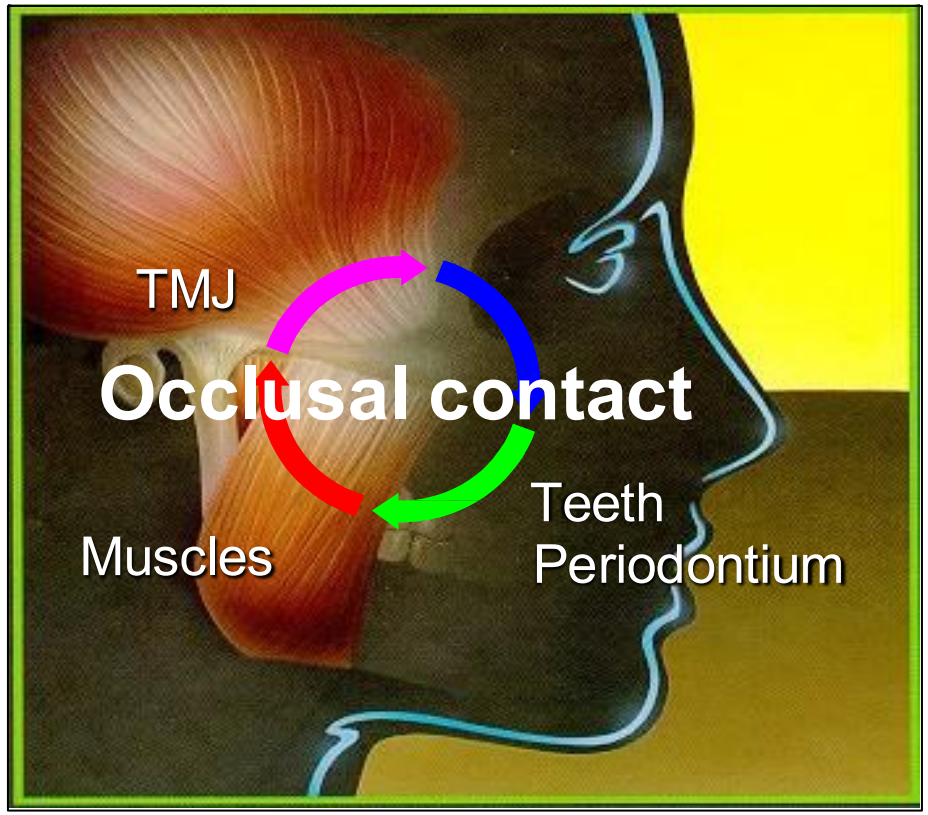
Masticatory system as depicted in "Textbook of dental anatomy"

Masticatory system: made up of teeth, periodontium, articulatory system.
These are all interconnected, but for the purpose of this lecture, we are mostly focusing on the articulatory system and the teeth.

Occlusion

Indications for Occlusal Analysis

- Prosthodontic treatment
- TMJ/muscles assessment
- Periodontal assessment
- Mobility assessment
- Functional discomfort
- Mechanically failed restorative treatment
- Bruxism diagnosis
- Orthodontic treatment



Indications for Occlusal Analysis

Isolated teeth can not be treated separately

Systematic and organized treatment planning is necessary

Occlusion

Indications for Occlusal Analysis

Obtaining good record of patient's occlusion

- Baseline record
- Monitor occlusal changes
- Monitor disease development
- Assessment of treatment implications

Occlusion

Clinical Examination Parameters

► Examination
- TMJ
- Masticatory muscles
- Dental occlusion

► Performed in conjunction with routine dental examination

► Extra-oral assessment:
- Masticatory muscles (masseter, temporalis, medial pterygoid, cervical muscles, suprahyoid muscles)
- TMJ

► Intra-oral assessment:
- Masticatory muscles (lateral pterygoid, medial pterygoid)
- Dental occlusion

Occlusion

TMJ Examination

► Determine if there is masticatory disorder

- Pain (chronic, acute)
- Sound (clicking, crepitus)
- Limited movement (locking, trismus)
- Midline deviation and Midline deflection

Average opening

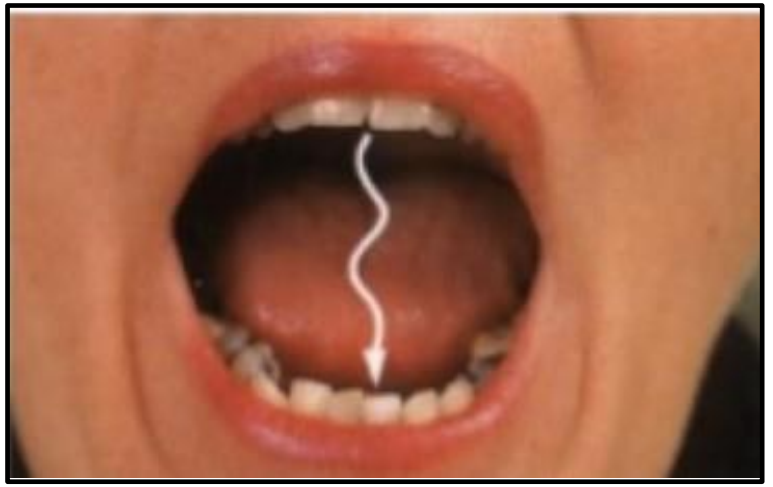
Occlusion

TMJ Examination

► Determine if there is masticatory disorder

- Pain (chronic, acute)
- Sound (clicking, crepitus)
- Limited movement (locking, trismus)
- Midline deviation and Midline deflection

Midline deviation



Midline deflection

TMJ Examination

- Occlusion alteration was commonly applied to treat TMD and facial arthromyalgia
  - Not supported by evidence
- Any TMD-related occlusion treatment should be conservative and reversible (e.g. occlusal splint and removable prosthesis)
- TMD should be stabilized prior to extensive prosthodontic treatment
- Patient should be informed that prosthodontic treatment is not aimed to restore TMJ health

De Boever et al; 2000

Occlusion

TMJ Examination

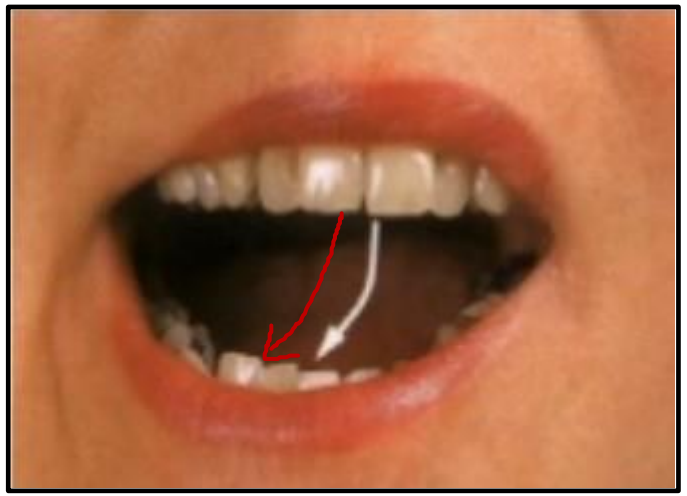
- Palpating TMJ capsules
- Posterior palpation - Index fingers in the ears as patient open and closes.
- Lateral palpation
- Evaluate
  - Pain
  - Joint sound
  - Disc movement

Occlusion

TMJ Examination

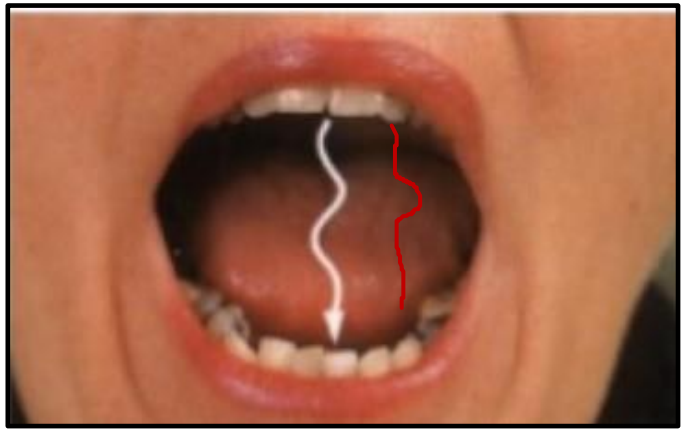
► Mandibular movement evaluation
- Movement smoothness
- Mandibular translation

Midline deflection



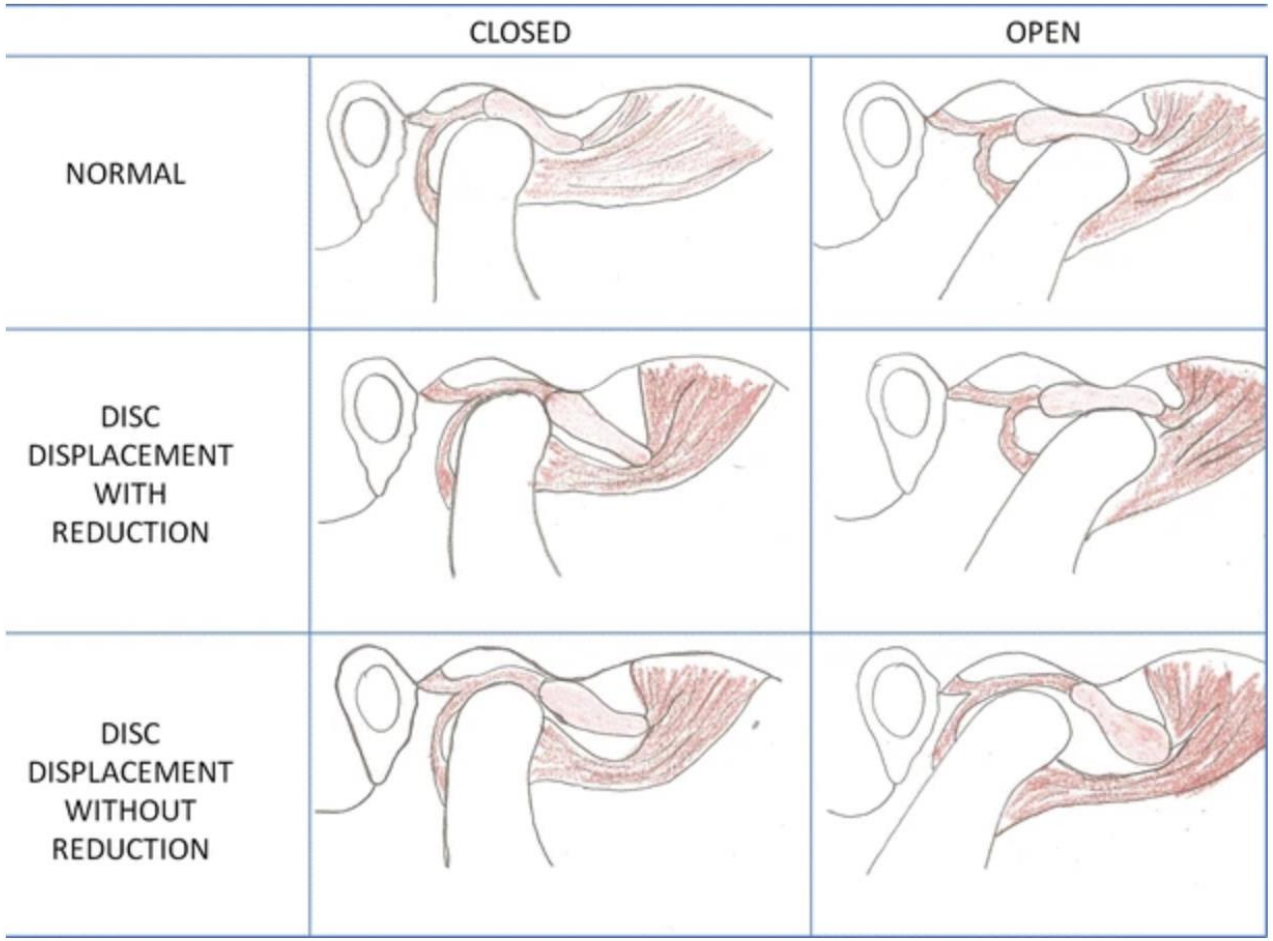
- Continuous displacement of the mandibular midline
- Sign of ADD without reduction

Midline deviation



- The mandible return to the centered position
- Indicative of interference during condyle movement
- Prominent sign of ADD with reduction

Occlusion



Bhargava D, Jain M, Deshpande A, Singh A, Jaiswal J. Temporomandibular joint arthrocentesis for internal derangement with disc displacement without reduction. Journal of maxillofacial and oral surgery. 2015 Jun;14:454-9.

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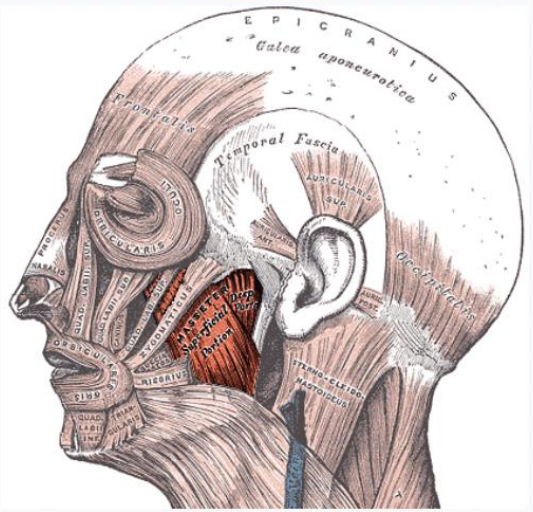
Masticatory Muscles Examination

- Palpating **masseter** muscle at rest and clenching
- Testing **temporalis** in the same way

Masseter – Origin and insertion

Masseter



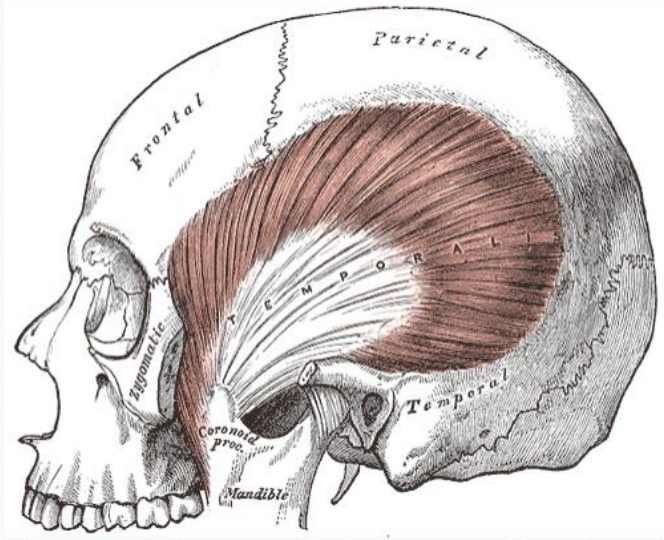
The left masseter muscle (red highlight), partially covered by superficial muscles such as the platysma muscle (below) and both the zygomaticus major and minor muscles

Details	
Origin	zygomatic arch and maxillary process of zygomatic bone
Insertion	Angle surface of ramus of mandible, coronoid process
Artery	masseteric artery
Nerve	mandibular nerve (V3)
Actions	elevation (as in closing of the mouth) and protrusion of mandible

Masticatory Muscles Examination

- Palpating **masseter** muscle at rest and clenching
- Testing **temporalis** in the same way

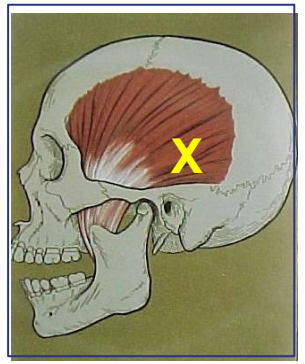
Temporalis muscle

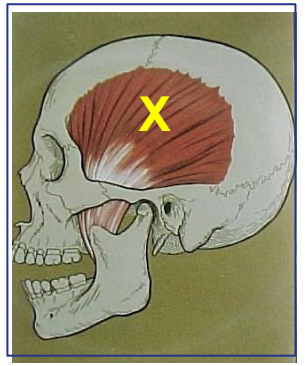


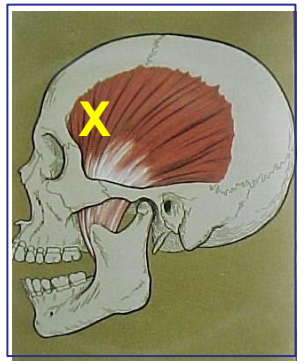
The temporalis muscle; the zygomatic arch and masseter have been removed.

Origin	temporal lines on the parietal bone of the skull and the superior temporal surface of the sphenoid bone
Insertion	coronoid process of the mandible and retromolar fossa
Artery	deep temporal arteries
Nerve	deep temporal nerves, branches of the anterior division of the mandibular nerve (V3)
Actions	elevation and retraction of mandible

Temporalis





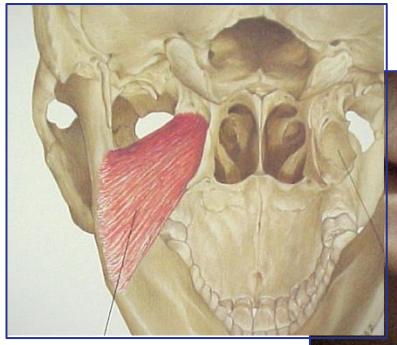


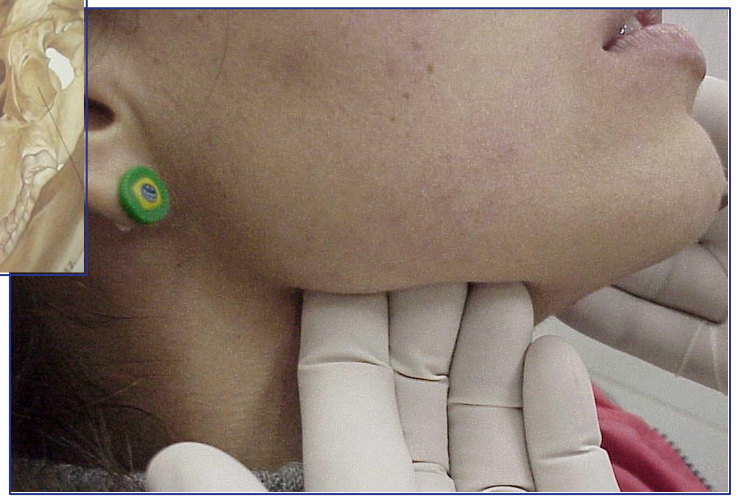
Occlusion

Masticatory Muscles Examination

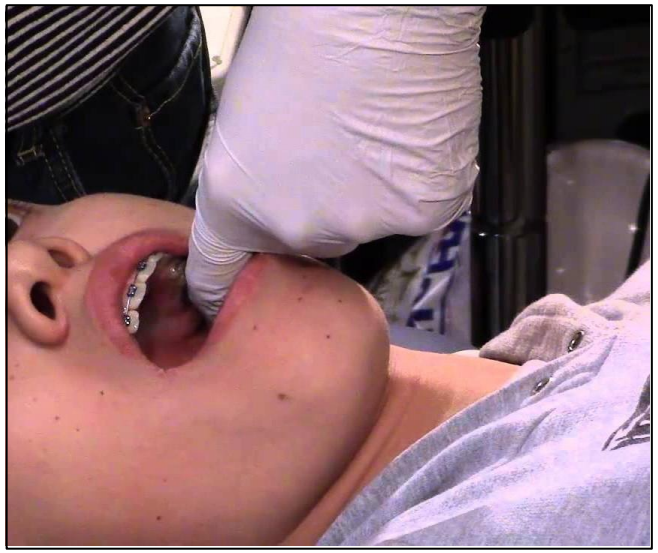
- Palpating **medial pterygoid muscle:** medial to mandibular angle

Origin	*deep head:* medial side of lateral pterygoid plate behind the upper teeth *superficial head:* pyramidal process of palatine bone and maxillary tuberosity
Insertion	medial angle of the mandible
Artery	pterygoid branches of maxillary artery
Nerve	mandibular nerve via nerve to medial pterygoid
Actions	elevates mandible, closes jaw, helps lateral pterygoids in moving the jaw from side to side





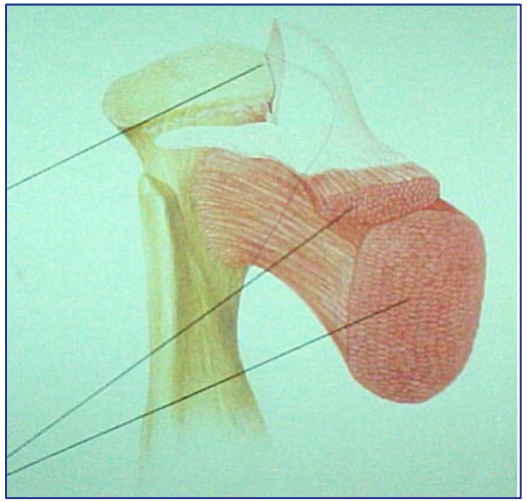
Extra-oral

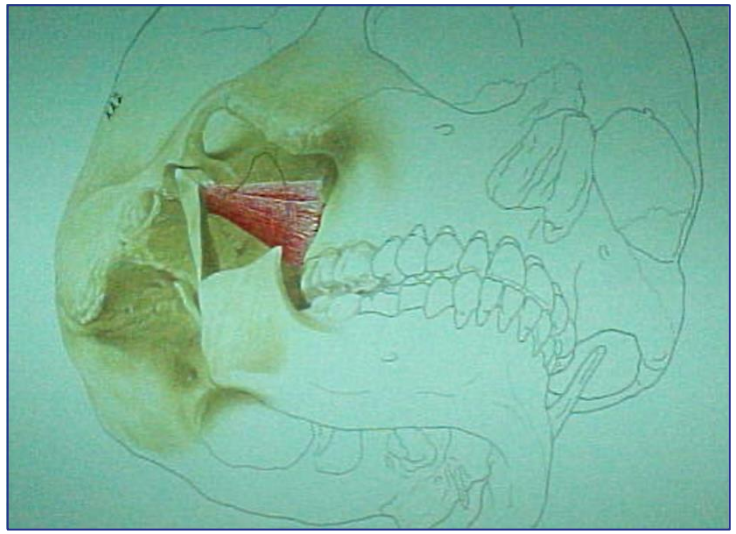


Intra-oral

Masticatory Muscles Examination

► Palpating **lateral pterygoid** muscle

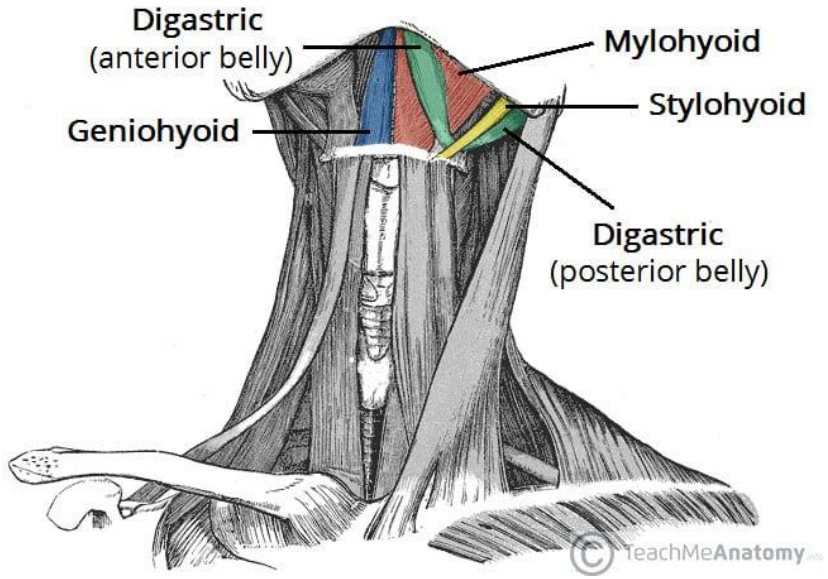


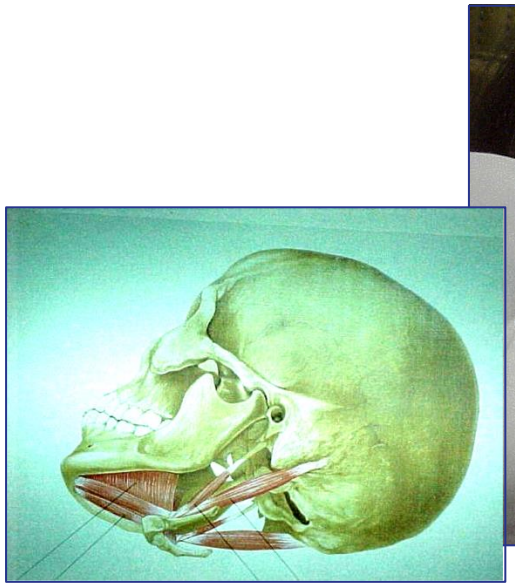


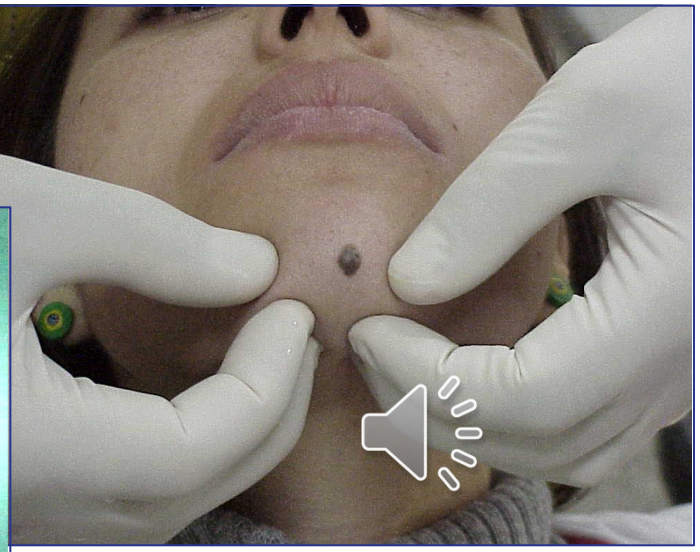
Origin	**Superior head**: infratemporal surface of sphenoid bone. **Inferior head**: lateral pterygoid plate
Insertion	**Superior head**: anterior side of the mandibular condyle. **Inferior head**: pterygoid fovea
Artery	pterygoid branches of maxillary artery
Nerve	lateral pterygoid nerve from mandibular nerve
Actions	depresses and protrudes mandible, side to side movement of mandible

Masticatory Muscles Examination

- Palpating **suprahyoid muscles**





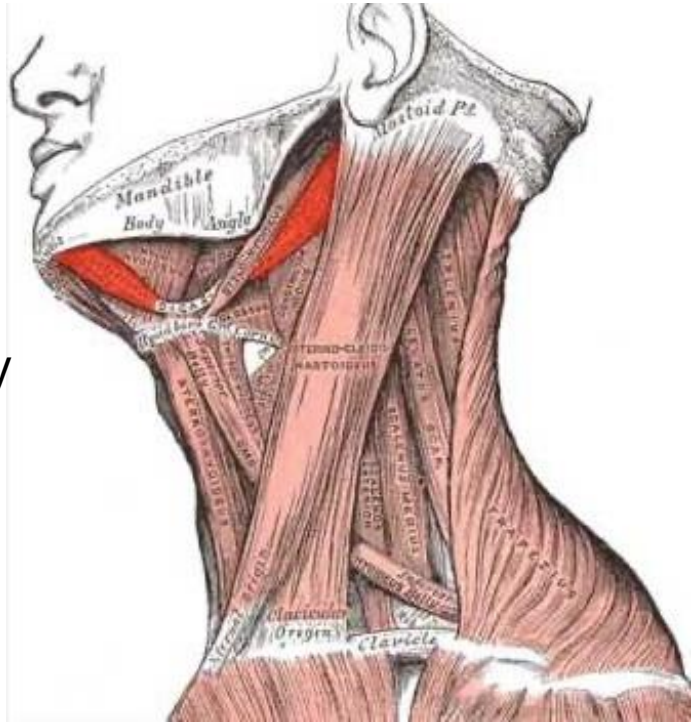


Occlusion

Masticatory Muscles Examination

► Palpating **suprahyoid muscles**

- Anterior belly
- Posterior belly



Digastric

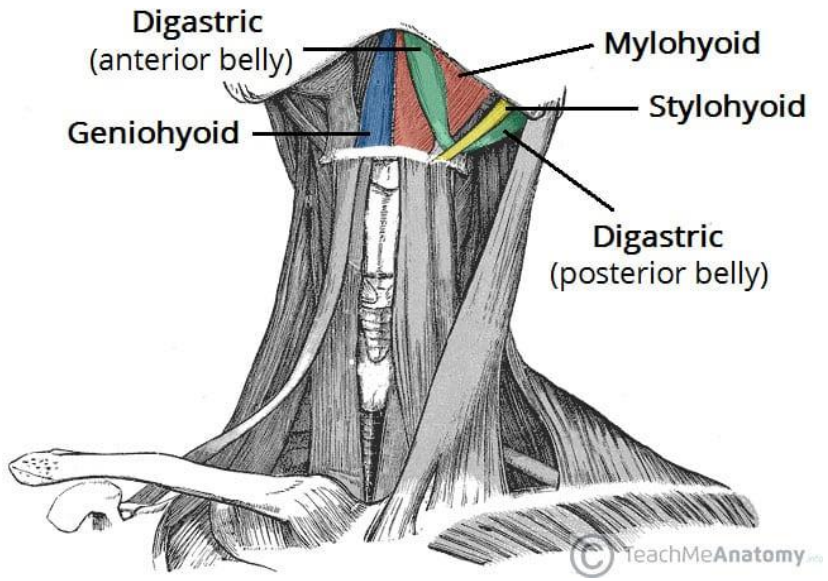
•**Attachments:**

- The anterior belly arises from the digastric fossa of the mandible.
- The posterior belly arises from the mastoid process of the temporal bone.
- The two bellies are connected by an intermediate tendon, which is attached to the hyoid bone via a fibrous sling.

•**Actions**: Depresses the mandible and elevates the hyoid bone.

Masticatory Muscles Examination

► Palpating **suprahyoid muscles**



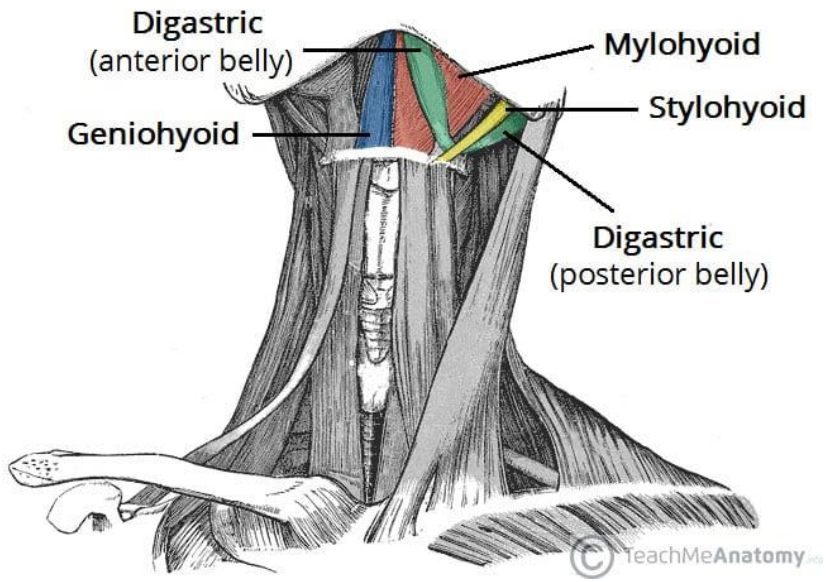
Stylohyoid

•**Attachments:** Arises from the styloid process of the temporal bone and attaches to the lateral aspect of the hyoid bone.

•**Actions**: Initiates a swallowing action by pulling the hyoid bone in a posterior and superior direction.

Masticatory Muscles Examination

- Palpating **suprahyoid muscles**

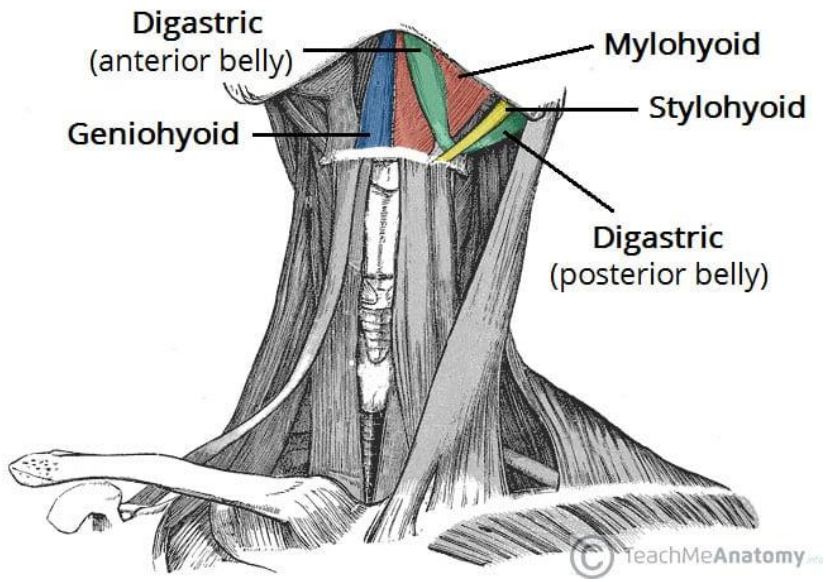


Geniohyoid

•**Attachments**: Arises from the inferior mental spine of the mandible. It then travels inferiorly and posteriorly to attach to the hyoid bone.
•**Actions**: Depresses the mandible and elevates the hyoid bone.

Masticatory Muscles Examination

- Palpating **suprahyoid muscles**

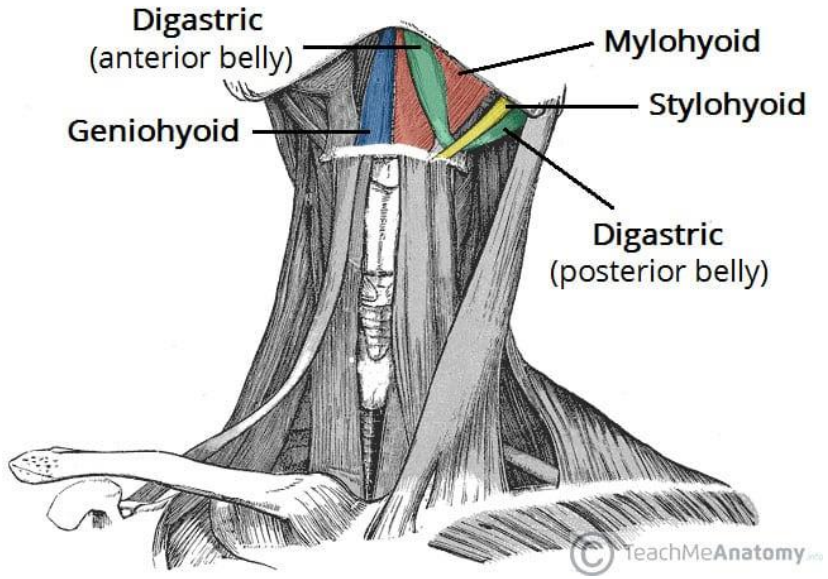


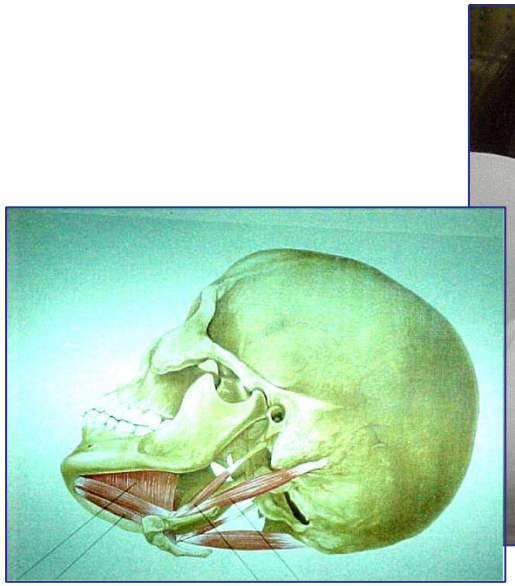
Mylohyoid

•**Attachments**: Originates from the mylohyoid line of the mandible, and attaches onto the hyoid bone.
•**Actions**: Elevates the hyoid bone and the floor of the mouth.

Masticatory Muscles Examination

- Palpating **suprahyoid muscles**





Occlusion

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Masticatory Muscles Examination

- Degree of opening: Opening of less than 40 mm inter-incisally will hinder efficient prosthodontic treatment

- Dynamic movements against resistance

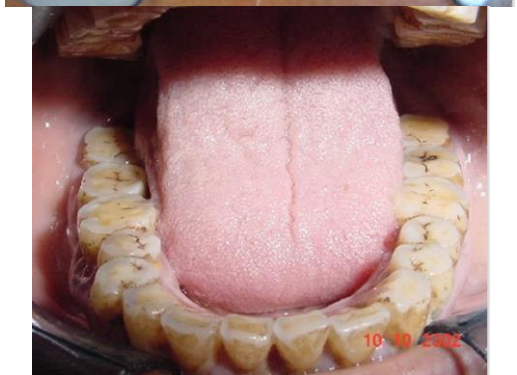
Occlusion

Range of motion:
Opening: 40-50mm
Lateral movements: 7-15mm
Protrusive: 7-15mm

Dental Occlusion

STATIC

- Centric occlusion and MIP: long centric or eccentric
- Freedom in centric
- Extent of posterior tooth support
- Angle's classification
- Overbite and overjet
- Cross bite



DYNAMIC

- Protrusion
- Lateral movements
  - Canine guidance
  - Group function
- Balanced occlusion
- Interferences

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Dental Occlusion

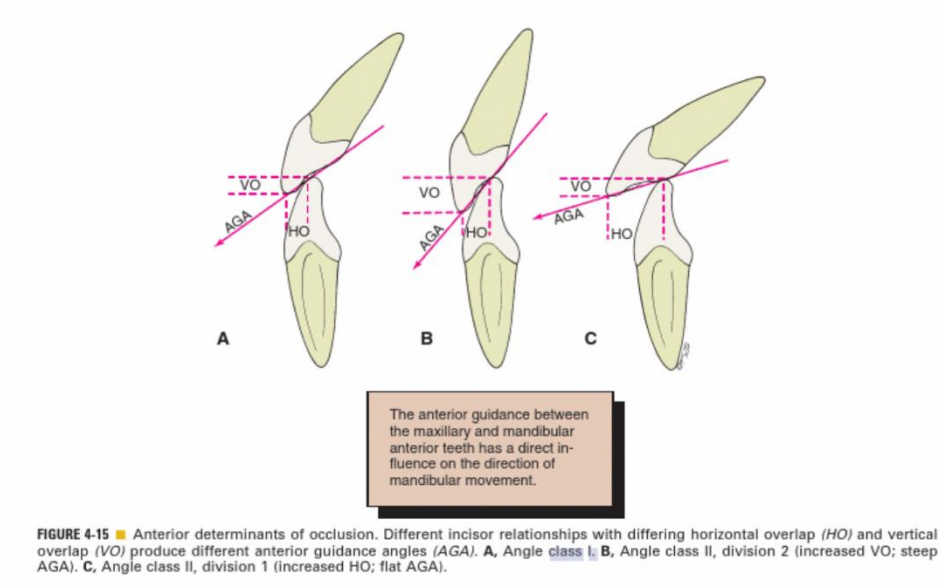


FIGURE 4-15 ■ Anterior determinants of occlusion. Different incisor relationships with differing horizontal overlap *(HO)* and vertical overlap *(VO)* produce different anterior guidance angles *(AGA)*. **A,** Angle class I. **B,** Angle class II, division 2 (increased VO; steep AGA). **C,** Angle class II, division 1 (increased HO; flat AGA).

Contemporary Fixed Prosthodontics

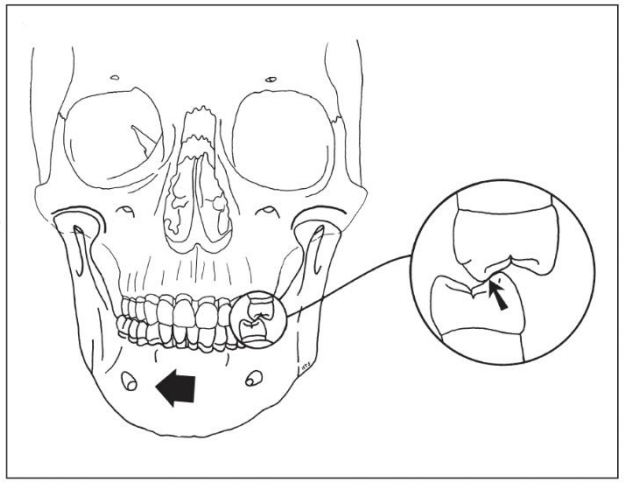


Fig 2-13 A nonworking interference results when there is contact between maxillary facial-facing cusp inclines and mandibular lingual-facing cusp inclines on the nonworking side.

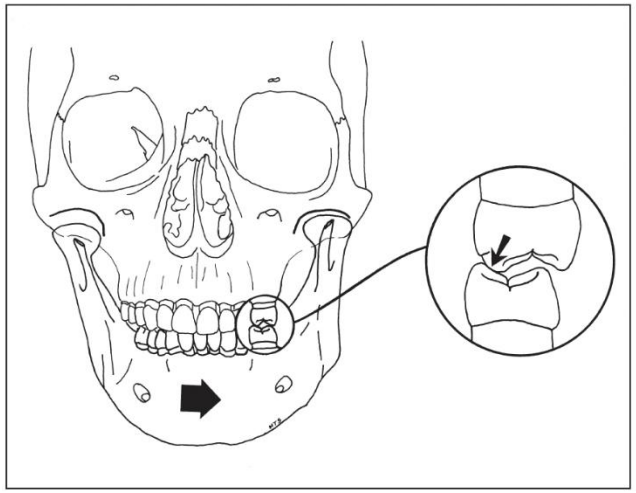


Fig 2-12 A working interference may occur between maxillary palatal-facing cusp inclines and mandibular facial-facing cusp inclines on the working side.

Fundamentals of Fixed Prosthodontics

DYNAMIC

- Protrusion
- Lateral movements
  - Canine guidance
  - Group function
- Balanced occlusion
- Interferences
  - Centric
  - Working
  - Non working
  - Protrusive

Dental Occlusion

Assess:

- Bruxism/clenching
- Mobility
- Periodontitis
- Tooth stability
- Mechanical failure

Dental Occlusion

Bruxism

- Worn teeth
- Muscle tenderness
- Muscle hypertrophy
- Cracked teeth
- TMJ pain, locking, clicking

Dental Occlusion

Periodontitis

- Alteration of the occlusion with the prime aim of treating periodontitis is not recommended as it lacks supporting evidence

Mobility

- Increasing mobility that concerns the patient may require occlusal management
- In conjunction with splinting

Dental Occlusion

Fremitus

- Vibration or movement of teeth during light tapping
- Observation of tooth movement against finger placed across the tooth whilst patient taps teeth lightly together
- Significance: Fremitus of teeth indicates deflective contacts

Dental Occlusion

Tooth mobility

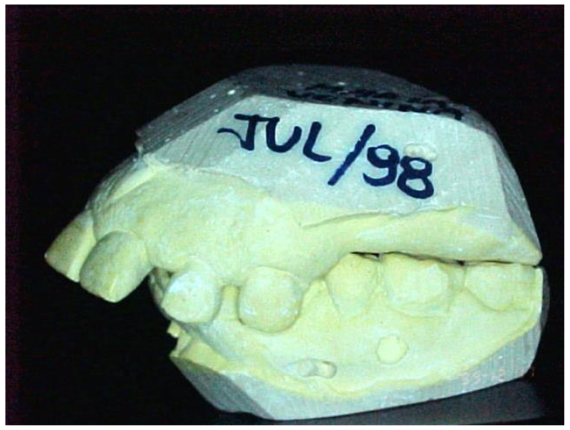
Miller classification (1950):

- Degree 0: ”physiological” mobility 0.1-0.2 mm horizontal
- Degree 1: ⩽ 1 mm horizontal
- Degree 2: > 1 mm horizontal
- Degree 3: Both horizontal and vertical

Dental Occlusion

Tooth stability

- Posterior deflective contacts or loss of posterior occlusal support can result in drifting of maxillary incisors
- Can result in open contacts and food packing



Dental Occlusion

Tooth stability

- Over-eruption of unopposed teeth can be evident
- Drifting/tilting

Dental Occlusion

Mechanical failure

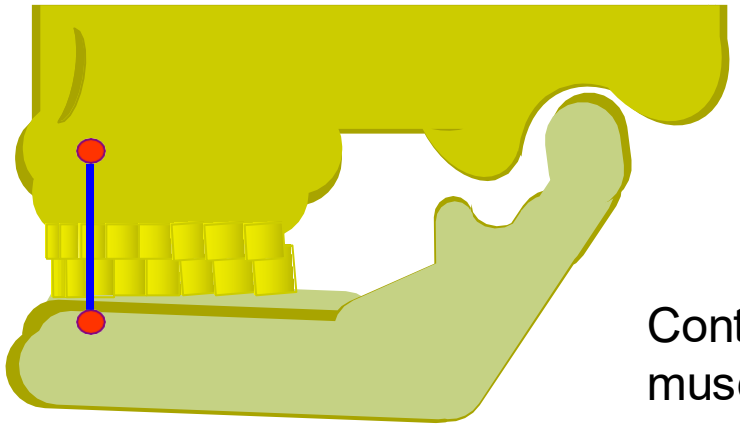
Can be due to

- Poor restoration design
- Lack of occlusal stability

Dental Occlusion

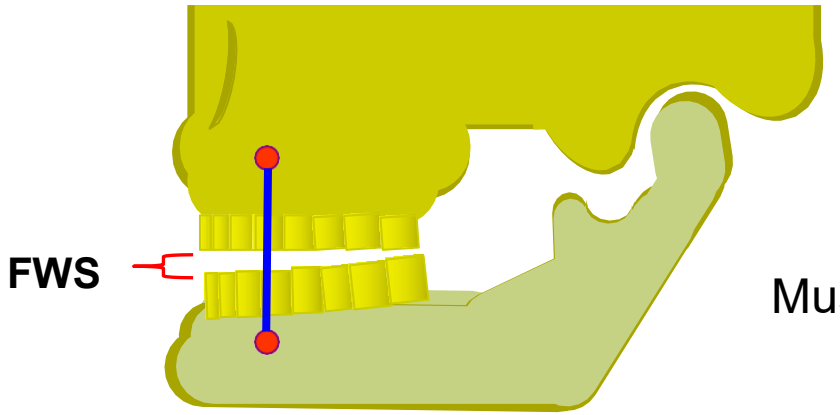
Vertical dimensions

- Rest vertical dimension (RVD)
- Occlusal vertical dimension (OVD)
- Freeway space (FWS)



Contracted muscles

OVD



Muscle tone

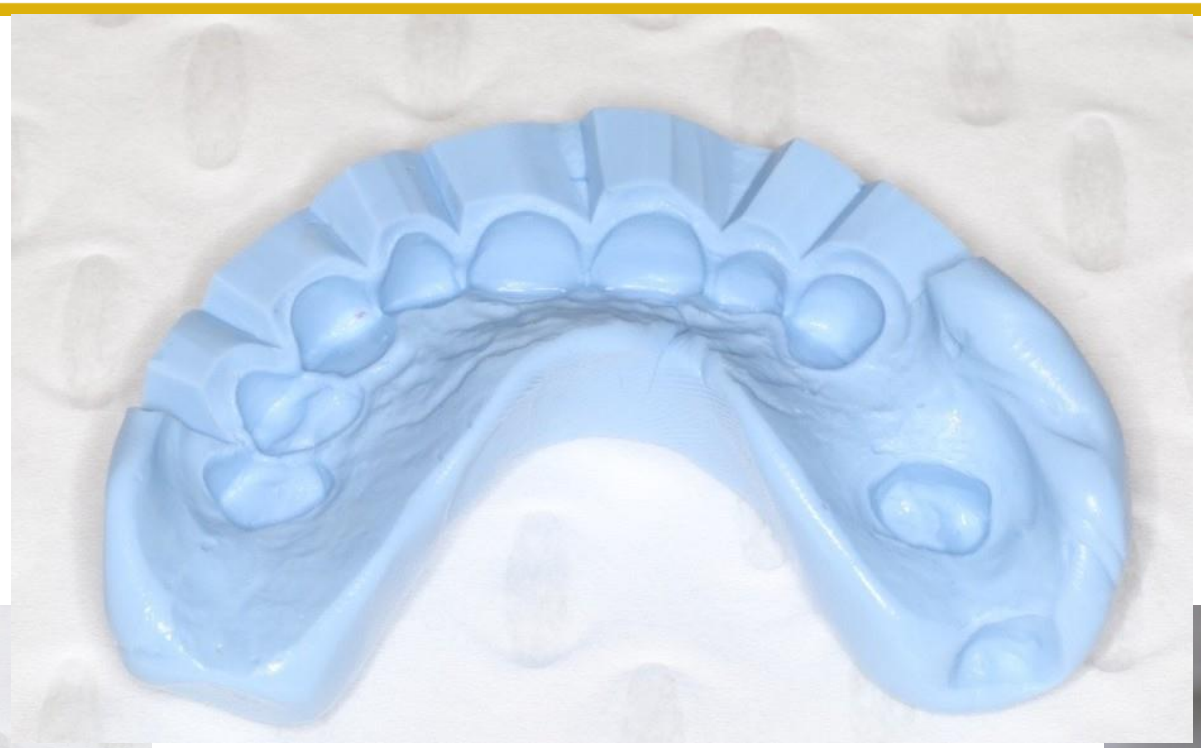
RDV

Occlusion

Occlusion

Occlusion

Occlusion



Occlusion

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Planning your case: Luxatemp – Mock up

Occlusion

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Dental Occlusion

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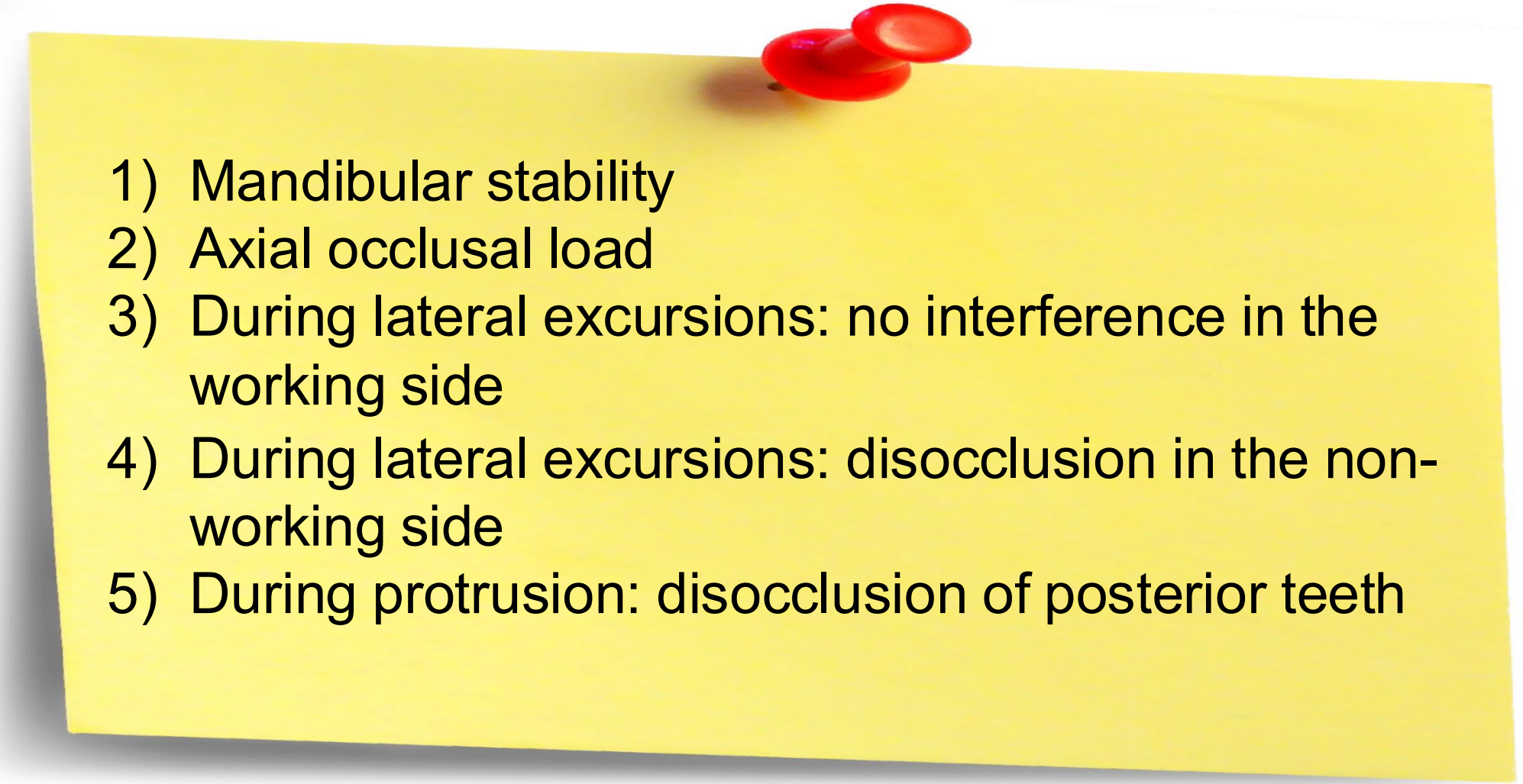
Criteria for Ideal Occlusion



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

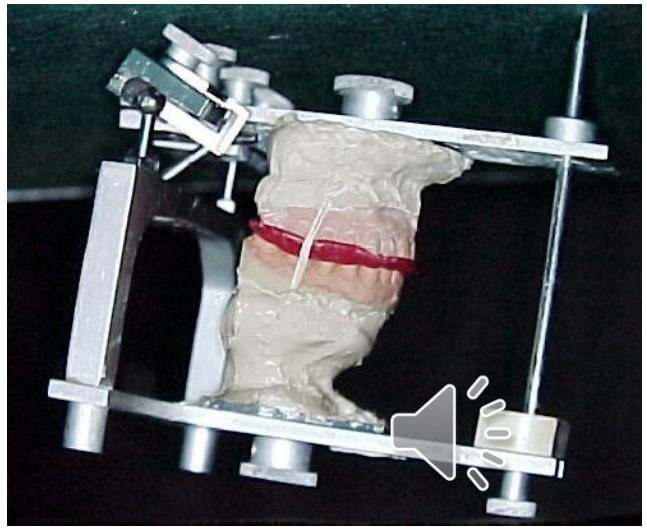
Treatment

► Treatment of occlusal problems is usually provided in conjunction with prosthodontic treatment.

► The choice of which approach should be applied is made at the planning stage before any irreversible work

► Tx will vary according to:

- Complexity of treatment
- Modifications required
- Condition of existing dentition/occlusion
- Presence of occlusal abnormalities

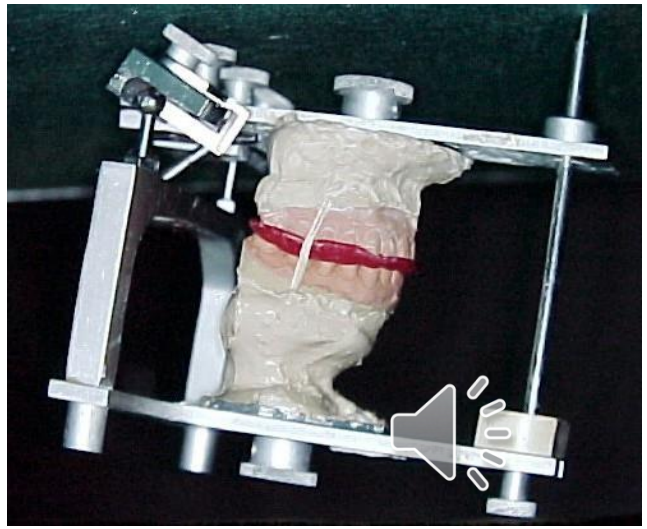


Treatment

- Treatment of occlusal problems is usually provided in conjunction with prosthodontic treatment.

- The choice of which approach should be applied is made at the planning stage before any irreversible work

- Two prosthetic approaches:
  Conformative and Reorganized



Occlusion

Conformative Approach

- ► Provision of restorations in harmony with the existing jaw relationships
- - According to maximal intercuspal position (MIP)
- ► Restorations must fit into the existing occlusal scheme
- ► Following the restoration, the occlusal contacts on the other (unrestored) teeth are unaltered

Conformative Approach

- Most cost-effective restorative method with the least restorative intervention
- Most common method applied in restorative dentistry
- Applied for single restorations to multiple restorations
- Easiest
- Safest
- Less likely to introduce problems for the tooth, periodontium, muscles and TMJ

Reorganized Approach

- Altering the existing occlusion scheme and establishing an ideal occlusion (or close to ideal occlusion)
  - According to centric relation
- Requires additional stages of designing and establishing a new occlusion before providing the definitive prosthesis (by provisional restorations)

Once the new occlusion is provided, the rest of the treatment is conformative of the new occlusion

Reorganized Approach
Indications

- An increase in occlusal vertical dimension is Indicated

-Teeth are significantly out of position (overerupted, tilted or rotated)

- History of repeated restoration failures at the existing occlusion scheme

-No posterior occlusal contacts at the desired vertical dimension

Occlusion

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TAKE-HOME MESSAGE

- Thorough occlusal analysis is mandatory prior to any prosthetic treatment
- The patient occlusion should be recorded before any prosthodontic treatment
- Conformative treatment is easier and more predictable and should be considered as first treatment option


Thank you