Concept of Neutral Zone

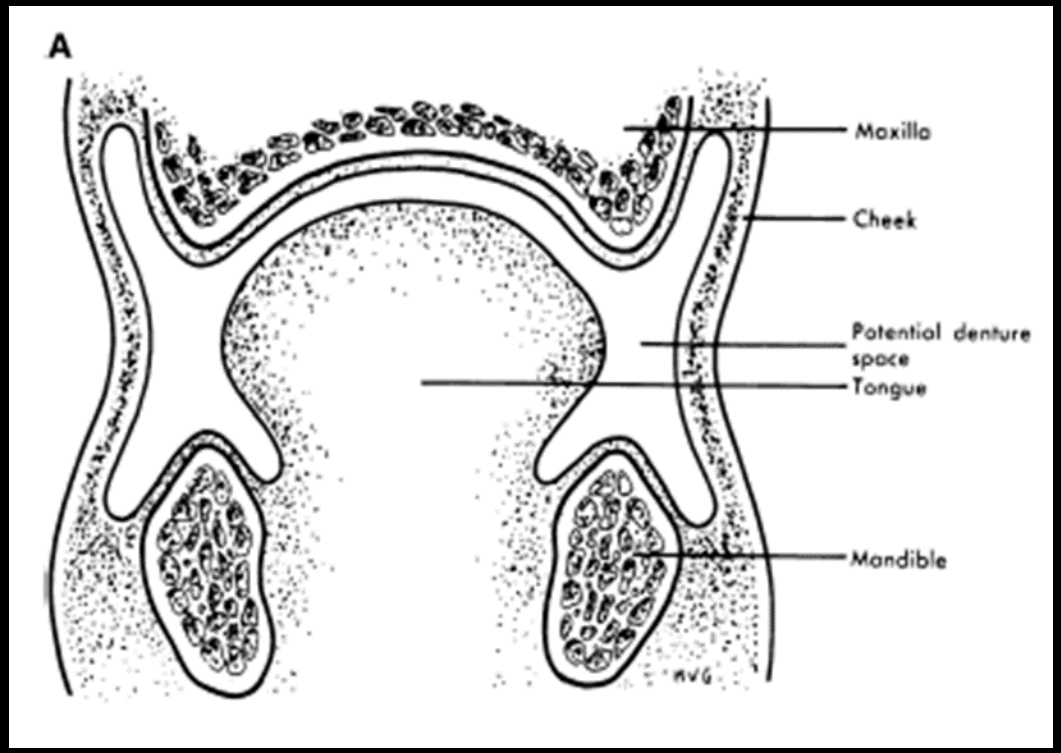
The objectives of any prosthodontic service are to restore the patient to :

- Normal function
- Esthetics
- Health

The design of prostheses to replace lost teeth and resorbed ridges is largely determined by the **position** and **amount of morphological changes** in the denture bearing area of the jaw.

These changes affect on **artificial teeth positions** in complete denture patients.

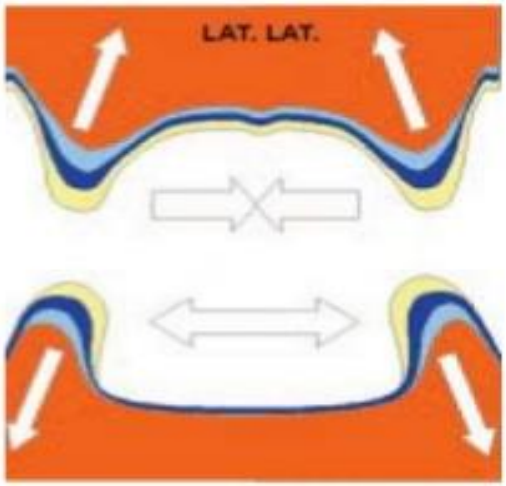
- The eruption of the teeth in the oral cavity is influenced by the forces exerted by tongue, cheeks, and lips.
- These muscular forces collectively determine the final dental arch form and position of the tooth in the oral cavity.
- This muscular environment continues throughout life, even after teeth have been lost and greatly influences this potential space.



After the loss of natural teeth, it is difficult to ascertain the exact position due to varying patterns of alveolar bone resorption in different segments.

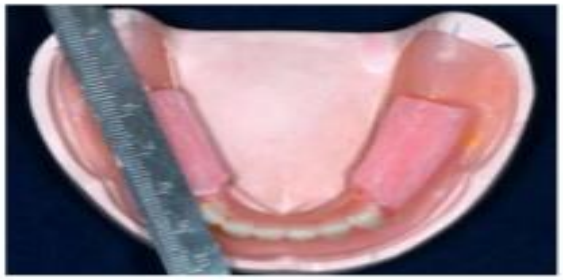
direction of bone resorption

- **Maxilla resorbs upward and inward** to become **progressively smaller** because of the direction and inclination of the roots of the teeth and the alveolar process.
- The opposite is true of **the mandible, which inclines outward** and becomes **progressively wider**.
- This progressive change of the edentulous mandible and maxilla makes many patients appear prognathic.



- Mandibular posterior teeth are aligned along a line that extends from the center of the retromolar pad, passes through the central grooves of the lower posterior teeth, and reaches the tip of the lower canine.
- **Crests of the residual ridge may be used as a biometric**

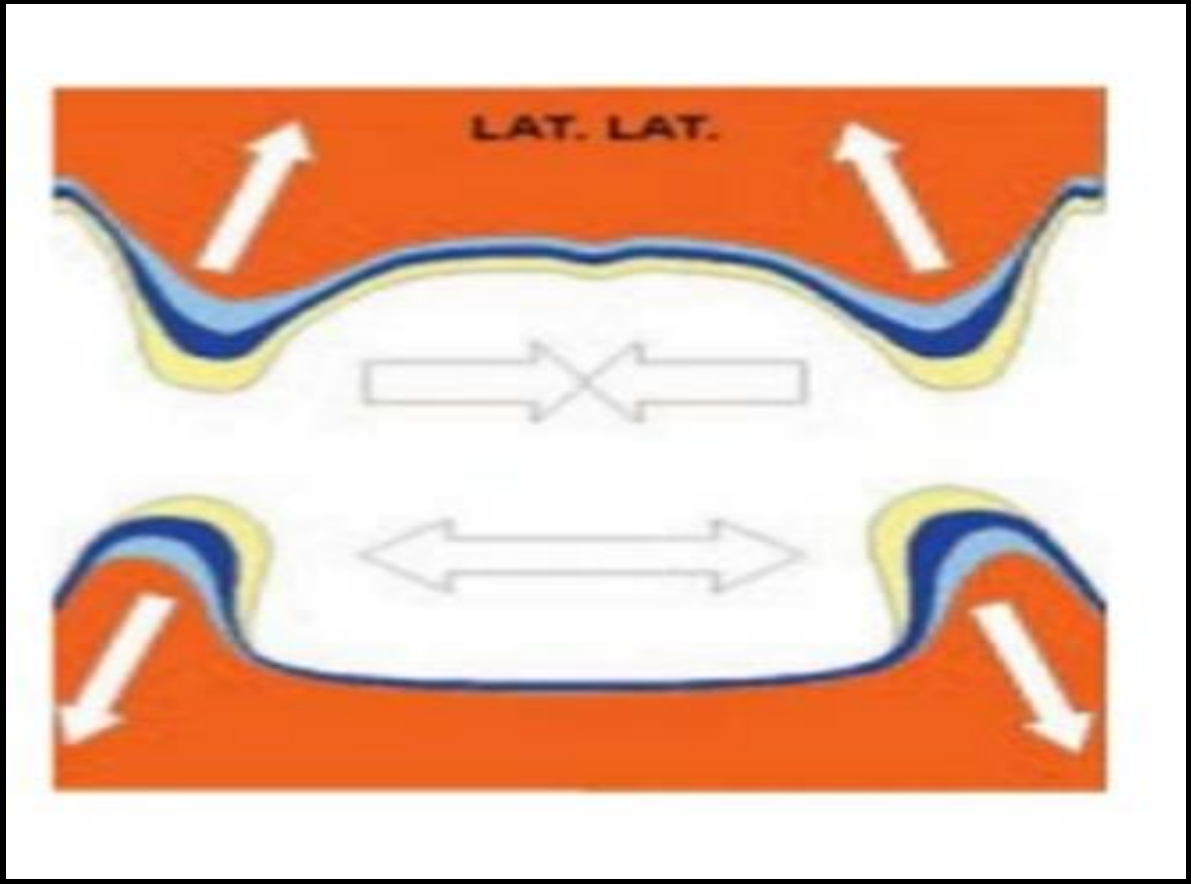
➢ **The posterior teeth are generally placed to enhance the stability of the mandibular denture.**



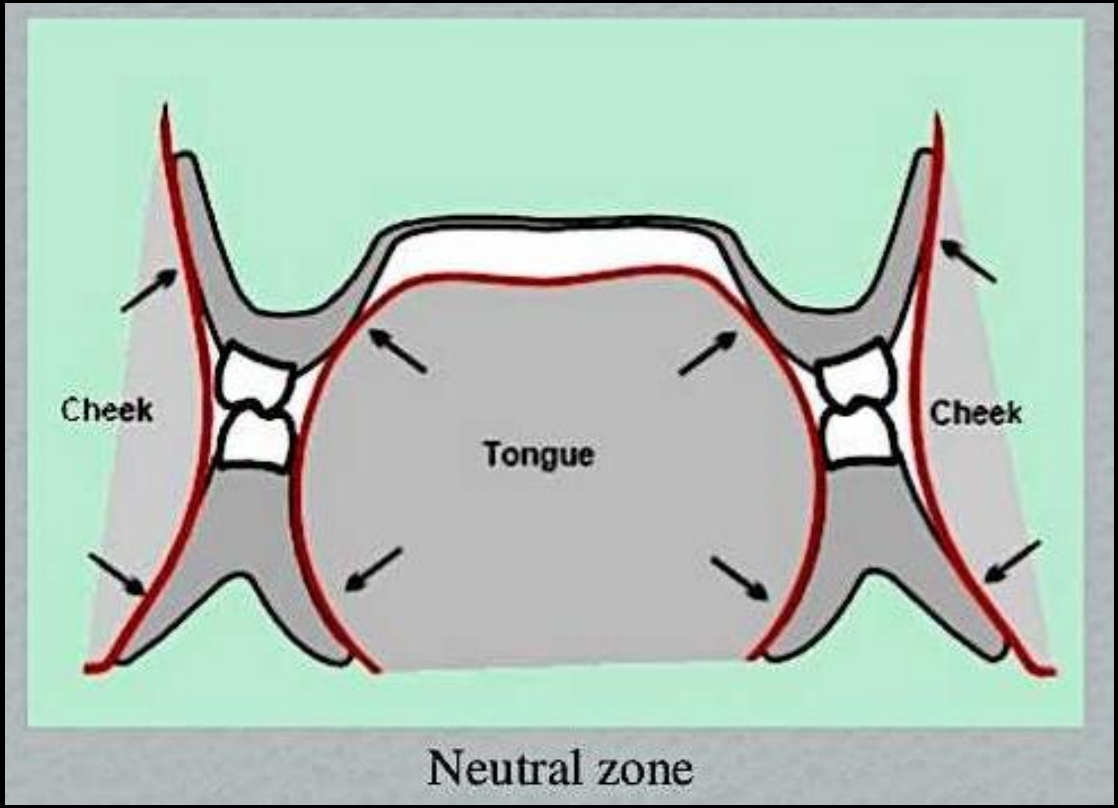
➢ **The mandibular teeth should be arranged so that they are positioned over the crest of mandibular residual ridge.**

➢ **The Retro molar pad is used as a guideline to determine the buccolingual position.**

- Unfortunately the crests do not remain in same antero-posterior and medio-lateral position. Viewing from the occlusal aspect, the crest of the residual alveolar ridge shifts **lingually in maxilla** and **buccally in mandible**. Both arches are resorbed in vertical and horizontal directions.

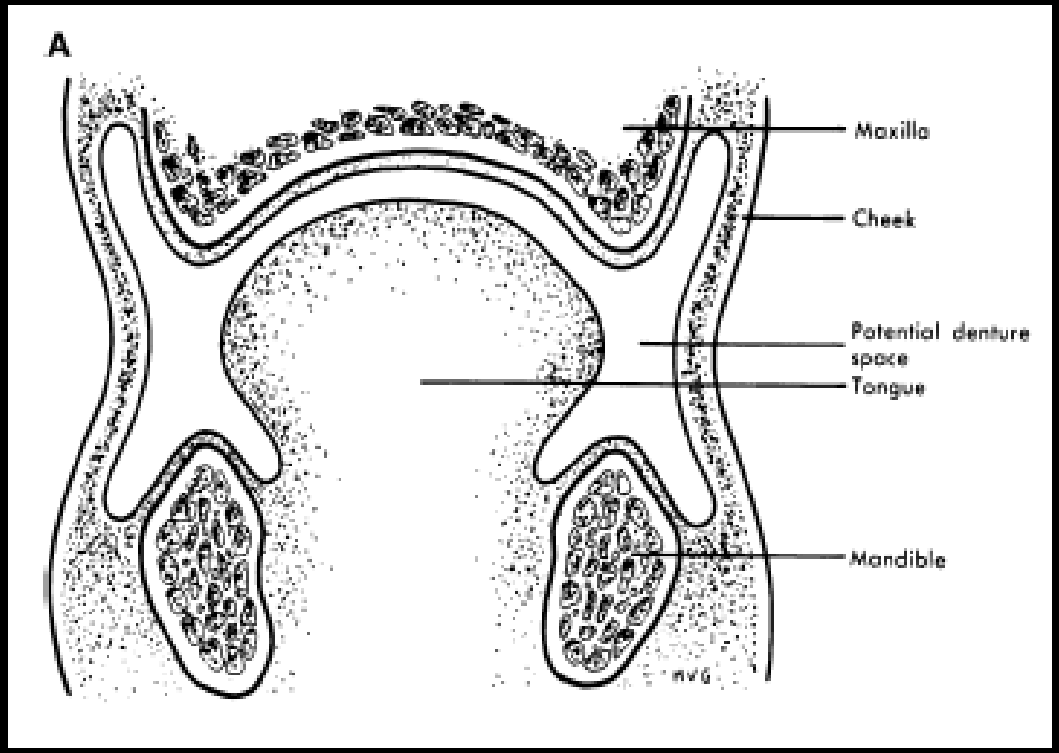


- This allows **more space for tongue movement** and hence **tongue enlarges over the years**. This results in **exertion of force more towards buccal and labial sides**.
- Cheeks and lips may not respond in the same fashion due to loss of tonicity of muscles, with advancing age. Therefore neutral zone may not lie at the place where it was, when teeth were present.



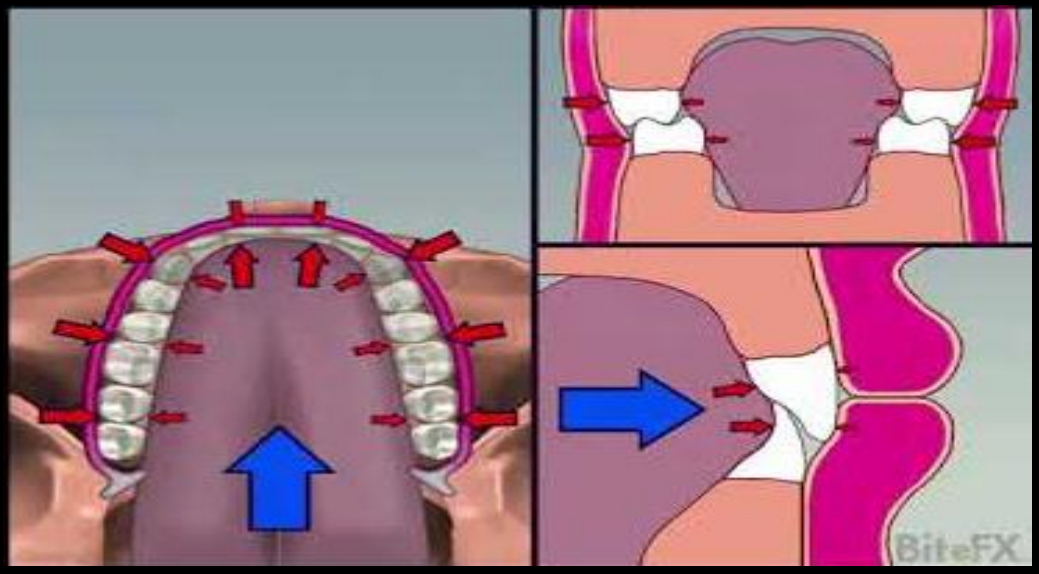
Complete dentures are primarily mechanical devices, but since they function in the oral cavity, they must be shaped so that they are in harmony with normal neuromuscular function.

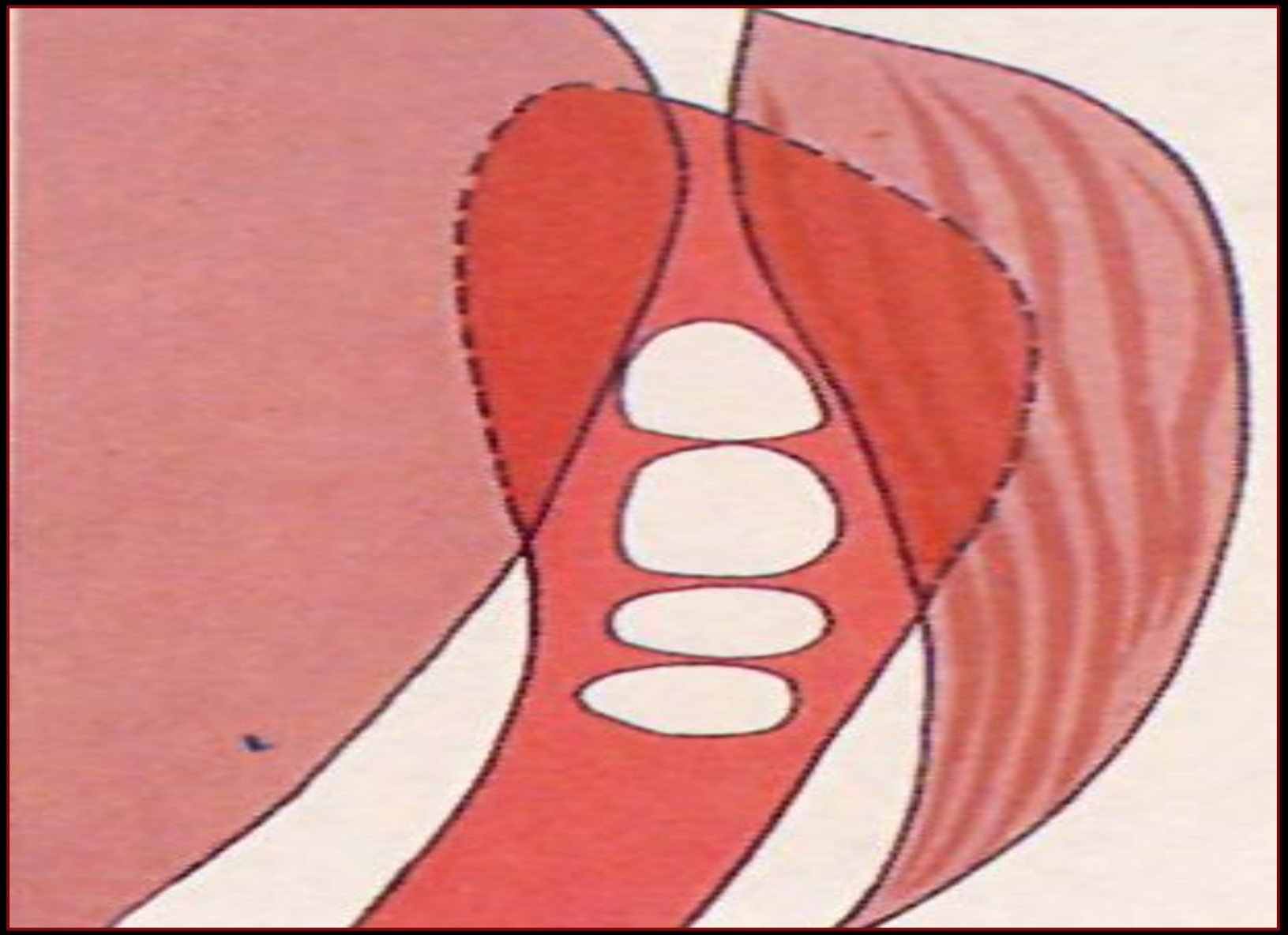
Denture space is a void which exists within the oral cavity when all of the natural teeth have been lost.



Neutral zone may be defined as:

The space where during function the forces of the lips and cheeks pressing inwards neutralize the forces of the tongue pressing outwards.





Terminology

dead zone

stable zone

zone of minimal conflict

zone of equilibrium

zone of least interference

biometric denture space

denture space and

potential denture space .

Objectives of neutral zone technique:

1. Enhance Stability .
2. Improve Retention.
3. Optimize Functionality.
4. Increase Comfort .
5. Reduce Food Impaction .

Indications of the Neutral Zone Technique:

- Severe Ridge Resorption .
- Flabby or Mobile Ridges .
- Unstable Dentures .
- Neuromuscular Disorders.
- Post-Surgical or Trauma Cases.
- Gag Reflex Issues.
- Previous Denture Failures.

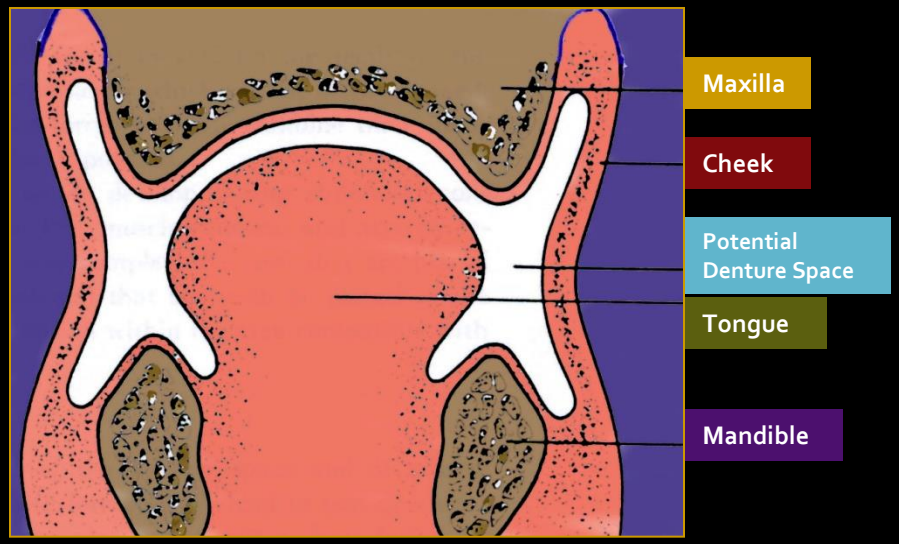
Advantages of the Neutral Zone Technique:

1. **Enhanced Stability & Comfort.**
2. **Improved Functionality.**
3. **Better Adaptation to Oral Structures.**

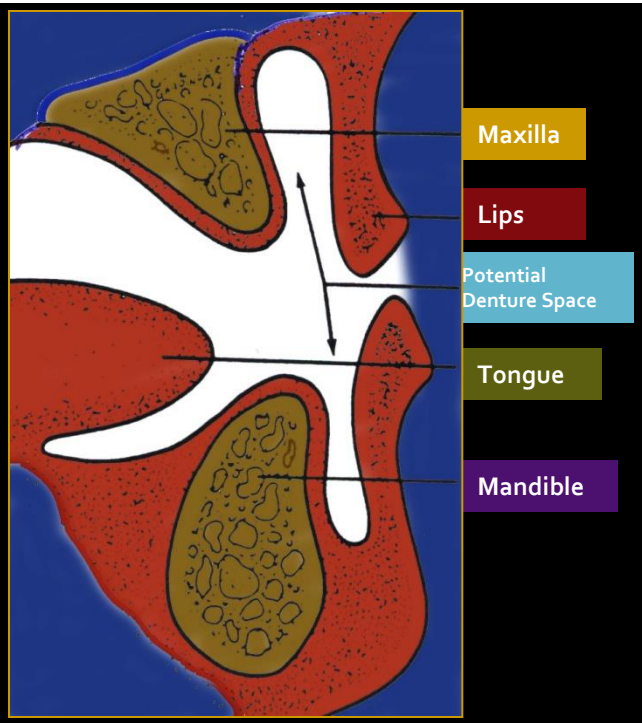
Disadvantages of the Neutral Zone Technique:

1. **Time & Cost Intensive.**
2. **Skilled Expertise Needed.**
3. **Limited Patient Suitability.**
4. **Potential Discomfort & Errors.**

The Potential 'Denture Space'

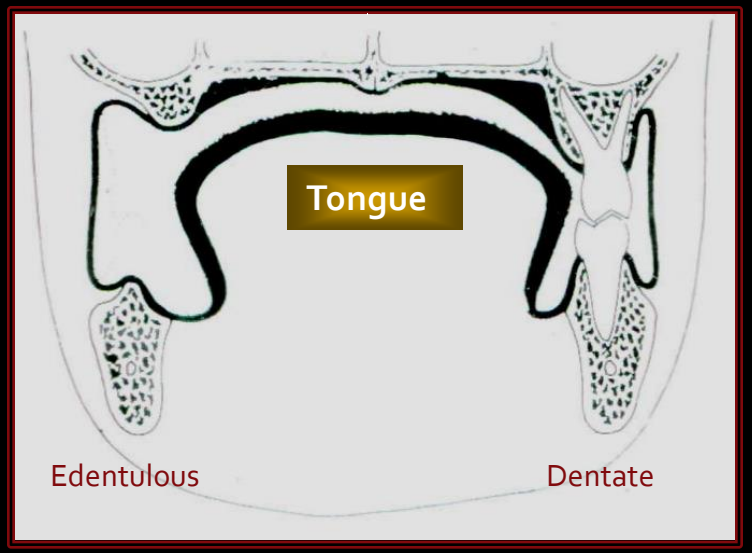


Cross - section



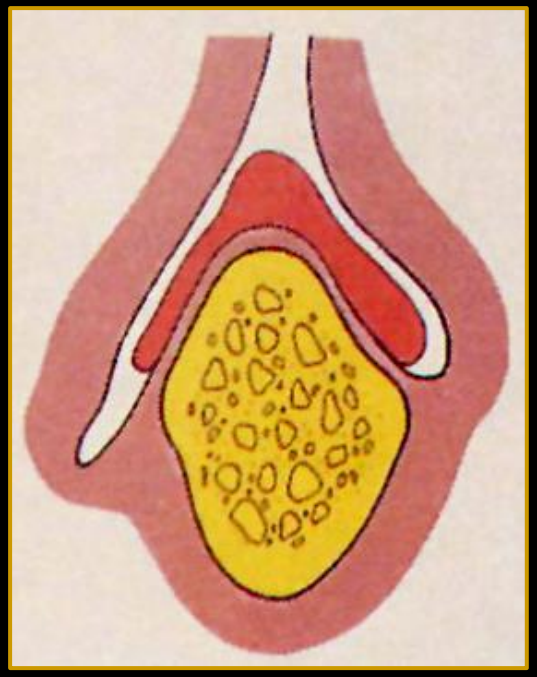
Sagittal - section

The Potential 'Denture Space'



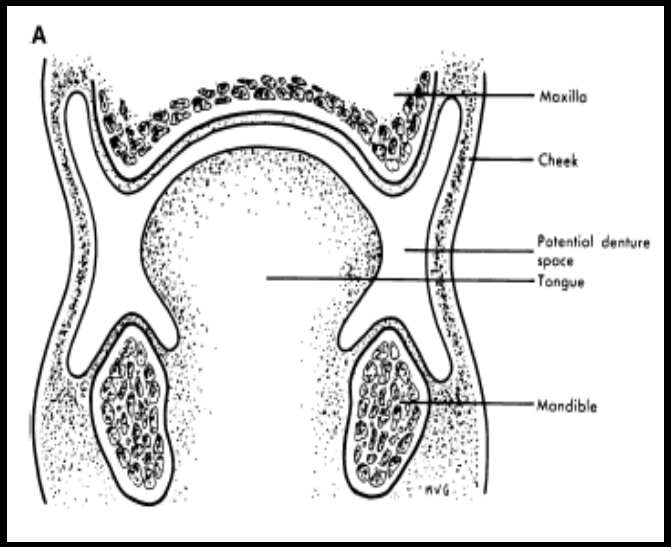
Neutral zone approach in complete dentures

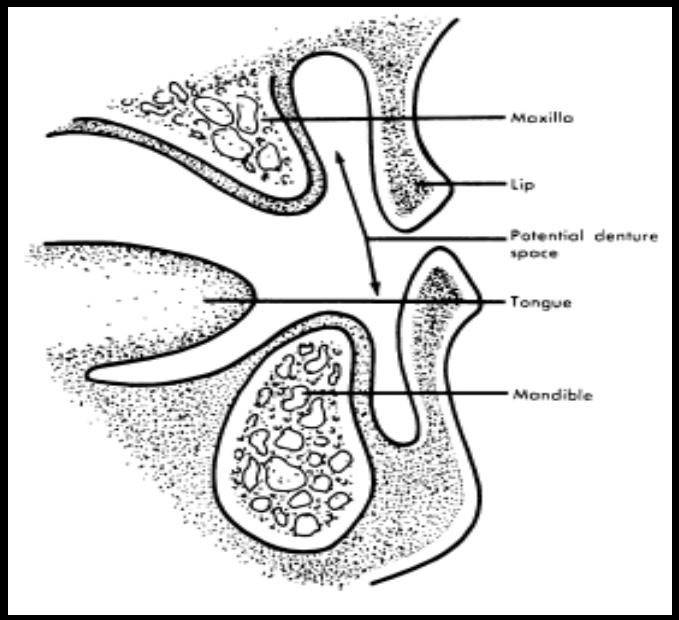
‘We should locate that area in the edentulous mouth where the teeth should be positioned so that the forces exerted by the muscles will tend to stabilize the denture rather than unseat it’.



Boundaries of denture space

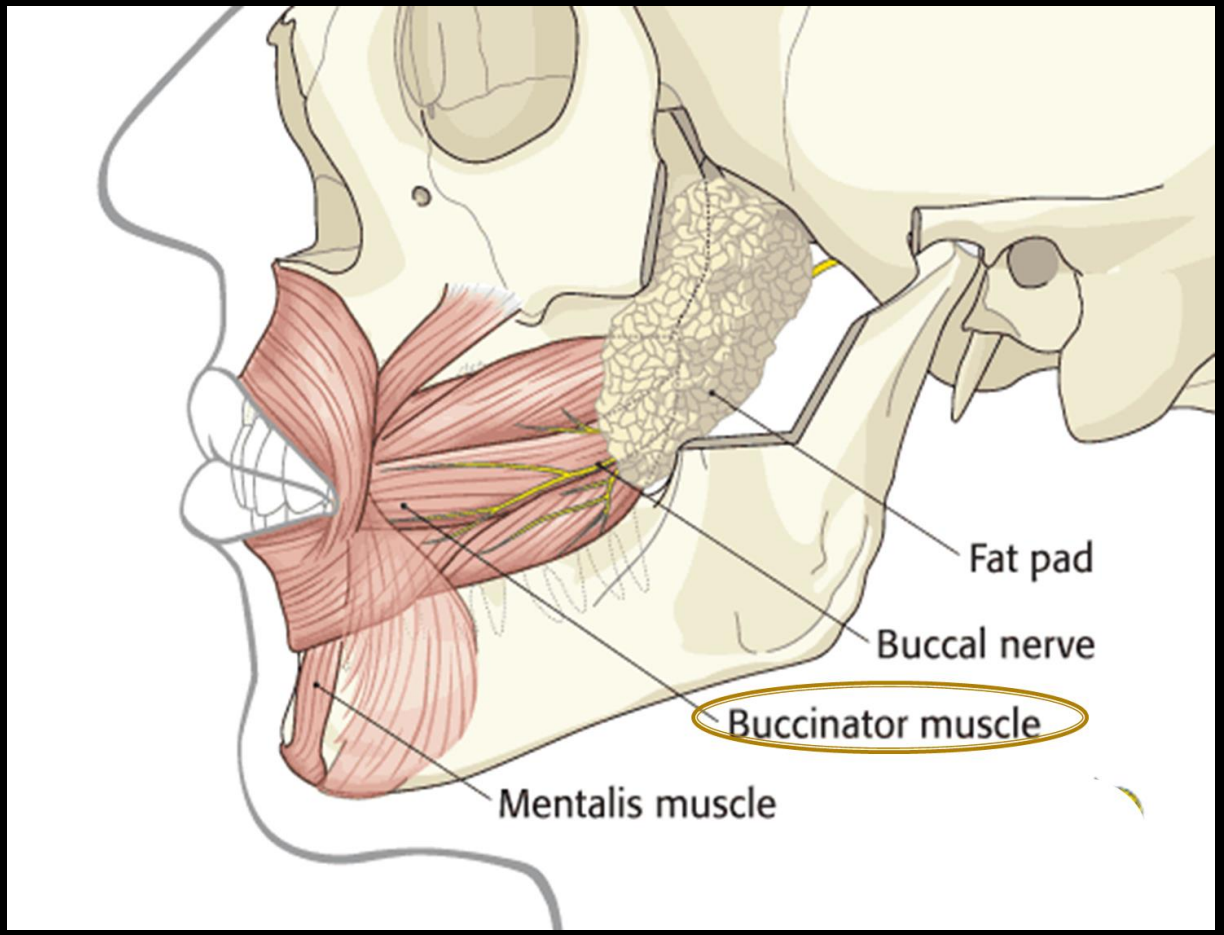
It is bounded by the upper ridge, hard, and soft palate from above, the lower ridge from below, tongue medially and cheek and lip externally or laterally.





1. Maxillary and mandible buccal region:

In this region, the **buccinators** considered as the main boundaries of the denture space.



The buccinator

This muscle has a large role in determining the neutral zone. It extends anteriorly from the pterygomandibular raphe, from above the maxillary molars and below the mandibular molars to converge with other muscles at the modiolus.

The role of the buccinator during function is to position food on the occlusal surfaces of the teeth. This action is co-ordinated with the tongue to maintain the food in this position.

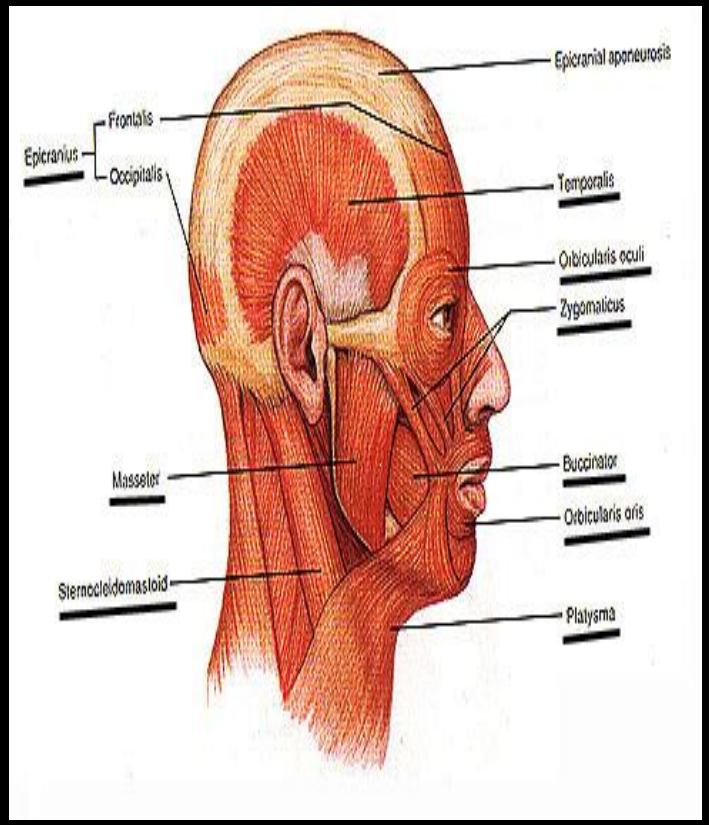
The buccinator

Because of the direction of muscle fibers (**which is parallel to the border of the denture and not at right angle to it**), the contraction of the muscle has a **slight displacing action to the denture.**

The Masseter and Temporalis (Masticatory Muscles)

- These muscles are not directly in the neutral zone, their force and action impact the position of the lower denture, especially during mastication.

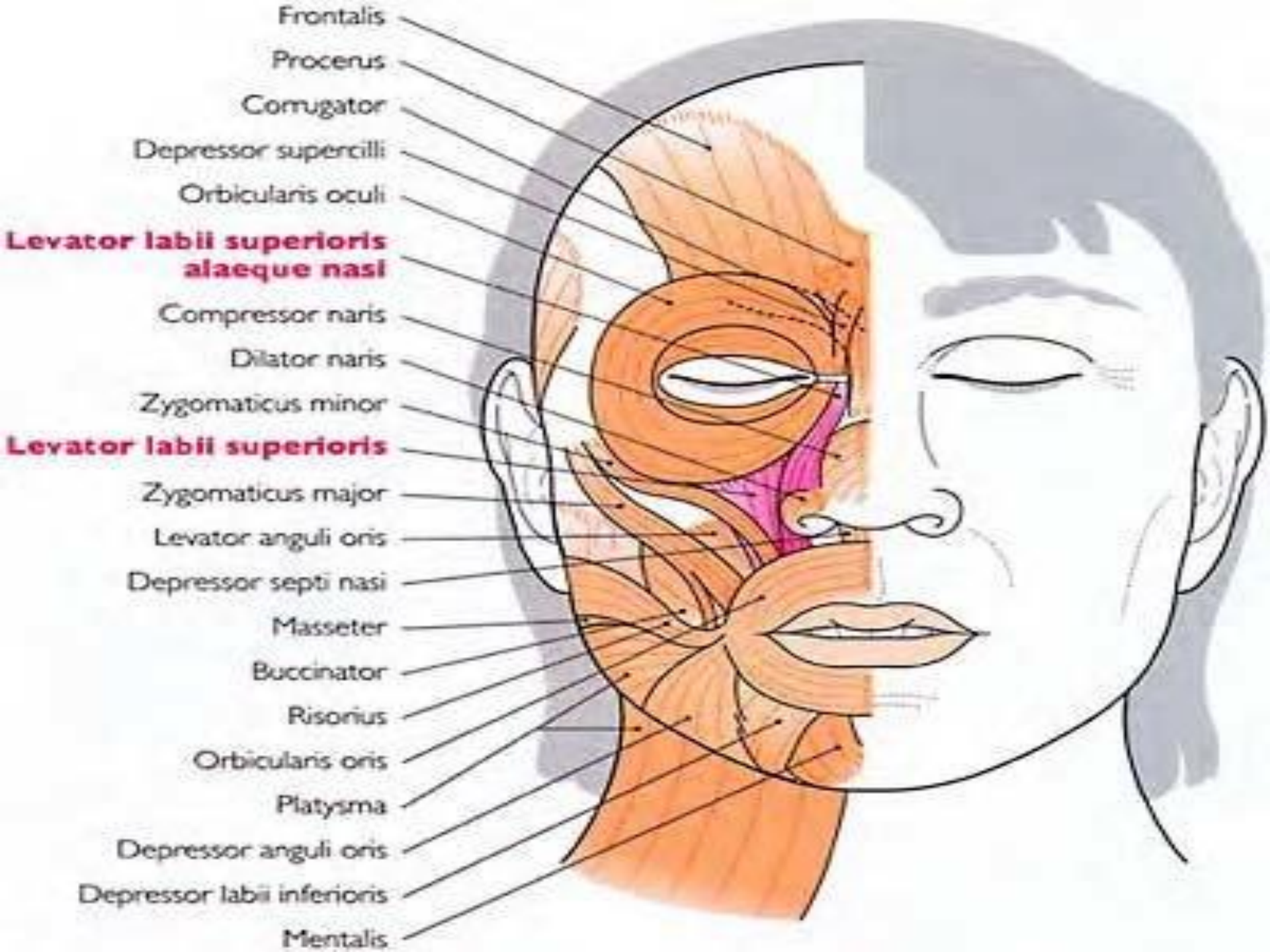
- It exerts a strong force when the teeth come into contact during chewing, which impacts the position and stability of the lower denture, particularly at the **distobuccal (back and outside) region**.



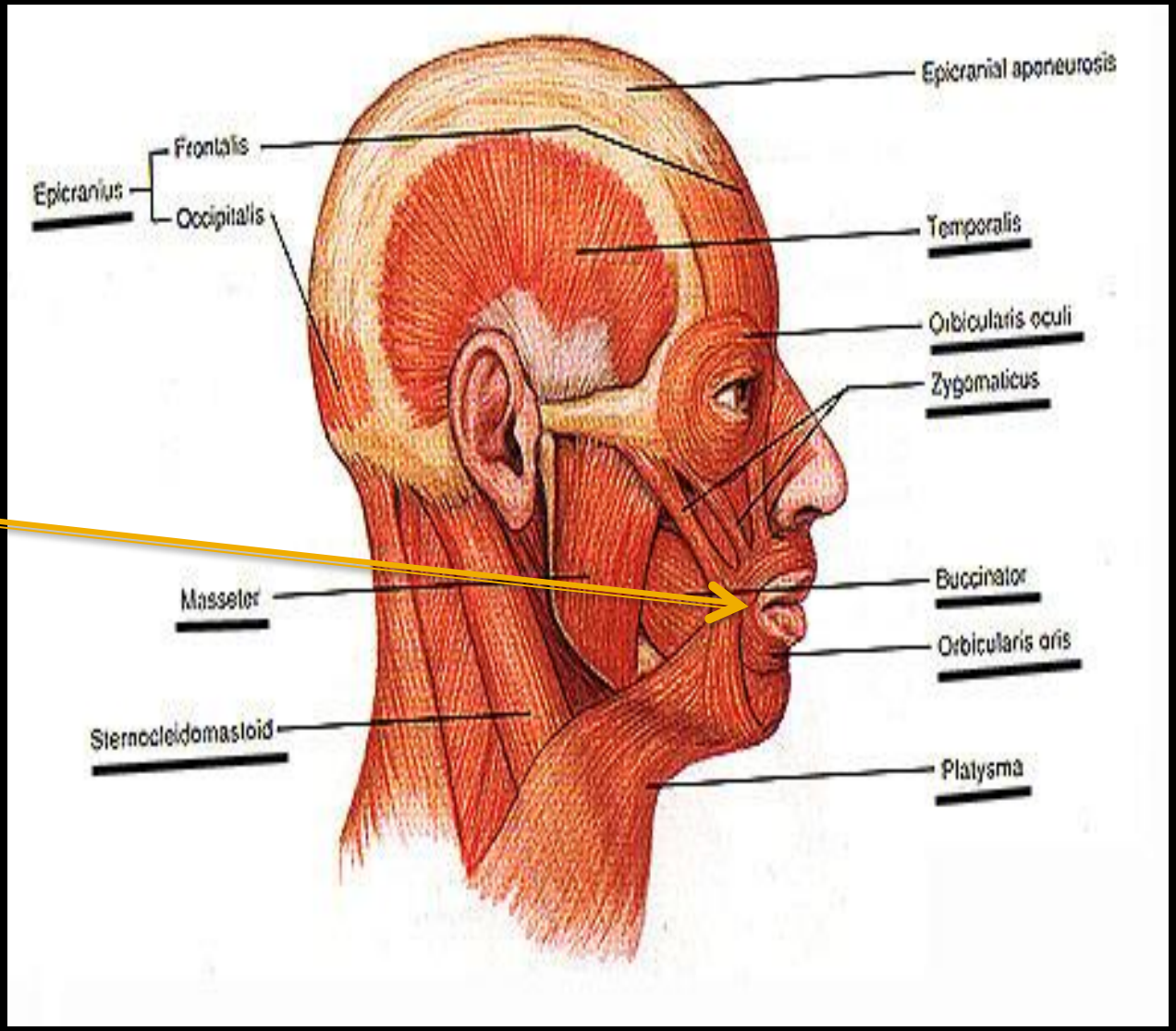
2. Anterior margin of buccal region:

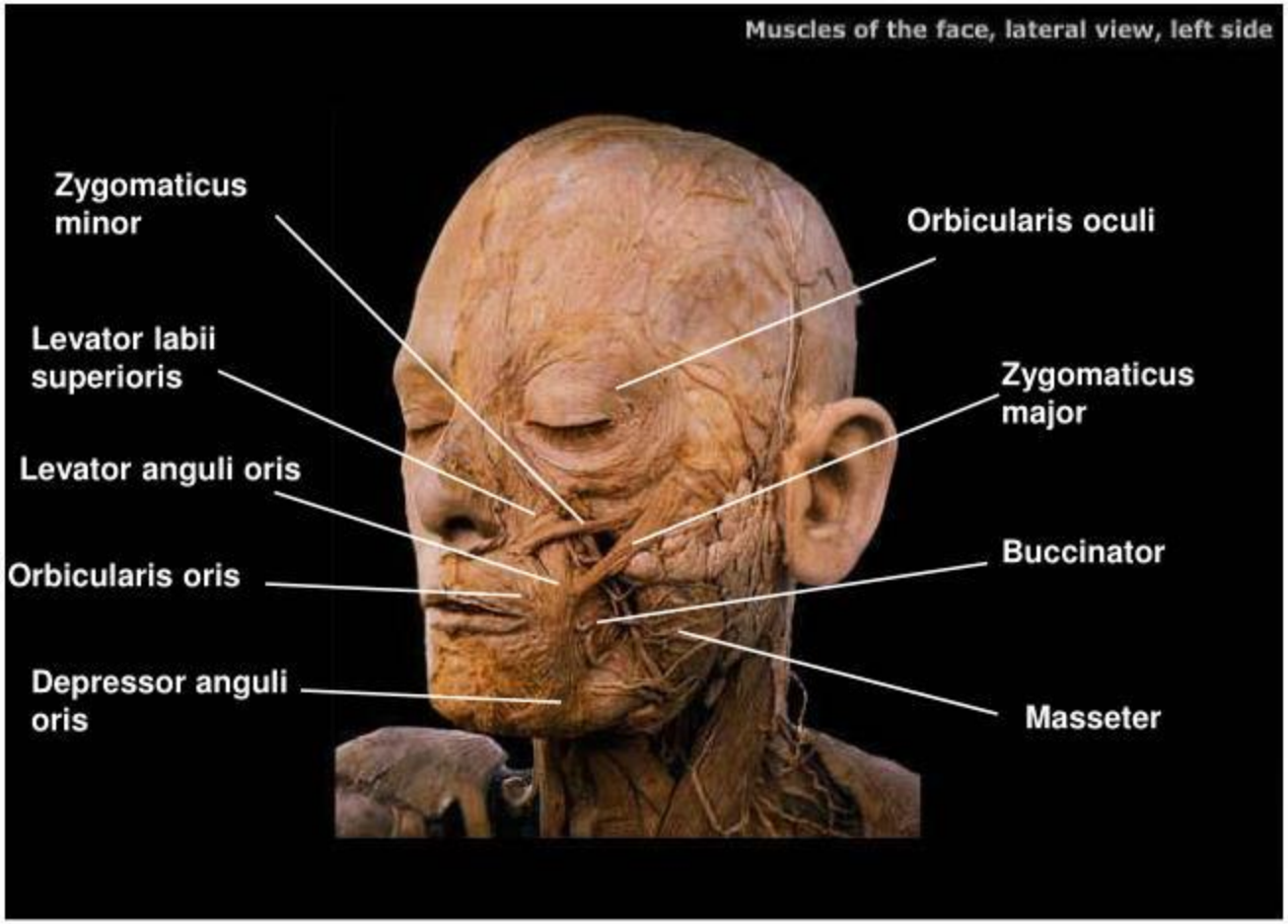
The modiolus

The modiolus is a strong knot of muscle that alters the position of the angle of the mouth. The main muscles that converge at the modiolus are the buccinator, orbicularis oris, zygomaticus major, and the levator and depressor anguli oris. Free movement of this knot of muscle must be ensured if the lower denture is to be stable. The modiolus determines the position of the premolar teeth and the shape of the polished surface in that region. This produces a narrowing of the denture so that the polished surface does not hinder the movements of the modiolus during function.


Frontalis
Procerus
Corrugator
Depressor supercilli
Orbicularis oculi
Levator labii superioris alaeque nasi
Compressor naris
Dilator naris
Zygomaticus minor
Levator labii superioris
Zygomaticus major
Levator anguli oris
Depressor septi nasi
Masseter
Buccinator
Risorius
Orbicularis oris
Platysma
Depressor anguli oris
Depressor labii inferioris
Mentalis

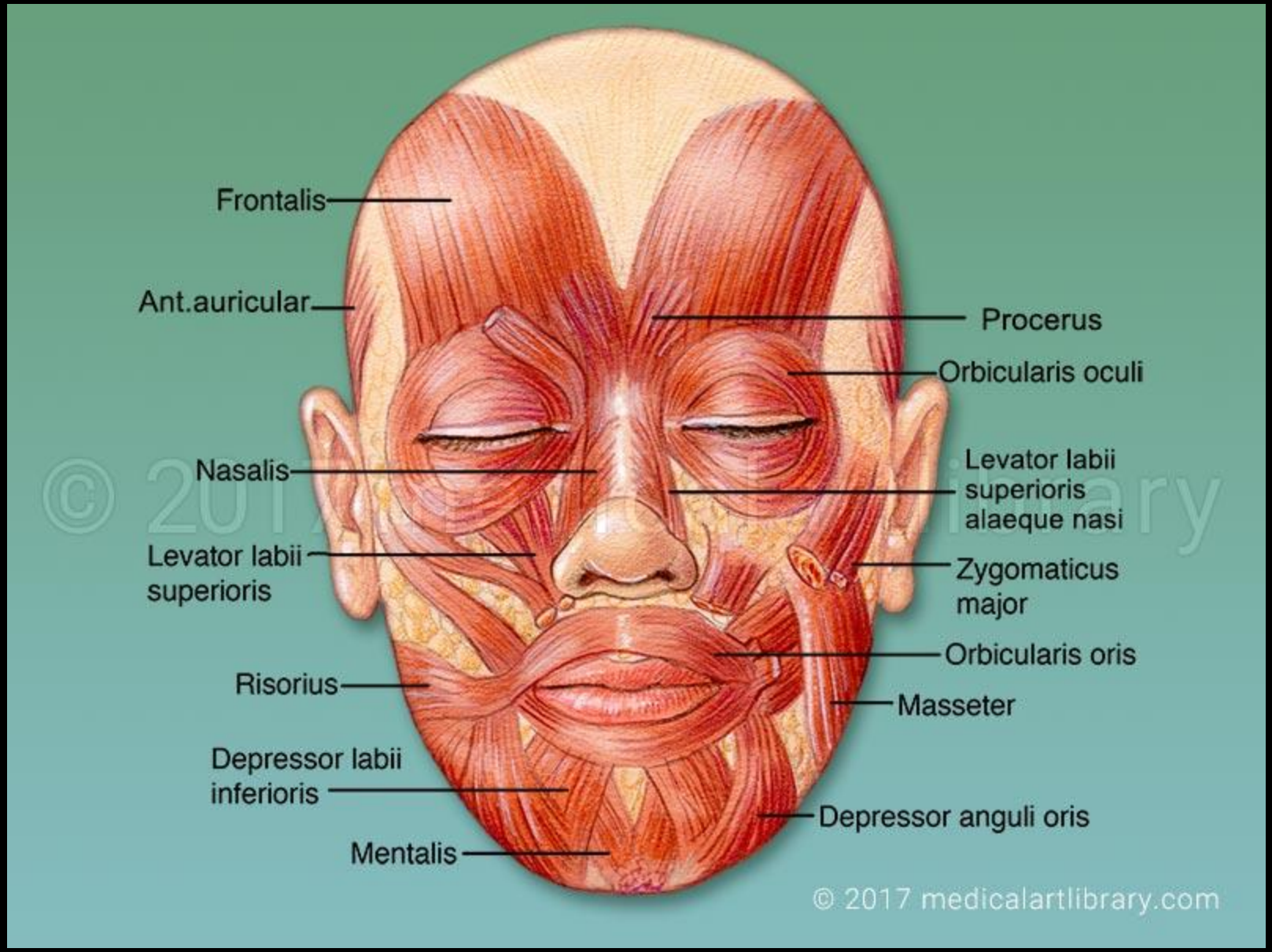
The modiolus




Muscles of the face, lateral view, left side
Zygomaticus minor
Levator labii superioris
Levator anguli oris
Orbicularis oris
Depressor anguli oris
Orbicularis oculi
Zygomaticus major
Buccinator
Masseter

3. Labial region:

It extends from one modiolus to the another. Its boundaries in the maxilla are formed by levator labiisuperioris and in the mandible by depressor labiinferioris and mentalis. The **origin** of these muscles determines the length of labial flange but the **degree of ridge resorption and the tonicity of muscle** determine the thickness of the flange. Anterior portion of the labial region is bounded by orbicularis oris.


Frontalis
Ant.auricular
Procerus
Orbicularis oculi
Nasalis
Levator labii superioris alaeque nasi
Levator labii superioris
Zygomaticus major
Orbicularis oris
Risorius
Masseter
Depressor labii inferioris
Depressor anguli oris
Mentalis
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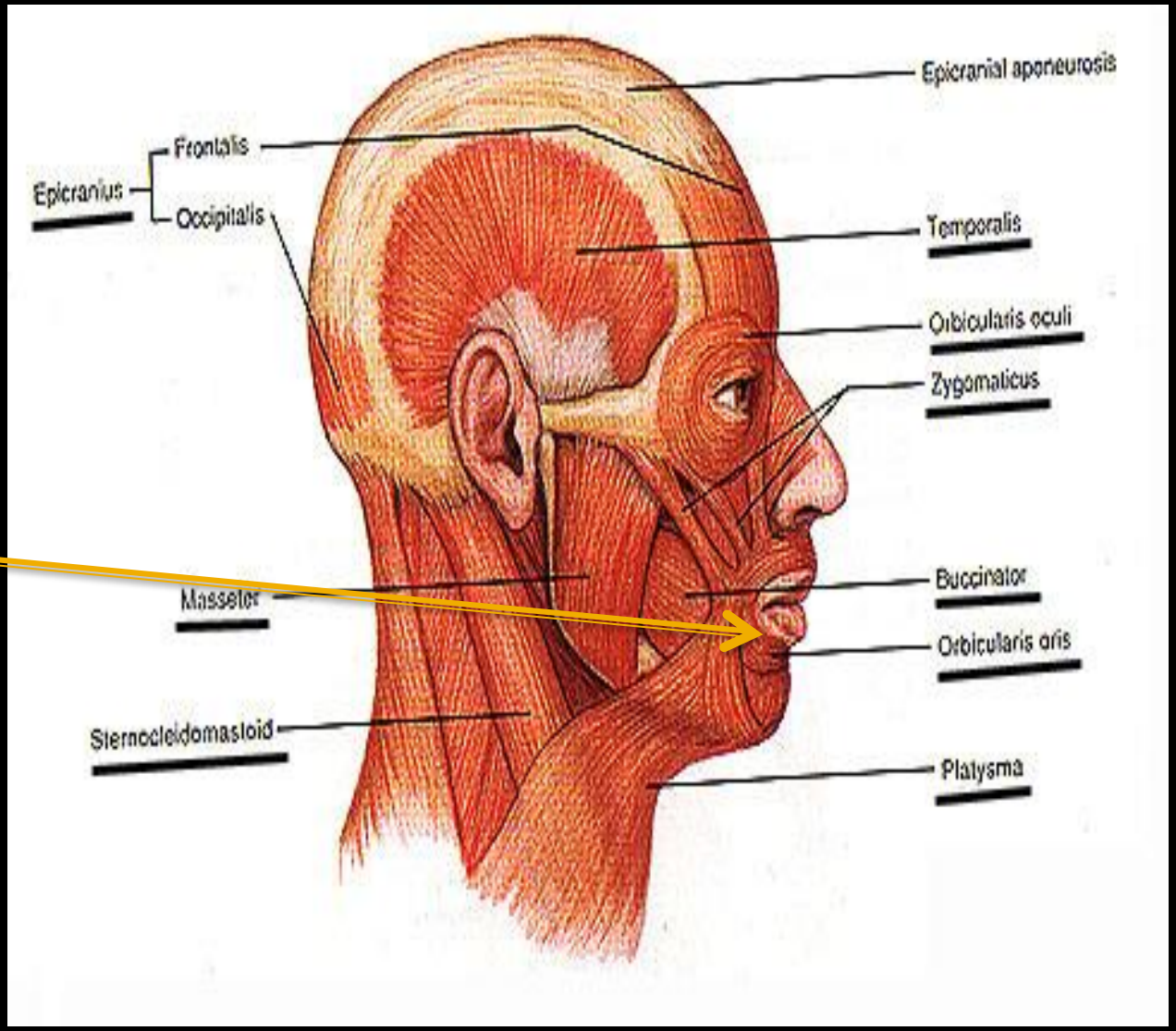
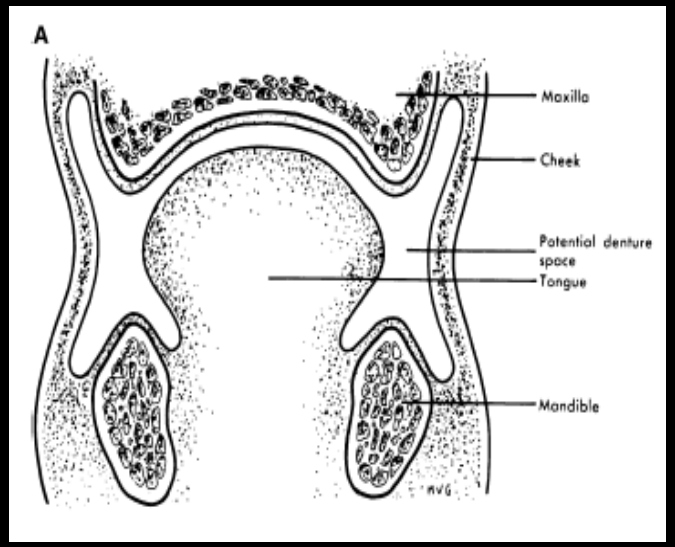
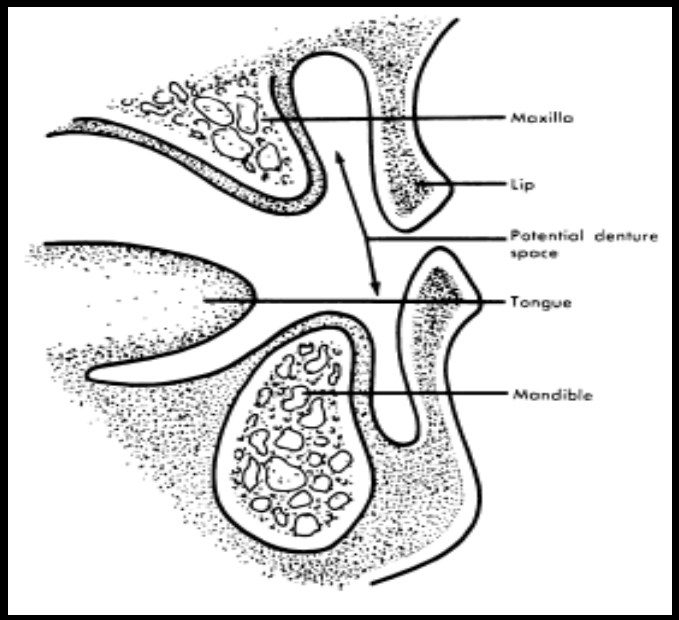
Orbicularis oris



4. Palatal region:

It is bounded by the upper residual ridge, hard palate, and anterior part of soft palate. It is very important during phonation of words.

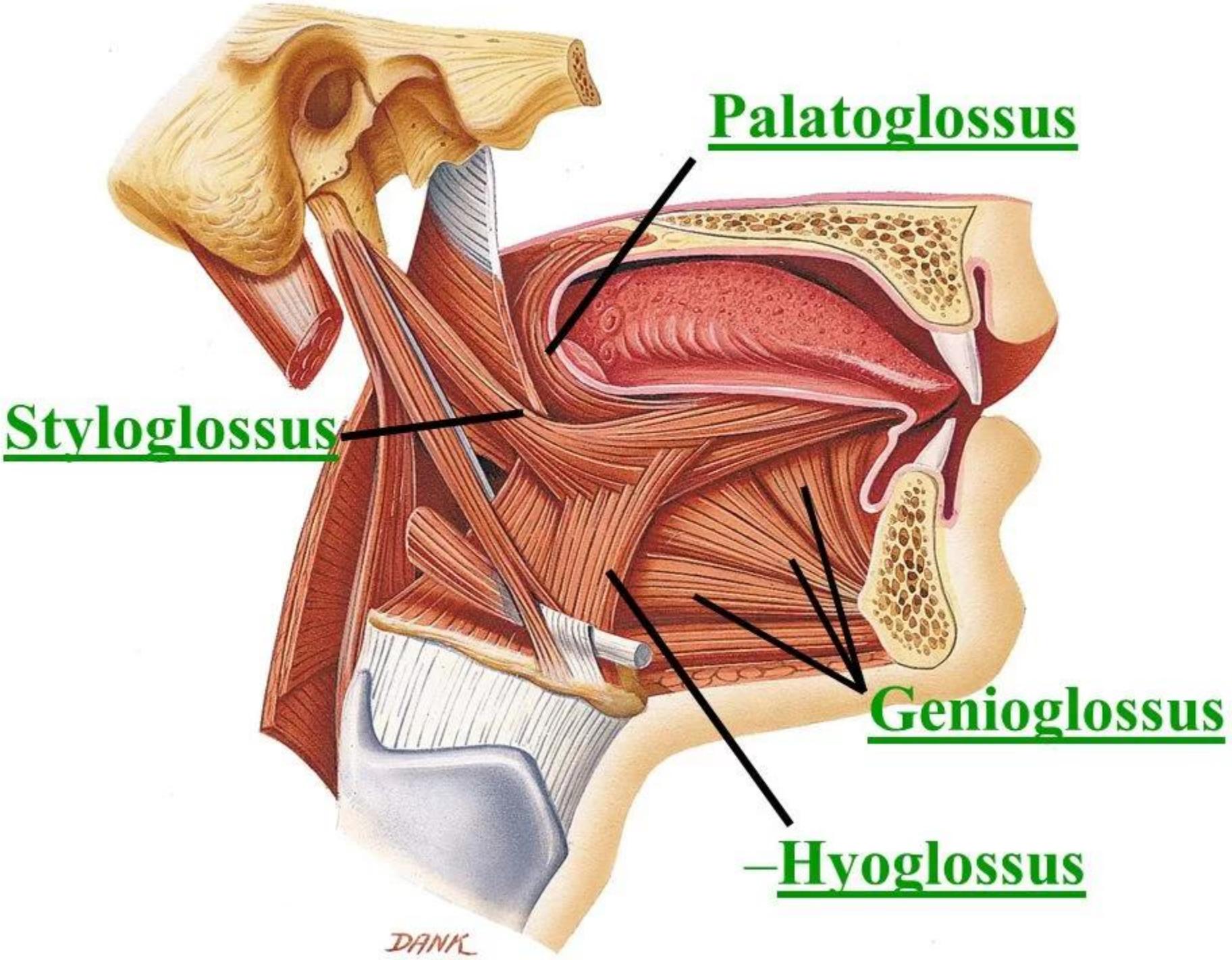




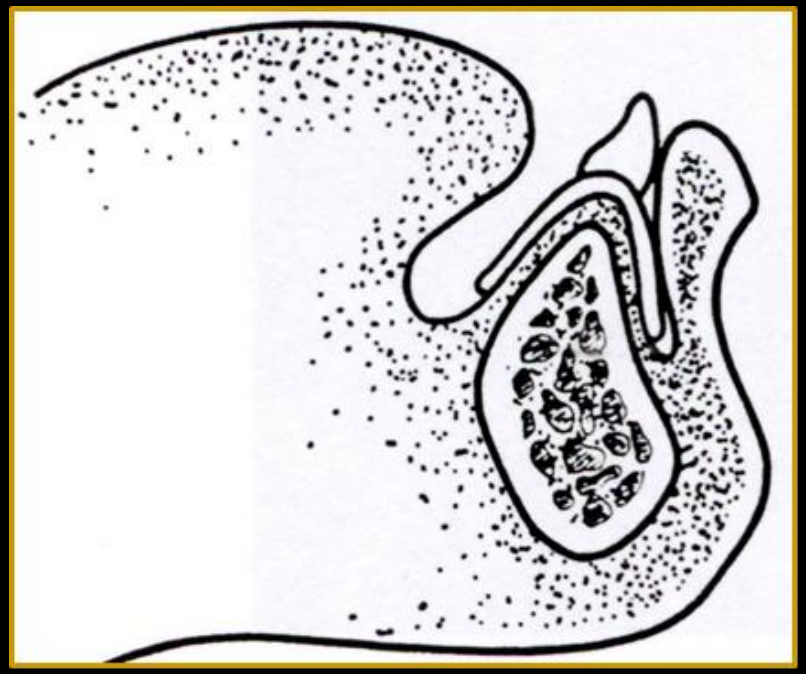
5. Mandibular lingual region:

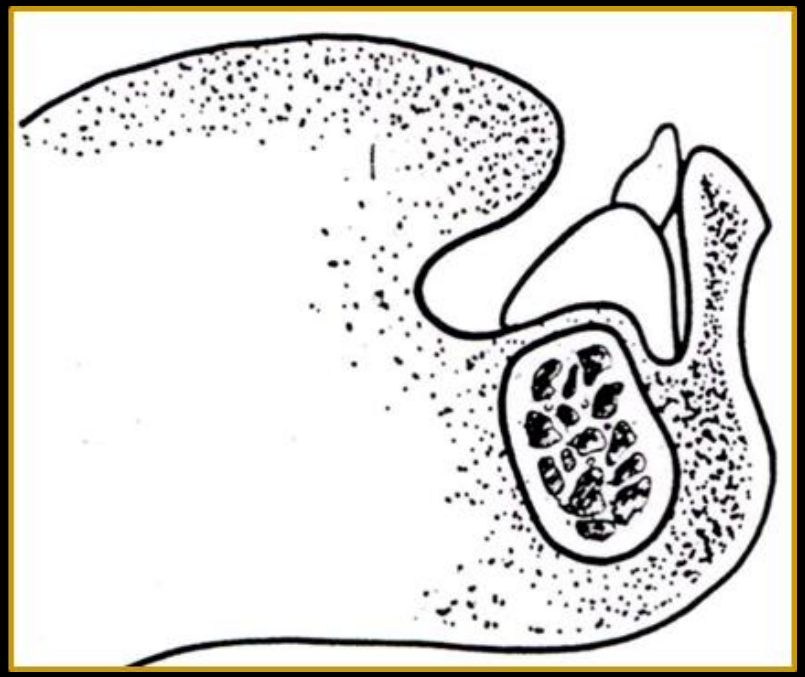
- It is the most important region. It is formed mainly by **tongue** which is a powerful group of muscles.

- **Intrinsic Muscles:** Responsible for shaping the tongue within the mouth.
- **Extrinsic Muscles:** These muscles move the tongue in different directions and are important for controlling the position of the denture.


Palatoglossus
Styloglossus
Genioglossus
–Hyoglossus
DANK

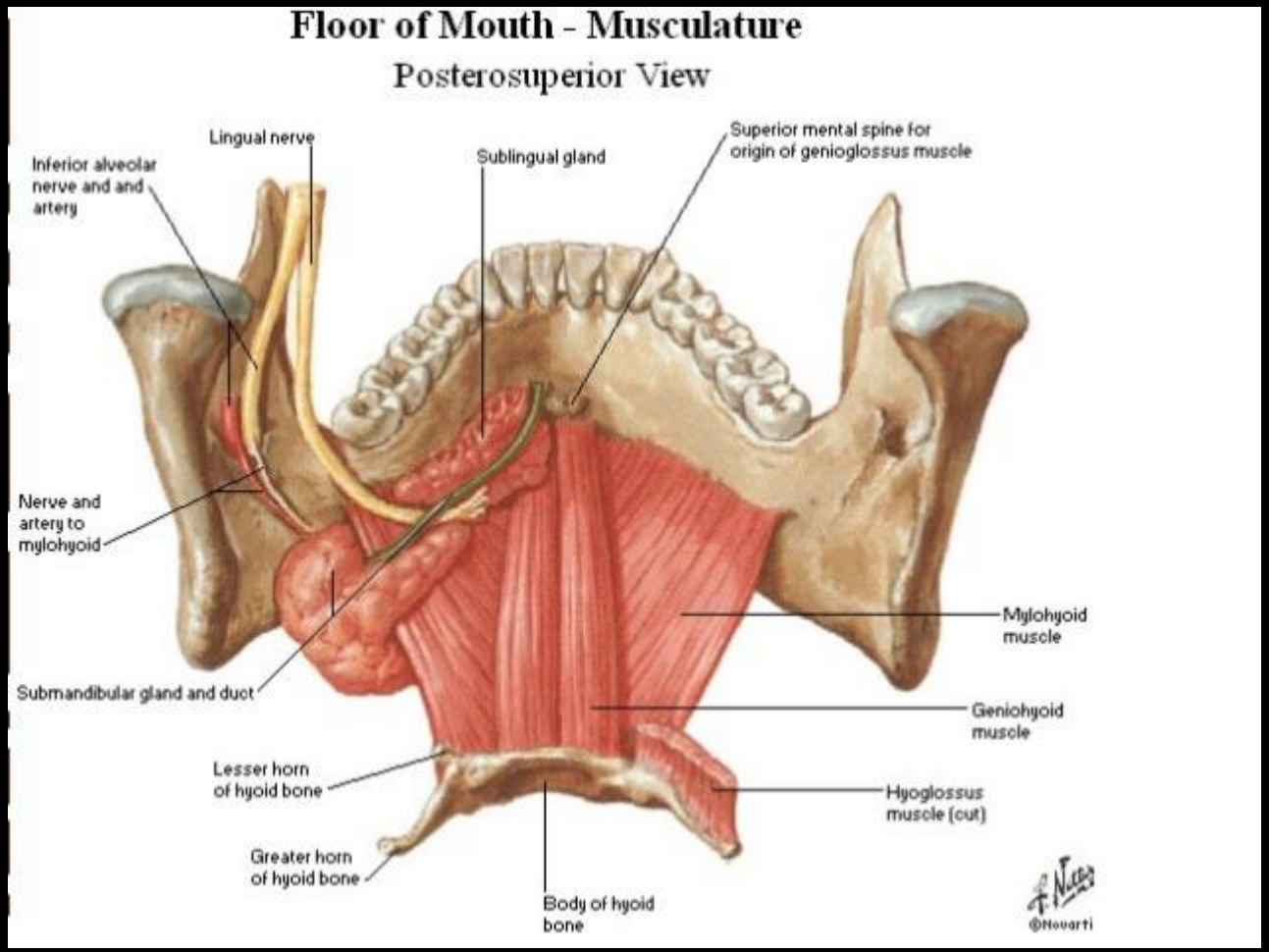
- If the posterior teeth are set too lingual, the tongue will displace the denture during function. Also the occlusal plane should not be high to allow the tongue to lie on the occlusal surface during rest.



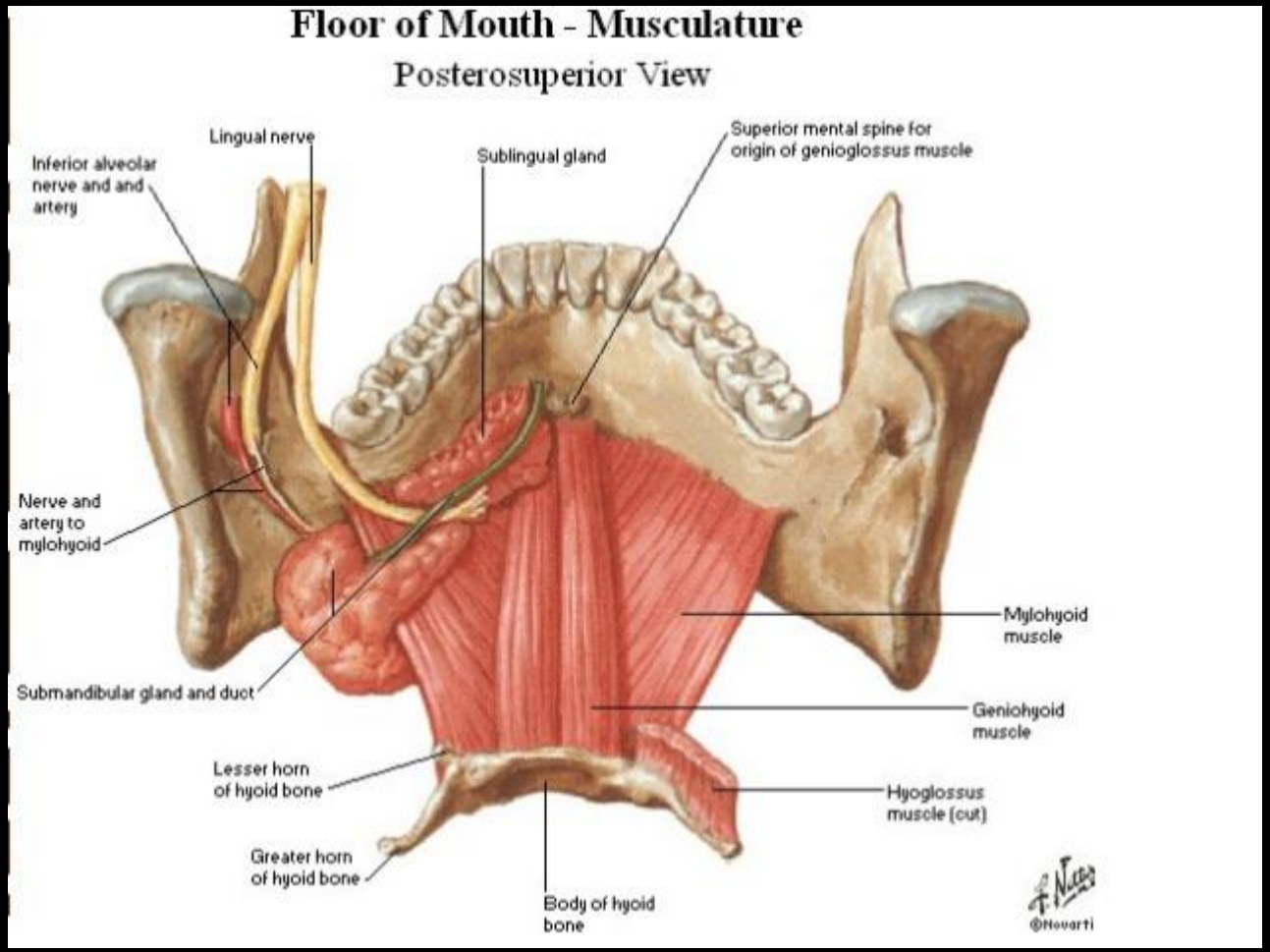


6. Floor of mouth:

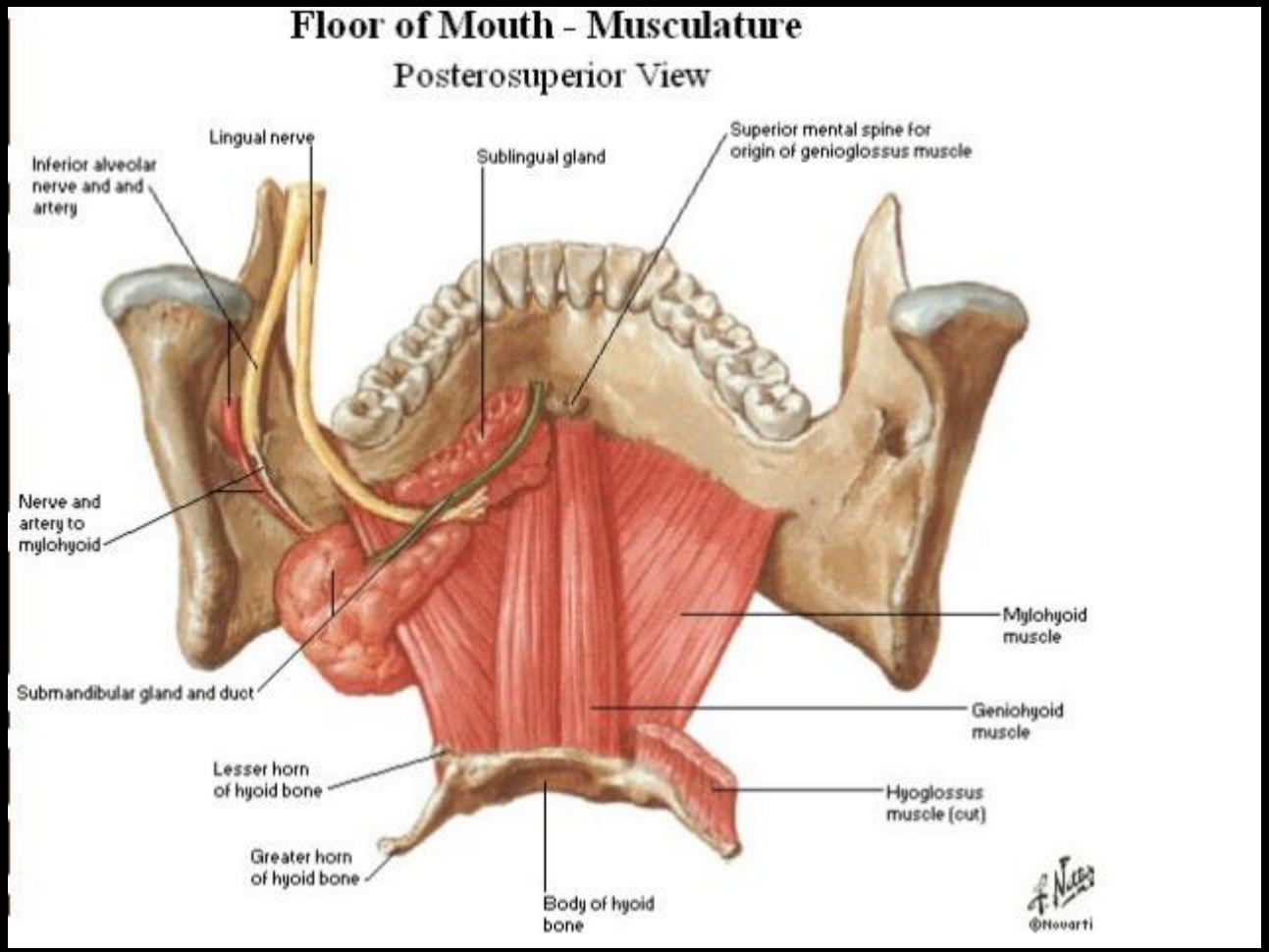
- The composition of this region is mainly the **mylohyoid muscle** arising from mylohyoid line. The direction of the muscle fibers is different in various regions.



- In the anterior part of floor of mouth, the fibers extend almost horizontally while posteriorly, it extends obliquely to the hyoid bone.



- So anteriorly the mylohyoid muscle is considered as the limit of the denture while posteriorly the denture flange is extended sometimes below the mylohyoid line depending on the direction of the muscle fibers.



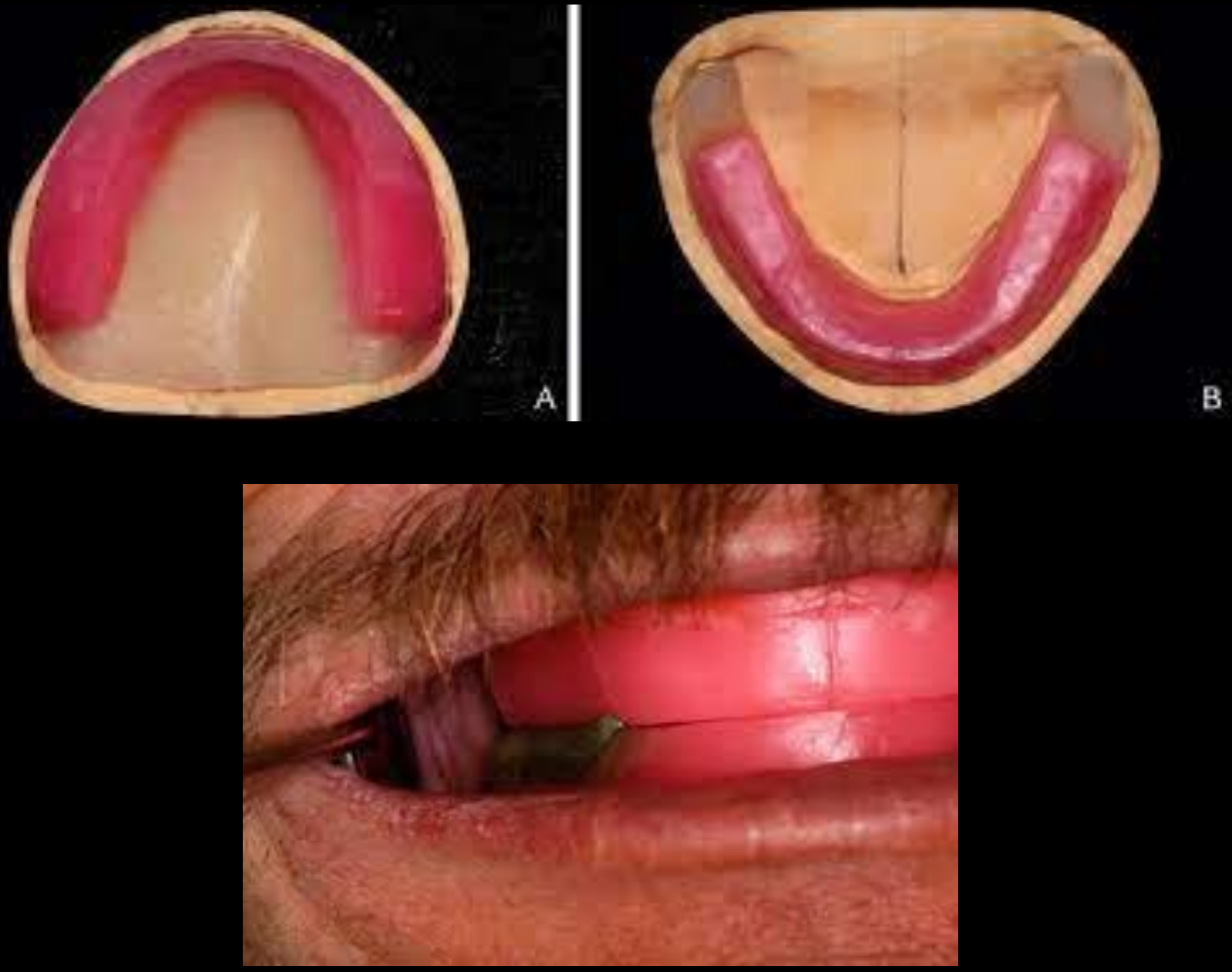
NEUTRAL ZONE TECHNIQUE

Methods of assessing the neutral zone:

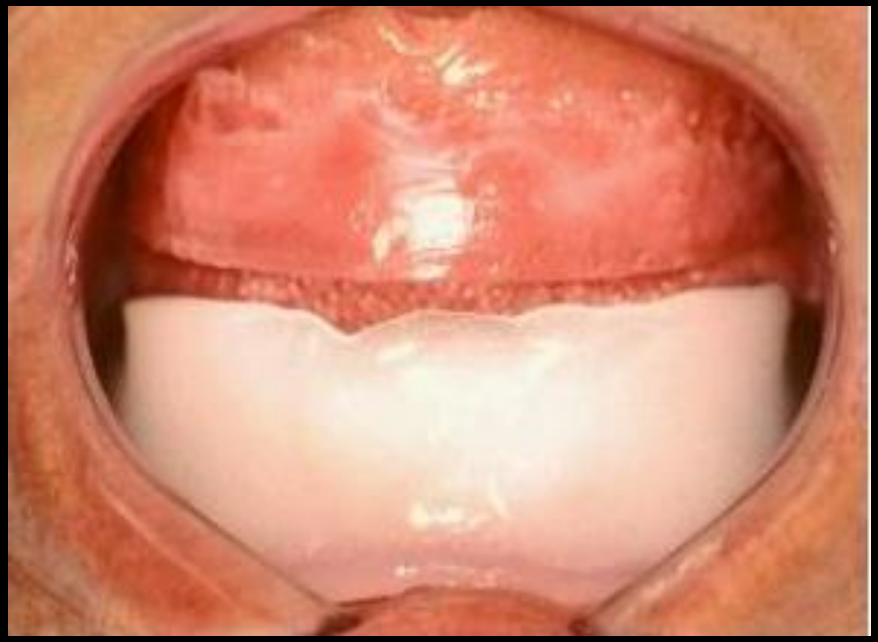
- Conventional method
- Functional method

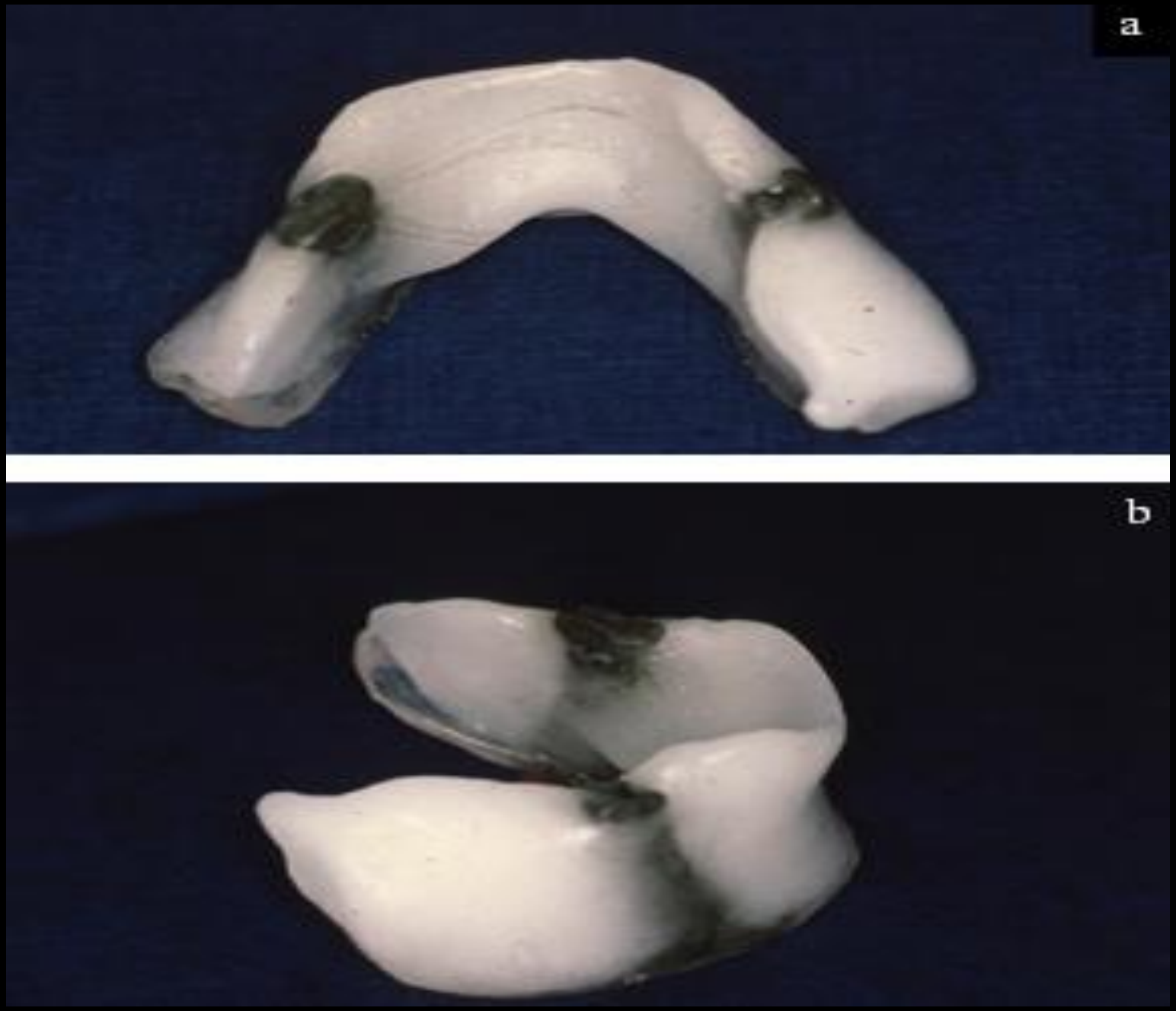
Functional method

Metallic oxide paste (Zinc oxide/Eugenol impression paste), green stick impression compound. (close fitting tray)


A
B

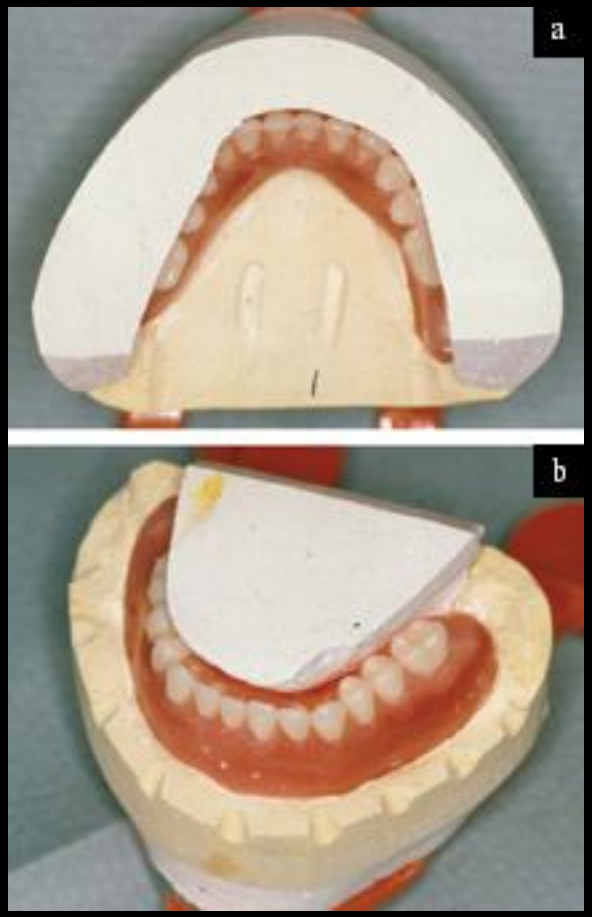

Visco-gel
Visco-gel




a
b

2- Tray with wire loops

Mandibular Neutral Zone Record


a
b


A
B
C


Thanks