

REVIEW ARTICLE

Complete Denture Musculature

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ABSTRACT:

An understanding of the muscles of face is important to successful complete denture construction. These muscles may be observed at work by the dentist when he first views his patient and that patient begins to speak. An understanding of its prosthodontic significance enables the dentist to employ postoperative vision in the treatment planning stage which can minimize denture failures. Hence, in this article an attempt is made to review all the muscles and their activity and how they can be manipulated for success of prosthodontic treatment.

Key Words: Complete denture, Musculature

Received: 3 August, 2020

Accepted: 19 August, 2020

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This article may be cited as: Gupta R, Arora N, Vashisth D, Singh P, Chib V. Complete Denture Musculature. Int J Res Health Allied Sci 2020; 6(5): 192- 198.

INTRODUCTION

Jeffery P. Okeson has very rightly said that "Nothing is more fundamental to treating patients than knowing the Anatomy." ⁽¹⁾ Martone has termed this muscular activity the fourth dimension or vitality factor of a patient. Man is a complex of intellect and emotions in addition to being an anatomic and physiologic unit by and large, he communicates his thoughts to others through speech. But his feelings and emotions are most frequently conveyed through facial expressions. ⁽²⁾

A successful prosthesis requires balance between different related factors and must fulfil the following criteria- of being in harmony with surrounding oral environment and orofacial musculature and preservation of remaining structures, restores masticatory efficiency; ability to perform during functions like deglutition, speech, respiration; and be aesthetically pleasing. Among these criteria maintaining harmony between prosthesis and muscles and preservation of the same is of utmost importance and a challenge to the dentist.

Muscle action influences the fabrication of denture at every step beginning from impression making to jaw relations to teeth setting and finally successful retention, stability and comfortable wearing of denture. ⁽³⁾ Achieving correct positioning of the borders of the mandibular denture has taxed the abilities of generations of prosthodontists. The entire border of the denture

should be in contact with soft displaceable tissues to complete the peripheral seal and achieve satisfactory stability and retention. ⁽²⁾

THE MUSCLES

"The quantity of motion in a joint is regulated by the power of contraction and relaxation of the muscles which act on it" (MacKenzie)

An accurate knowledge of the origin and insertion of a muscle is essential in determining its action. This applies more particularly to the insertion which is a direct indication of activity.

Muscles evolve in groups and though each one performs some special function it does not act alone.

The orofacial muscles influencing complete denture prosthesis are muscles of

Facial expression
Muscles of mastication
Muscles of tongue
Muscles of soft palate
Pharyngeal muscles
Suprahyoid muscles
Infrahyoid muscles. ⁽³⁾

MUSCLES OF FACIAL EXPRESSION AND MASTICATION

These muscles generally do not insert into the bone. They are subcutaneous in position and produces wrinkles or fold in the skin when they contract. They are responsible for expression of different emotions of an individual. ⁽³⁾

The muscles of the face develop from the second pharyngeal arch and are innervated by branches of the

facial nerve. They are in the superficial fascia, with origins from either bone or fascia, and insertions into the skin. They also act as sphincters and dilators of the orifices of the face (i.e., the orbits, nose, and mouth). ⁽⁴⁾

MUSCLES AFFECTING THE MANDIBULAR DENTURE

ANATOMIC REGION	MUSCLES THAT INFLUENCE EXTENSION	HOW TO ACTIVATE THE MUSCLE	EFFECT OF ACTIVATION ON COMPLETE DENTURE
LABIAL VESTIBULE Runs from the labial frenum to the buccal frenum ⁽⁵⁾	A) ORBICULARIS ORIS It is the sphincter muscle of the mouth that completely encircle the mouth ⁽⁴⁾	Cheeks are manipulated outward, upward, and inward. ⁽⁶⁾ Also the patient is instructed to 1) Lick the upper and lower lips with the tongue ⁽⁷⁾ 2) To open mouth wide. ⁽⁵⁾ 3) To purse the lips	Activates the orbicularis oris muscle with its associated muscles of facial expression. ⁽⁷⁾ The muscle becomes stretched, narrowing the sulcus. The mandibular denture is displaced if flange is unnecessarily thick. ⁽⁵⁾
	B) MENTALIS	Instruct patient to evert the lower lip (pout). ⁽⁷⁾	Activates the mentalis muscle against the compound. ⁽⁷⁾ It raises and protrudes the lower lip as it wrinkles the skin of the chin. ⁽⁴⁾
LABIAL FRENUM	<ul style="list-style-type: none"> • INCISIVUS (Depressor labii inferioris) 	Lower lip is manipulated outward, upward, and inward. ⁽⁶⁾	Allows for freedom of movement of the connective tissue-formed frenum.
	<ul style="list-style-type: none"> • ATTACHMENT FROM ORBICULARIS ORIS 	Elevate the frenum and then manipulate the lip with a side-to-side motion. ⁽⁷⁾	Permits a seal to form by the molding of the area using the side-to-side movement of the lip therefore, maximum seal with freedom of movement. ⁽⁷⁾
LINGUAL FRENUM	Lingual frenum with its intrinsic connective tissue fibres	The patient is instructed to protrude his tongue and the move it side to side to register that narrowly defined area only. ⁽⁷⁾	Allows freedom of the lingual frenum connective tissue band to prevent the denture from being dislodged during normal tongue movements. ⁽⁷⁾
BUCCAL VESTIBULE	BUCCINATOR Horseshoe shaped muscle ⁽⁸⁾	The area and border are molded by grasping the cheek between the thumb and fingers and manipulating the tissue outward, downward, and inward. ⁽⁶⁾ Look at the buccal flange internally to see that the cheek is not distended and also from outside for esthetics and facial form. ⁽⁷⁾	Moves the fibres of the buccinator muscle and the soft tissues of the cheek in the direction of the muscle activity during patient function. Avoids overextension which can cause displacement of the denture base and soreness of the tissues.

BUCCAL FRENUM	DEPRESSOR ANGULI ORIS (Triangularis)	Manipulate the cheek outward, upward, and inward. And also antero-posteriorly. ⁽⁶⁾	Allows for freedom of movement of the connective tissue band Permits a seal to form by the manipulation of the cheeks in a back- and-forth motion. ⁽⁷⁾
MASSETRIC NOTCH	<ul style="list-style-type: none"> MASSTER BUCCINATOR BUCCAL PAD OF FAT 	The patient is asked to close onto the clinician's fingers while the clinician resists the closure movement and gently presses downward on the tray. ⁽⁶⁾	This procedure forces the masseter muscle into action; the masseter, in turn, forces the buccinator in the direction of the distal buccal corner of the retromolar pad, creating the masseter groove. ⁽⁶⁾
RETROMYLOHYOID CURTAIN	<ul style="list-style-type: none"> SUPERIOR CONSTRICTOR 	The patient is instructed to "open and protrude the tongue" to activate the retromylohyoid curtain and then to "close down on my fingers" to activate the medial pterygoid muscles, which function posteriorly to the curtain and tend to displace it forward. ⁽⁶⁾	As the patient closes, resist the closure by downward pressure of the fingers to cause the medial pterygoid muscles to contract. If a formed border is not present or if the border is knife edged, the flange is usually too short. ⁽⁶⁾
	<ul style="list-style-type: none"> PALATOGLOSSUS MUSCLE 	Instruct the patient to move his tongue into his right and left cheeks while the tray is held in position	This tongue movement moves impression material so that the future tongue action will not displace the completed denture
MYLOHYOID AREA	MYLOHYOID MUSCLE	The patient is asked to perform repetitive, forced swallowing. ⁽⁷⁾ The patient forcefully protrude the tongue and move it from side to side. ⁽⁶⁾	The action of mylohyoid influences almost the entire mandibular lingual denture border. It is a very thin sheet of fibres and can be displaced downward and laterally easily during impression making. However, the denture cannot extend lateral to the mylohyoid ridge or its movement will traumatise the soft tissue.
	TONGUE (SIZE, POSITION AND AMOUNT OF MOVEMENT)	For anterior region of the lingual flange instruct the patient to push the tongue against the front part of the hard palate. ⁽⁶⁾ Instruct the patient to move his tongue into the upper and lower vestibules on each side of his mouth. ⁽⁷⁾	The amount of movement of the floor of the mouth is often greater with tongue movement. The swallowing activity, therefore, will sometimes allow the denture to extend further into the floor of the mouth for better seal and stabilisation. ⁽⁷⁾ This procedure develops the width of and length of the anterior lingual flange.
SUBLINGUAL FOLD SPACE	<ul style="list-style-type: none"> GENIOGLOSSUS MUSCLE TONGUE MYLOHYOID 	Place additional compound into this area. To place the tongue to just contact the handle of the tray to prevent reduction of the length too rapidly. Also instruct the patient to gently wet his upper and lower lips with his tongue ⁽⁶⁾	Causes slight contraction of the genioglossus muscle, which pushes against the tissues superior to it.

MUSCLES AFFECTING THE MAXILLARY DENTURE

ANATOMIC REGION	MUSCLES THAT INFLUENCE EXTENSION	HOW TO ACTIVATE THE MUSCLE	EFFECT OF ACTIVATION ON DENTURE BORDERS
LABIAL FLANGE	ORBICULARIS ORIS	The muscle is manipulated by pulling the upper lip outward, downward, and inward. ⁽⁶⁾ Instruct the patient to lick his upper lip. Do this with only the surface of the compound heated. ⁽⁷⁾	Manually manipulating the lips with their associated musculature to seal the denture border in displaceable tissue, the pressure helps control the esthetic form of the peripheral roll. ⁽⁷⁾
LABIAL FRENUM Fan shaped	It contains no muscle and has no action of its own. ⁽⁵⁾	Lift the upper lip vertically, place the frenum into the compound, and then manually mold this area externally by moving the lip while simultaneously applying pressure to control the width of the area. ⁽⁷⁾ Instruct the patient to purse lips	Manually manipulates the tissue of the frenum in the compound to give it freedom to function.
BUCCAL FLANGE	BUCCINATOR	Molded by grasping the cheek between the thumb and fingers and manipulating the tissue outward, downward, and inward. ⁽⁶⁾	Simulates the movement of the buccinator muscle and associated soft tissues.
CORONOID PROCESS AREA	<ul style="list-style-type: none"> CORONOID PROCESS FIBRES OF TEMPORAL MUSCLE 	Have the patient open his or her mouth wide, then protrude and move the mandible to the right and to the left. ⁽⁶⁾	This action develops the distal extent of the denture in the hamular notch and also develops the space between the anterior border of the ramus coronoid process and the tuberosity. ⁽⁶⁾
POSTERIOR PALATAL SEAL AREA	PALATOPHARYNGEUS PALATOGLOSSUS TENSOR VELI PALATINI LEVATOR VELI PALATINI	Instruct the patient to open wide. Hold the patient's nostrils closed with your fingers and instruct the patient to blow through his nose Add an additional layer of compound and insert and ask the patient to swallow. ⁽⁷⁾ Clinically, the levator veli palatini can be tested by asking a patient to say "ah." ⁽⁶⁾	If the muscle on each side is functioning normally, the palate elevates evenly in the midline. ⁽⁴⁾ And a seal is maintained with good retention.

TONGUE AS A MUSCLE

“Half of a person’s beauty comes from their tongue”

Tongue requires more clinical evaluation as they relate to a planned complete denture.

- Size of the tongue⁽⁹⁾
- ❖ Smallness of the tongue may prevent contact with the lingual flange and make maintenance of food on the occlusal table difficult. This would contribute to decreased stability of the complete denture and increased adaptability problems related to its use.

- ❖ More commonly, the tongue hypertrophies because of the failure to replace missing teeth. When confined within a mandibular complete denture, an enlarged tongue exerts a constant dislodging force on it which cause increased difficulties in adaptability of the denture.

- Strength of the tongue⁽¹⁰⁾
- ❖ Lack of teeth encourages the patient to mash food against the alveolar ridges and the palate with the tongue. As in the other muscles of the body, this increased function leads to greater muscular tonicity.

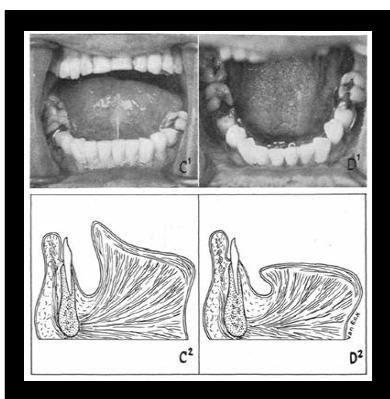
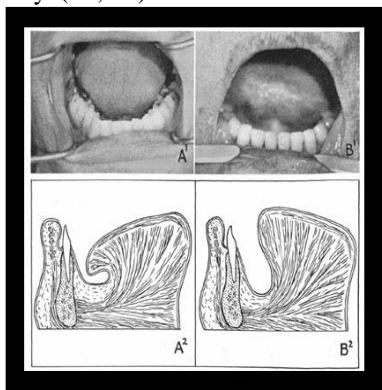
- ❖ When confined later, the strong tongue can easily move a complete denture.
- ❖ The stability of the complete denture will be less than ideal until the tongue has readapted to its intended function and until the patient learns to use the teeth rather than the tongue for mastication.

➤ **Position of the tongue** ⁽¹⁰⁾

- ❖ Wright and co-workers classified the positions of the resting tongue as normal and abnormal. They estimated that 25% of edentulous patients have abnormal or retracted tongues.
- ❖ It is evident from literature that, the prevalence of retracted tongue position is common in completely edentulous condition irrespective of duration of edentulousness. ⁽¹¹⁾

These retractions occur in four different forms:

1. A retraction by which the apex of the tongue curls downward from the mandibular incisors and dorsally along the frenulum, while the radix of the tongue is elevated. (A¹, A²)
2. The apex seems to disappear into the body of the tongue and give it a squared appearance. (b¹, b²)
3. The apex of the tongue curls upward and dorsally from the mandibular incisors. (C¹, C²)
4. The body of the tongue is depressed into the floor of the mouth moving the entire mass dorsally. (D¹, D²)



MUSCLES OF SOFT PALATE

The soft palate is posterior fibromuscular part of the palate that is attached to the posterior edge of the hard palate. It participates in most oral functions, especially velopharyngeal closure which is related to the normal functions of sucking, swallowing, and pronunciation. ⁽¹²⁾ Soft palate plays a vital role not only in normal physiological functions but also during fabrication of prosthesis in various situations like complete dentures, obturators, palatal lift prosthesis, sleep apnea, and so. Correct and exact identification of type of soft palate is of vital significance in diagnosis treatment planning and prognosis ⁽¹²⁾

TYPES OF SOFT PALATE (13)

House proposed three classes of palatal throat form based on the angle the soft palate makes with the hard palate and the soft palate muscle activity that will be necessary to establish velopharyngeal closure.

- In class I, the soft palate is horizontal as it extends posteriorly, requiring minimal muscular activity for velopharyngeal closure allowing more than 5mm of seal area.
- In class III, the soft palate is more acute in relation to the hard palate, necessitating marked elevation of the musculature permitting a narrow seal of less than 1mm.
- In class II type of soft palate contour lies somewhere between class I and class III allowing 1 to 5 mm of seal area depending on the muscular activity of the soft palate.



Fig. 1: Class I soft palate: (a) Hard palate, (b) soft palate, (c) palatal extension of denture

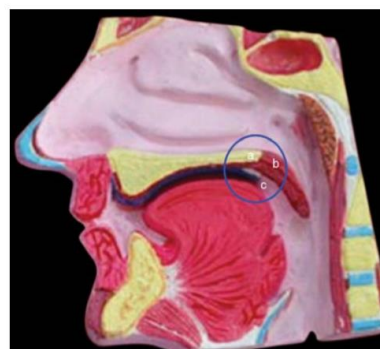


Fig. 3: Class III soft palate: (a) Hard palate, (b) soft palate, (c) palatal extension of denture

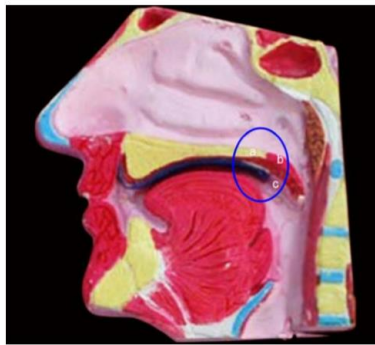


Fig. 2: Class II soft palate: (a) Hard palate, (b) soft palate, (c) palatal extension of denture

MUSCLES AND NEUTRAL ZONE⁽¹⁴⁾

Neutral zone is decided by the activity of various muscles. *Dentures should occupy a position in the mouth where all the forces during function are neutralized.* Otherwise, denture stability will be decreased proportionately to the difference in the amount of the opposing forces.

It's the hub of 8 muscles namely (15)

Orbicularis oris

Zygomaticus major

Zygomaticus minor

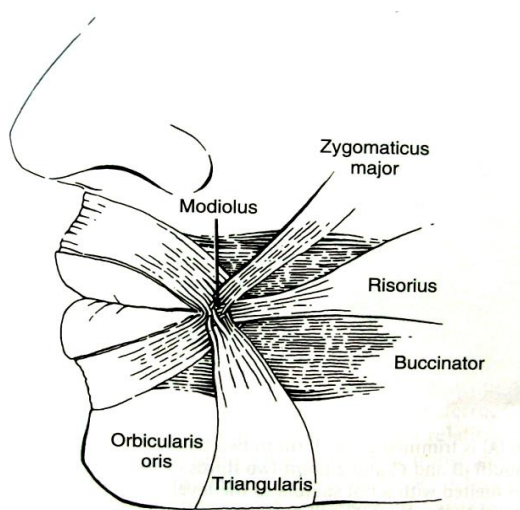
Levator labii superioris

Levator anguli oris

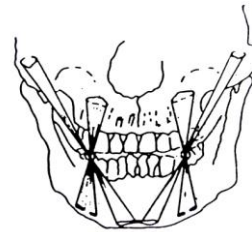
buccinator

Triangularis

Risorius



Muscles form a V-shaped strap that press against the bicuspid region. Denture will be unstable when bicuspid region is too wide.



CONCLUSION

An understanding of the muscles of face is important to successful complete denture construction. These muscles may be observed at work by the dentist when he first views his patient and that patient begins to speak. An understanding of its prosthodontic significance enables the dentist to employ postoperative vision in the treatment planning stage which can minimize denture failures.⁽²⁾

Because of the wide range of movements of the mandible, tongue, and facial musculature, the mandibular denture presents the greatest difficulty in learning to use complete dentures. Researchers have studied mandibular complete dentures and concluded that muscle activity transcended in importance all other factors responsible for retention, especially in relation to the mandibular denture where the residual ridge is highly resorbed.⁽¹⁶⁾

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