Anatomy and physiology related to prosthodontics

Myology

Muscles of facial expression

The zygomaticus major, zygomaticus minor, levator labii superioris, levator labii superioris alaeque nasi, levator anguli oris, depressor anguli oris, risorius, platysma, incisivus superioris, incisivus inferioris, orbicularis oris, mentalis and buccinator muscles are responsible for the expression seen in the lower half of the face.

Functions of muscles of facial expression

1. Laughing
2. Smiling
3. Frowning
4. Their actions reflect the mode and emotional status of an individual.
5. When these muscles are relaxed, the face lacks expression.

The perioral muscles of facial expression

Why we study these muscles?

1. *The perioral muscle do not insert into bone so it need support from teeth for proper function.*
2. *Incorrect positioning of the teeth or incorrect contour of denture base can affect the normal tonicity of theses muscle and can affect adversely the facial expression.*
3. *Lack of support allows sagging of the soft tissues of the face, while stretching inhibits the normal contraction of the facial muscles and results in changes in muscle tone.*

The insertion of these various muscles around the oral cavity opening is very important, where they partly insert into the connective tissue of the skin and partly into the mucous membrane of the lips.
The area which is situated laterally and slightly above the corner of the mouth known as the **muscular node or the (modiolus)**, which is a concentration of many fibers of this group of muscles. Here the labial flange of the maxillary denture should be reduced in thickness, so as not to effect the stability of the upper denture. At times, the mandibular first premolar should be arranged properly on the crest of residual ridge to avoid any interference with this modiolus.

Mentalis muscle

Functions related to prosthodontic

1. Contraction of this muscle is capable of dislodging mandibular denture.
2. It can dictate the level of extension of the labial flange of mandibular denture below the crest of the ridge.
3. Render the lower vestibule shallower when it contract.
4. Surgical repositioning of the mentalis muscle is sometimes advisable.

The incisivus labii superioris and inferioris muscles

Their actions on the vestibular fornix are similar to that of the mentalis muscles. They are small muscles, and their action alone would rarely dislodge a denture. However, their presence beneath the mucous membrane might present problems associated with flange extension and denture retention.

Buccinators muscle

It does not directly dislodge the denture because it contract in a line parallel to the plane of occlusion.
Its fiber parallel to the plane of occlusion but run at right angle to the fiber of masseter ,When masseter activated it push the buccinators muscle medially against denture border in the area of the retro molar pad ,so the denture should be contoured to accommodate this interaction between these two muscle. This contour is known as masseter groove.

Orbicularis oris muscle

- It is the sphincter muscle of the mouth. The upper lip is supported by the six anterior teeth and not the denture border.
- In normal occlusion the superior border of lower lip is supported by incisal third of the maxillary anterior teeth, if not so, the lower lip would be caught by the anterior teeth during occlusal contact.
- When the muscles of the lips are relaxed, the lips become flaccid. This can happen with jaw open therefore, it is important for dentist to make sure that the action of this muscle are recorded when making impression for dentures
- If this muscle is stretched, the angles of the mouth are easily irritated when an impression tray is inserted.

Suprahyoid muscles (*digastric, stylohyoid, geniohyoid, Mylohyoid*)

* Elevation of the hyoid bone and the larynx and depression of the mandible.
* Geniohyoid and Mylohyoid may influence the border of the mandibular denture.
* Mylohyoid muscles constitute the muscular floor of the mouth. It elevate the hyoid bone, tongue and the membranous floor of the mouth during swallowing. If the denture extend below and under the mylohyoid line, it will impinge on mylohyoid muscle, and can affect it action.

  Mylohyoid muscle acts

  1. Elevate the floor of the mouth in the first stage of deglutition.
  2. Elevate the hyoid bone.
  3. Depress the mandible.

Infra hyoid muscle (*sternohyoid, omohyoid, Sternothyroid and thyrohyoid)*

- No particular significance in complete denture prosthodontics with respect to any influence on denture border.
- They are important for they are a part of the kinetic chain of mandibular movement. Their action is to fix the hyoid bone so that the suprahyoid muscles can act on the mandible.

Muscles of mastication

1. Masseter
2. Temporalis
3. Medial Pterygoid
4. Lateral Pterygoid

Functions of these muscles

- Masticatory and non-masticatory movement of the mandible.
- In complete denture, the non-masticatory movement and the contacting of the teeth during these movement are probably of more concern than the masticatory movements.
- In recording jaw relation, centric relation is obtained with aid of posterior fibers of temporalis muscles.

Pterygomandibular raphe

A tendinous band lies between the pterygoid hamulus superiorly and the mandible in the area of retromolar pad inferiorly. It is the point of attachment for the buccinators muscles laterally and superior pharyngeal constrictor muscles medially.

Muscles of the soft palate

The tensor veli palatini, levator veli palatini, muscular uvulae, and palatoglossus are the muscles of the soft palate.

Tensor veli palatini: This slender muscle when taut, can influence the denture contour in the hamular notch area.

Levator veli palatini: It elevates the soft tissues during swallowing as well as helps in determining the position of the vibrating line when developing a posterior palatal seal for a maxillary denture.

Palatoglossus: When the two palatoglossi contract, they draw the tongue and soft palate toward each other. This action also exerts lateral pressure on the lingual extension of a mandibular denture.

Why study muscle of soft palate?

Since there is a need to determine the vibrating line which is located on soft palate not over the palatine bone.
The patient says Ah when the patient closes both nostrils and blow gently. The air will force the soft palate to flux inferiorly at the junction of movable and non-movable soft palate.

Soft palate can be classified into:

- Class I: horizontal with little muscular movement. In this case more tissue coverage is possible for posterior palatal seal.
- Class II: soft palate makes 45 degree angle to the hard palate. Tissue coverage for posterior palatal seal is less than that of class I condition.
- Class III: soft palate makes 70 degree angle to the hard palate. Tissue coverage for posterior palatal seal is minimum.

Tongue

The tongue is a muscular structure composed of intrinsic and extrinsic muscles fibers. The intrinsic muscles originate and insert within the tongue and responsible for change in shape. While the extrinsic muscles originate in structure outside the tongue and can move the tongue as well as alter its shape.

Function related to prosthetic dentistry

It is located in the floor of the mouth and is in intimate contact with the lingual flanges of mandibular denture. The denture flange must be contoured to allow the tongue to have its normal wide range of functional movement, that's why the patient should be asked to move his tongue to the left and right as well as protruding it anteriorly in muscle trimming procedure during lower impression making as well as asked to moisture his lips.

Muscle physiology

The human body is very adjustable machine, capable of adapting to changes in the environment. By means of Sensory nerve endings the body is notified of the changes and by the effectors, it adjust to these changes.
The effectors of the body are the muscle and glands.
The muscle involved in denture complete function are the skeletal muscle which are controlled by CNS that passes through a synapsis, then efferent nerve will be activated which lead to muscle contraction called reflex (voluntary action).

The oral cavity has many sensory nerve fiber receptors; many of these are associated with periodontium, when teeth loss these receptors are loss.
Muscle contraction is of two types

1. Isometric contraction occur when the muscle does not shorten during contraction
2. Isotonic contraction occur when the muscle shortens, but the tension remains the same.

In the mandible both isotonic and isometric contraction occurred.

Isotonic to move the mandible and isometric to brace the mandible when teeth contact.

When load applied on muscle Elongate with limit, the greater the load the greater the stretch, this is of importance during recording of jaw relation.

Oral mucous membrane

Much of mucous membrane either helps support a complete denture directly or comes in contact with it intermittently.
Oral mucosa could be classified into:
1. The masticatory mucosa.
2. The lining mucosa.
3. Specialized mucosa.

The masticatory mucosa is keratinized stratified Squamous epithelium. In edentulous patients covers the crest of residual ridge (here it is firmly attached to the underlying structure), and the hard palate.
The lining mucosa is Stratified Squamous epithelium non keratinized. It is found in the lips, cheeks, vestibule spaces and ventral surface of the tongue. Usually the lining mucosa comes into contact with the denture borders. The submucosal structure may be either tightly or loosely attached to underlying structures.
The specialized mucosa covers the dorsum of the tongue, here the mucosa is keratinized including the papillae on the upper surface of the tongue.
Oral mucosa of soft palate is stratified squamous epithelium none keratinized. The Sub mucosa here have numerous gland supporting membrane, it is a transition between loosely and fixed type of mucosa.

Salivary gland and saliva

Saliva is secreted by 3 different main exocrine glands:
1. A serous secretions by the parotid gland.
2. A mixed but mostly serous secretion by the submandibular glands.
3. A mixed but mostly mucous secretions by the sublingual glands.

Some other smaller glands are located in the mucosa of the tongue, lips and palate.
The viscosity of saliva is important. A thick ropy saliva can cause some problems:

1. Very thick saliva can force the dentures out of their correct position.
2. Complicates impression making by forming voids in the impression surface while the impression material sets.
3. Causing the patients to gag while impression are made and after the new denture are installed.

On the other hand a lack of saliva (xerostomia) cause some problem:

1. Reduced retention of denture.
2. Sticking of cheeks and lips to the denture base in an uncomfortable manner.
3. Formation of sore spot under the denture which is very annoying to the patient.
4. Lack of oral hygiene.

Physiologic factors affect salivation

1. Agreeable taste stimuli result in profuse salivation.
2. A smooth surface inserted into the mouth (Ex: polish surface of denture) will result in an increase in salivation.
3. When a patient is dehydrated salivation decreases.
4. Emotional and other psychological stimuli excite the autonomic nervous system, and in turn the function of the body organs are altered.
5. As one ages, the saliva becomes more ropy in consistency.

Function of saliva

1. Contain enzyme digestive ptyalin for digestion of starchy foods.
2. Lubricant for the mucosa and surface of the denture.
3. Protective agent (antifungal and antibiotics activities).
4. Aids in retention of removable prostheses.
5. Mechanical cleansing.