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MUSCLES AND MALOCCLUSION – A REVIEW

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Abstract:
Although bone is the hardest tissue in the body, it is responsive to change when there is alteration in environmental balance. The major factor in this environmental balance is the musculature. The integrity of dental arches and relations of the teeth to each other within each arch and with opposing members are modified by stabilizing and active functional forces of orofacial muscles and the tongue. Aberrations of muscle function seen in oral habits such as thumb and digit sucking, tongue thrusting, mouth breathing, lip sucking and nail biting can and do produce marked malocclusion. Treating malocclusion is gaining more attention among patients in the current decades due to the raising esthetic concern. Also, today's parents are much bothered on the appealing appearance of their children. Comprehensive orthodontic management should not only correct the arch form and teeth, but also involve identification of the possible etiologic factors and an attempt to eliminate the same. So, it is very important to have a knowledge regarding the effect of orofacial muscles and tongue on malocclusion which is emphasized in this presentation
Keywords: environmental balance, orofacial muscles, tongue

INTRODUCTION:

Literature reveals that "growth and maintenance of skeletal unit depends on soft tissue matrix which includes muscles". Tomes Theory in 1873 states that"Perioral muscles and tongue determines position of teeth".Functional Matrix Theory – Melvin Moss , 1962 states that "The origin , form , position, growth and maintenance of all skeletal tissues and organs are always secondary, compensatory and necessary responses to chronologically and morphologically prior events or processes that occur in specifically related non-skeletal tissues , organs or functional spaces"[1].

EQUILIBRIUM THEORY (PROFITT ,1978)[2]

Primary factor in equilibrium is Intrinsic forces by tongue and lips.Stable dentition exists in a state of balance where the net resting pressure of tongue,lips,cheeks and periodontium is zero. "If balance is disrupted, teeth moves until a new state of equilibrium is reached". Malocclusion is the nature's attempt to establish a balance between all morphogenic functional and environmental components. During mastication and deglutition , tongue force = 2 to 3 x more force as lips and cheeks.Net effect is balanced due to tonal contraction, peripheral fiber recruitment of buccal and atmospheric pressure – offset tongue pressure (Winders , 1958)[3].

MUSCLE PATHOPHYSIOLOGY AND RELATED DENTOFACIAL CHANGES:

1)Thumb Sucking Habit :[4]

It has a horizontal vector and a vertical vector of force

Horizontal vector of force acts on palatal aspect of alveolar process & maxillary incisors. This causes lengthening & anterior displacement of anterior maxillary base and proclination of maxillary incisors.

Vertical vector of force causes delay in the vertical growth of anterior maxillary base, hinders eruption of anterior teeth, causes over-eruption of posterior teeth and creates anterior openbite

Muscle pathophysiology and the related dentofacial changes:

Muscle pathophysiology	Dentofacial change
Tongue displaced inferiorly into floor of mouth Contraction of cheek muscles (buccinator)	Narrow maxillary arch High arch palate Bilateral posterior crossbite
Hypotonic upper lip	Proclination of maxillary incisors High lip line
Hyperactive mentalis (to create lip seal)	Retroclination of mandibular incisors Deep mentolabial sulcus
Tongue thrust habit during swallowing	Openbite

2) Tongue thrusting habit[5]

Muscle Pathophysiology	Dentofacial change
Tongue thrusting forward between upper and lower teeth during swallowing	Anterior openbite Proclined maxillary anteriors Proclined or retroclined mandibular anteriors
At rest,tongue lower level	Narrow maxillary arch Posterior crossbite
Mandible stabilised by facial muscles instead of masticatory mus cles during deglutition	Marked contraction of lips and facialmuscles, no contractio n of temporalis during swallowing
Hyperactive mentalis (to create oral seal in open bite)	Deep mentolabial sulcus

3) Mouth breathing habit

Muscle pathophysiology	Dentofacial change
Compensation for reduced airway [6] Prolonged forward posture of head Increased strain on extensor muscles of head Stretching of infrahyoid muscles Inferior and posterior traction of hyoid bone	Downward and backward growth of mandible – adenoid facie s

 Retraction and depression of mandible	
Positioning of tongue downward Tension of buccinator muscle	Narrow maxillary arch High vault palate Posterior crossbite
Abnormal lip function from outside Tongue thrusting	Protrusion of maxillary and mandibular incisors Flaring of incisors Anterior openbite
Lower lip cushions lingual to maxillary incisors (to create o ral seal during swallowing)	Increased overjet

Mouth breathing can lead to either Class II or Class III Malocclusion[7].

- Muscles depress jaw to open mouth, exert backward pressure which displaces mandible distally and retards its growth leading to Skeletal Class II (Bresolin et al,1984)
- Constantly open jaw,low tongue posture causes excessive mandibular growth leading to lack of tongue thrust on palate and upper jaw further causing Sagittal and transverse maxillary deficit ,ultimately resulting in Skeletal Class III (Rakosi & Schilli,1981)

4)Lip sucking & Mentalis habit

Muscle pathophysiology	Dentofacial change
Backward force on lower anteriors and forward for ce on upper anteriors[9]	Proclination of maxillary anteriors Retroclination of mandibular anteriors Increased overjet and overbite Accentuation of mentolabial sulcus

MUSCLES AND THREE CLASSES OF MALOCCLUSION

Class I Malocclusion :

Normal muscle function Abnormal habit leading to Malocclusion can cause compensatory and adaptive muscular activity

Class II Div 1 Malocclusion

True : Abnormal jaw relationship -Muscle activity accentuates existing pattern
Pseudo : Abnormal oral habits -Morphologic changes and Abnormal muscle activity to compensate such as hyperactive mentalis ,hypotonic upper lip and increased buccinator activity
Normal / Reduced overbite causes maxillary incisors to be under influence of orbicularis oris (weak muscle).So,they are less likely to move lingually and there is wedging of lower lip between maxillary and mandibular incisors causing proclination of maxillary anterior teeth

Class II Div 2 Malocclusion :

Normal cheek and lip muscles Forced retrusion of mandible during closure (to compensate for retroclination of maxillary incisors) causes dominant activity of posterior fibers of temporalis and masseter[10]
Increased overbite is present.So,maxillary central incisors are under mentalis activity which is a strong muscle.This causes retroclination of centrals.Orbicularis oris influences maxillary lateral incisors which is a weak muscle and thus there is not much retroclination of laterals [10](Force of Mentalis > Orbicularis oris (Wilson , 1975)

Class III Malocclusion :

Short & hyperactive upper lip and Redundant lower lip
Low tongue posture causes narrow maxillary arch

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