https://doi.org/10.46344/JBINO.2022.v11i01.14

MUSCULUS BUCCAE – THE UNSUNG MUSCLE

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ABSTRACT

A successful prosthesis must fulfill the following criteria: being in harmony with the surrounding oral environment and orofacial musculature and preservation of remaining structures, restoring masticatory efficiency; ability to perform during functions like deglutition and speech respiration; and being aesthetically pleasing. Among these criteria maintaining harmony between prosthesis and muscles and preserving the same is of utmost importance and a challenge to the dentist. Buccinator action influences denture fabrication at every step beginning from impression making to jaw relations to teeth setting and finally successful retention, stability and comfortable wearing of the denture. Similarly, a properly constructed denture helps restore the health of the stomatognathic system of which muscles are a part. It enables the muscle to function to its physiological limit and maintain tonicity.

KEY WORDS: Buccinator, Modiolus, Denture, musculomucosal flap.

INTRODUCTION:

Couper and Myot named the buccinator muscle in 1694. It originates from the hyoid arch, i.e., the 2nd branchial arch innervated by the facial nerve. It acts upon the cheek and the angle of the labial commissure. This muscle, defined as skin muscle, has no cutaneous insertion but inserts directly on the mucous membrane.[1]

Buccinator comes from a Latin term for a trumpet player.[2] As in blowing a trumpet, when the cheeks are distended with air, the buccinators compress them and force the air out between the lips.[3] This article describes the role and functions of a buccinator.

DESCRIPTION OF BUCCINATOR:

The buccinator, quadrangular in form, lies more profound than the other facial muscles. Located lateral to the teeth, it forms the lateral wall of the oral cavity. Anatomically, the buccinator is unique. It has three origins. One origin from above is the alveolar process of the maxilla, opposite the molar teeth. Another origin from below is the alveolar process of the mandible, opposite the molar teeth. From behind, the muscle originates from the pterygomandibular raphe, which sits between the buccinator and the superior pharyngeal constrictor muscles Fig.1. The function of the lips is supported by the pattern of insertion of the buccinator. The upper fibres pass into the upper lip to become continuous with the orbicularis oris. The middle fibres converge toward the angle of the mouth and decussate, passing to the upper and lower lips to enhance the sphincter action of the orbicularis oris muscle. The lower fibres pass directly into the lower lip to become continuous with the orbicularis oris.[3]

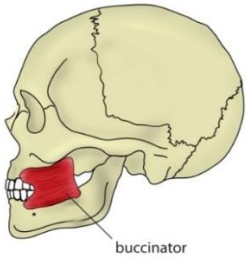

Fig. 1

RELATIONS OF THE MUSCLE:

The superficial surface of the buccinator is covered by the buccopharyngeal fascia and the buccal fat pad. Its deep surface is adjacent to the buccal glands and the mucous membrane of the mouth.

The parotid duct passes forward on the muscle and pierces it to enter the mouth opposite the maxillary second molar tooth. The transverse facial artery roughly parallels the duct, usually lying above it. The buccinator muscle is innervated by buccal branches of the facial nerve (not through the buccal branch of the mandibular nerve, which also lies on its outer surface and sends twigs through it to the buccal mucosa).

The buccinator is an important accessory muscle of mastication. The muscle acts to hold the food between the teeth during mastication and forces food out of the vestibule before swallowing. It also forces air during blowing.[3]

INNERVATION OF BUCCINATOR:

Blood is supplied from three arterial branches: the posterior half from the buccal arterial branch of the internal maxillary artery, the anterior half from the branches of the facial artery, and the buccinator from the small branches of the posterosuperior alveolar artery, a

branch of the internal maxillary artery. Venous drainage of the buccinator is more generous than the arterial supply. All these veins are tributaries to either a posterior main collector such as the pterygoid plexus and the internal maxillary vein or an anterior collector such as the facial vein. Motor innervation of the buccinator muscle comes from the facial nerve. As for sensory innervation, the buccal branch of the inferior maxillary nerve pierces the posterior half of the buccinator muscle. This nerve arborizes extensively on the buccal mucosa.[4]

ROLES OF BUCCINATOR:

Buccinator mechanism:

The presence of a band of musculature surrounding the arch is recognized anatomically. Gray's Anatomy states that except for the tendinous interruption of the pterygomandibular raphe, "The constrictor, buccinator, and orbicularis oris would form a continuous sphincter-like band of muscle.

The electromyographic investigation of the muscles of the "buccinator mechanism" shows that: 1. The orbicularis oris, buccinator, and superior constrictor muscles functionally performed as a unit in the acts of swallowing, blowing, sticking, pronouncing vowels, chewing, and coughing. 2. The functional and anatomical relationships of the orbicularis oris, buccinator, and superior constrictor muscles, i.e., simultaneous contraction of the components of this ring of musculature surrounding the dentition, suggest the potential for a resultant force which should be investigated for its possible involvement in maintenance of equilibrium of the teeth. 3. The buccinator and orbicularis oris play a definite role in beginning the swallow by producing a peristaltic-like wave of contraction originating in the oral cavity and passing pharyngeal. 4. Superior constrictor muscles, normally active in swallowing, were also found to be active in blowing, sucking, pronouncing vowels. coughing, forceful inhaling and exhaling, and retruding the mandible.[5]

Role in salivary secretion:

The buccinator muscle fibres plays a physiological role that extends to the terminal portion of the parotid gland and functional role in salivary secretion. The tortuous luminal structures related to the longitudinal smooth muscle layer of the duct also participate in the control of salivary flux. The valve-like structures could also play a role in the prevention of salivary reflux. Finally, the presence of the terminal ampule, which is associated with the muscle fibres surrounding the parotid duct, could play a role in the localization of sialolithiasis.[6]

Buccinator Musculomucosal Flap:

The buccinator myomucosal island flap (BUMIF) was introduced by Carstens MH et al.,[7] in 1999, is a useful, versatile technique for correcting defects in any part of the oral cavity, with good results and modest morbidity.[8] The buccinator muscle has a rich vascular supply that can be used for flap harvesting. In 1999, Zhao Z et al.,[9] described two different buccinator myomucosal island flaps.

The advantages of the buccinator musculomucosal flap are minimal donor site morbidity, ease of harvesting, and high success rates. On the other hand, the disadvantages include bulkiness, temporary limitation in mouth opening, and lack of keratinized mucosa. The maximum size of the buccinator

musculomucosal flap measures 7 cm long and 5 cm wide, which can be used to cover a medium-sized intraoral defect. Although attention should be paid to some anatomical structures such as the facial nerve and the parotid duct during the flap harvesting procedure, there is virtually no risk of damage if the muscle layer and the orifice of the Stensen duct, which is usually located in the buccal aspect of the maxillary molar region, are correctly identified. Bleeding may occasionally occur but can be easily controlled by electrocauterization. The buccinator Myomucosal flap is used for reconstruction of the tongue, the floor of the mouth, palate, lips, cheek mucosa. [7,10]

Function of The Buccinator Muscle as an aid to denture retention and stabilization

Fish[11] states that the "polished" surface of the denture is "gripped" by the buccinator muscle which aids instability. Craddock[12] concurs with this view. The relatively superior and inferior fibres of the buccinator muscle have a resultant force that tends to raise the upper and depress the lower denture, respectively, thus aiding stability and retention.

Lundquist DO conduct a study on electromyographic recordings of the buccinator muscles in subjects with natural and artificial dentitions states that 1) The muscles on the working side in unilateral chewers contract more vigorously than those on the balancing side in normal opening and closing movements. 2) The buccinator muscle contracts most actively and exerts pressure on the buccal flange only on the working side of unilateral chewers. 3) The action of the buccinator muscle on the balancing side is not felt to be significant in aiding the stability and retention of the dentures in unilateral chewers. 4) Two contractions of the buccinator muscle on the working side were recorded for some subjects tested. The first occurred at the time of the closing masticatory stroke just prior to reopening. The other occurred as the teeth first met the resistance offered by the bolus of food. 5) The various types of occlusions have no effect on buccinator muscle contraction. 6) The buccinator muscle is effective bilaterally as an aid in denture retention and stabilization only if the patient is a bilateral chewer. 7) Alteration of the contour of the buccal aspect of the buccal flange of the dentures has no appreciable variation in the electromyographic recordings. 8) The electromyographic recordings support the theory of the action of the buccinator muscle as described by Fish.[13]

Role of Buccinator in Complete Denture Prosthesis:

Buccinator muscle becomes part of denture bearing area in the lower jaw. Fortunately, the action of buccinator does not dislodge the lower denture directly because the muscle fibres contract in a line parallel to the occlusal plane, and also, they are at right angle to the fibres of masseter. So, when masseter is activated, it pushes the buccinator medially against the denture border in the distobuccal area. This is a dislodging force and the denture should be contoured to accommodate this interaction of muscles. This contour in the denture base is called masseteric groove. The position of the attachment of buccinator muscle in upper jaw determines the vertical height of disto-buccal flange of maxillary denture. The middle fiber of the buccinator muscle

tense anteroposteriorly during mastication to move a bolus of food inward between the opposing posterior teeth and then to press against their buccal surfaces to hold it there as the jaws close in mastication.[14]

Buccinator Role in Modiolus:

Modiolus[14] - ("A HUB OF A WHEEL" - LATIN) - It is a fibromuscular mass formed by the convergence of muscles towards a focus just lateral to the buccal angle. It can be palpated most effectively by using the opposed thumb and index finger to compress the mucosa and skin simultaneously. It is formed by nine muscles. They are divided into two groups 1. Transverse modiolar muscles - Buccinator, Risorius, Orbicularis oris, Incisivus superior & inferior. 2. Cruciate modiolar muscles - Zygomaticus major, Levator anguli oris, Depressor anguli oris, Platysma pars modiolaris.

The contraction of modiolus compresses the corner of the mouth against the premolars so that the occlusal table is closed in front. Food is crushed by premolars and molars, and it does not escape at the corner of mouth. Prosthetically, the functional movements can be made during the border moulding procedure by holding the modiolus between the thumb and the index finger. Modiolus helps in establishing the height of the occlusal plane of occlusal rim. Corners of the mouth are marked on the occlusal rims to provide the dentist and technician with anterior landmarks for the height of first premolars.[14]

The convergence of the muscles of facial expression into the modiolus makes it a muscular knot of considerable strength with a wide versatility of movement up, down, forward and back. Situated as it is at the angle of the mouth, it is in a strategic position to unseat mandibular dentures and sometimes maxillary dentures as well. This may occur if the arch form of teeth and the flange are too wide and restrict the freedom of movement of the modiolus. Hence the lower denture requires to be made narrow in the premolar area so that the pressure of the modiolus may be maxillary dentures taken by the upper denture, due to its greater retention and resistance to lateral movement.[14]

Buccinator Muscle Repositioning:

Alterations of the mucobuccal fold and vestibule are valuable adjuncts in periodontal-prosthetic management. Understanding and proper utilization of recommended procedures will definitely contribute to more favorable and lasting results. Apical repositioning of an aberrant muscle attachment will preserve all important functions of the muscle as well. Instead of restoring suboptimal edentulous areas, which may complicate future hygiene maintenance, pre-prosthetic surgeries should be considered to achieve appropriate ridges for restorations. Bagheri ON and Baghele MO described the apical repositioning of buccinator muscle to achieve the required vestibular depth.[15]

DISCUSSION:

There are several roles of buccinator, Studies shows that small muscle fibres were observed in specimens, and extended to the terminal portion of the duct, suggesting that they act as a dilator of the parotid duct.[6] The buccinator myomucosal island flap is used for intraoral defect closures. The two

myomucosal flaps described are one is based superiorly, supplied by the anterior buccal branches of the distal facial artery, and the second is a posteriorly based flap supplied by the buccal artery and the posterior buccal branch of the facial artery.[9] Kim YK and Yun PY have used a posterior-based buccinator musculomucosal flap in a patient to solve the problem of closure for implant caused by insufficient soft tissue.[4]

Fish has explained how the middle fibres of the musculature of the tongue and the middle fibres of the buccinator muscle hold a bolus of food between the teeth for mastication.[9]

In complete denture prosthesis, buccinator helps in retention of maxillary denture. The buccal surface of the maxillary denture which incline inward from the border towards the teeth, is in direct contact with the lateral forces from contracting buccinator muscle. The force exerted on an inclined plane may be broken down into two components. One component act in the direction parallel to the inclined plane. The other component, called normal force, acts perpendicularly to the inclined plane. So, a greater superiorly directed normal component of the force will help in the retention of the denture.[14]

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