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SOFT TISSUE MORPHOLOGY

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In spite of heredity soft tissues acts as a mould and guide the development of the dento-alveolar structures. The teeth lie in a zone of balance between the soft tissues.

The major soft tissues are the

1. Lips
2. Tongue
3. Cheek

Lips:

1. Position/Length
2. Habit
3. Competence
4. Tonicity
5. Functional abnormality

Position: Normal

Upper lip- extends onto the upper incisal one-third of the upper anterior teeth.

Lower lip- extends onto the lower incisal one-third of the upper anterior teeth

Habit: Usually the lips touch each other lightly or there is interlabial gap about 0-1 mm.

Lips may be

- (a) Habitually together
- (b) Habitually apart.

Tooth-to-lip relationship

For optimal esthetics, it is considered desirable that approximately 2 to 4 mm of the maxillary central incisors be uncovered by the upper lip at rest (in other words, the upper lip should cover roughly 2/3 of the maxillary central incisor crown length at rest).

Similarly, in an esthetically pleasing smile, the upper lip is raised approximately to the level of the cemento enamel junction of the incisors, so that the full crowns of the maxillary incisors are shown.

Excessive gingival exposure on smiling ("gummy" smile) is considered unesthetic, as is inadequate maxillary incisor exposure on smiling ("edentulous" smile). The tooth-to-lip relationship is an important parameter in orthodontic treatment planning, which to a great extent determines the type of incisor movement desired.

- **Lip protrusion**

Anterior position of one or both lips relative to the nose and chin or other facial structures.

- **Lip retrusion**

Posterior position ("flatness") of one or both lips relative to the nose and chin or other facial structures.

Lip exercises

Exercises aiming at stimulating the musculature of the lips, with the objective of achieving a competent lip seal. A key component of functional appliance treatment, stressed by R. Fränkel.

Lip interposition

The habit of placing the lower lip between the maxillary and mandibular anterior teeth, or between the mandibular anterior teeth and the palate (often seen in patients with an increased overjet).

Lip incompetence (Incompetent lip seal)

Excessive separation of the lips at rest.

Cephalometric measurements

- **Lower lip length**

A linear measurement from soft tissue menton to stomion inferius, measured along the true vertical line.

- **Upper lip length**

A linear measurement (in mm) from subnasale to stomion superius, measured along the true vertical line.

Lips may be competent or Incompetent

Competent lips: Lips are said to be competent when they can maintain a lips seal with the muscles of facial expression in relaxed position and mandible in resting (endogenous) posture. With competent lip morphology, the lips are habitually in contact with each other at rest, but they may also remain apart. Thus the competent lip morphology might have the following behaviors:

1. Competent lip morphology with lips together.
2. Competent lip morphology with the lips habitually apart (due to nasal obstruction or sometime with no apparent cause.)
3. Lips are competent but protruding incisors prevent the lips from coming together (potentially competent lips). In this case, when the upper incisors are retroclined and overjet reduced, that will produce anterior seal at rest position in front of the incisors.

INCOMPETENT LIP

When the lips remain parted during the relaxed position of muscle of facial expression & mandible is in rest position it is called incompetent lip.

It may be due to –

- Abnormal morphology of lips.

It is essentially due to disproportion between the soft tissue & bony frame work.

Abnormal morphology which causes incompetent lip –

1. Lips may be abnormally short & thus inadequate to maintain lip seal.
2. Lips may be normal size but there may increase vertical distance b/w their attachment.
3. Because of increased horizontal distance b/w the lips they cannot maintain a lip seal at rest.

Abnormal behavior of incompetent lip –

1. They may be habitually held together.
2. They may remain habitually apart.

Effect:

1. Moderately incompetent lip – contraction of the circumoral muscles to maintain the lip seal – retro lining and crowding of incisor teeth.
2. Sometimes incompetence is great – contraction of cacuminal muscle only, cannot maintain lip seal – Habit postures of lips, tongue &

mandible will take place to produce ant oral seal, this posture is called “adaptive habit posture – produce malrelationship of labial segment.

3. Severe incompetence – oral seal is produced by contact between lower lip & tongue – procline the upper incisors.

On a class II dental base the lower lip may lie completely behind upper incisors – proclination of upper incisor and retroclination of lower incisors also produce increased overjet & incomplete overbite.

Anterior oral seal:

It is instinctive for an individual to maintain an anterior oral seal to allow nasal respiration and to prevent escape of saliva. The instinctively and reflexly produced sealing off of the anterior end of the digestive tract, is called the **anterior oral seal**. As will be found later, this almost invariably involves a habit posture of the tongue.

It will involve habit posture of lips when the lips are incompetent, and habit posture of the mandible when the incisor relationship is not normal.

Adoptive habit postures

Practically the tongue, mandible and lips, rest and function as an integrated unit. These postures to maintain an anterior oral seal have been called

‘adoptive habit postures’ (Ballard 1962) i.e. instinctively or reflexly produce and maintained posture (with active muscles contraction) in response to functional need. These adoptive postures and behaviors may produce mal relationship of the labial segments.

When the lips are moderately incompetent, the lips seal may be produced by sustained contraction of the circumoral muscles. In this case, the isometric and isotonic muscle contraction required producing lip seal is within physiologic economy and such a habit posture is maintained by sensory feed-back. This has the effect of retroclining and crowding of the incisor teeth.

Where the lips are rather more incompetent, the lip seal cannot be maintained comfortably as the muscle effort required to do so would be too great. In such a case the mandible assumes a forward habit posture to facilitate approximation of lips comfortably.

Where the lips are even more incompetent, and even this abnormal posture cannot maintain an anterior seal. Here, the oral seal is produced by the contact between the lower lip and the tongue in addition to a posterior oral seal by contact between the soft palate and dorsum of the tongue.

In case with gross lip incompetence, it may be necessary both to posture the mandible forward and to make lip to tongue contact in order to produce the anterior oral seal.

The above are just a few examples of the infinite variations of behavior pattern by which an anterior oral seal may be achieved, not only at rest, but also in speech and swallowing. It should be realized that, incompetent lip morphology is not due to mouth breathing or nasal obstruction as used to be thought and individuals with incompetent lips contact between the dorsal surface of tongue and soft plate (posterior oral seal).

It should be recognized that incompetent lips cannot be made competent by exercise. However, as a child grows, he tends to keep his lips together by subconscious muscular effort provide the degree of incompetence is not too great.

Strap-like lower lip

When the lips especially the lower lip retracts excessively during expressive behaviors is called the strap like lower lip.

this may effects the position of anterior teeth.

Effects:

The effects depend to some extent on the relationship of the lower lip (this type) to the incisors.

i) When the lower lip line is low – not controlling the upper incisors – results

Anterior segment of the mandibular alveolar process become at a retruded position on its base with protruded chin.

Lower incisors may also be retroclined.

ii) When lower lip line is associated with any degree of post normality – result.

Produce class II div-1 incisor relationship.

iii) When lower lip line is high & of firmly retracting type – may affect the upper incisors which depend on and – post relationship of dental base – such as –

Mild to moderate class II dental base – result retrocline the upper incisor producing a class II div-2 malocclusion

On severe class II dental base –

- And oral seal is produced by the tongue & lower lip contact with the lower lip acting behind the upper incisors – result -

- Proclination of upper incisors in over jet thus may produce a severe class II div-1 M.O.

Everted lips

Lips are often full and everted. This type of lip morphology is commonly associated with proclination of both the upper and lower labial segments (bimaxillary Proclination) and such proclination of anterior segments are difficult to treat successfully.

FAVOURABLE LIP MORPHOLOGY

Position / length

Compare with teeth position.

Upper lip – Extends on to the upper incise 1/3 of the upper ant teeth

Lower lip - Extends on to the lower incise 1/3 of the upper ant teeth

Habit: usually lips touch each other likely or there is an inter-labial gap about 0-1mm.

Lips may be < habitually apart or

habitually together

Competent lip:

The lips are set to be competent if they touch each other likely or there is inter labial gap of 0-1mm.

Definition: A lips seal in which is maintained with minimum muscular effort of the circumoral musculature when the mn in the rest position.

Tonicity: Normal lip – Normal tonicity with adequate muscular support.

CHEEKS

The cheeks have moulding effects on the buccal teeth as the lips have on the anterior teeth. The effects of cheek and lips are counteracted by the tongue. Atypical swallowing patterns have been described in which the tongue thrusts forward and provide less support to the buccal teeth. This will cause narrowness of the arch as the cheek pressure is not adequately counteracted by the tongue. Similarly negative pressure is created in the mouth during thumb sucking which may also cause narrowness of the arches.

TONGUE

The size position and behavior of tongue is important in determining the shape and position of dental arches.

A large tongue (e.g. macroglosia), and one which is positioned forward due to any functional need may cause bi-maxillary proclination of anterior teeth with spacing. The reverse condition may occur with a small and backwardly placed tongue.

Tongue which is held very high in the roof of the mouth may produce wide upper arch and a narrow lower arch causing cross bite with the tongue resting on the upper surfaces of the lower cheek teeth.

Two postures of tongue have been described by Ballard:

- (a) The resting or relax posture and
- (b) The habit or adaptive posture.

In relax posture, (which may be noted by breaking the anterior oral seal), the tongue lies on the floor of the mouth. This tends to produce a posterior oral seal by its contact with soft plate.

In habit posture, the tongue assumes a forward position in contact with the incisors and the cheek teeth to produce or reinforce anterior oral seal and to seal off the floor of the mouth to control saliva flow into the anterior part of dorsum in preparation for swallowing (seal posture of tongue).

Where the lips are incompetent and habitually apart and where the overjet is large (associated with Class II sk. pattern), an oral seal between the tongue and lower lip will be instinctively adopted. This will be associated with proclination of upper incisors and incomplete overbite.

Similarly an anterior open bite or incomplete overbite is very often associated with a tendency to thrust the tongue forward to close the gap between the upper and lower teeth during speech and swallowing, and to achieve the anterior oral seal. This adaptive posture of tongue will revert to a normal position when the dental abnormality is corrected.

But rarely, there may be an active tongue thrusting activity during swallowing and speech which may actually cause certain abnormalities such as proclination of the incisors, grossly incomplete and reduced overbite or even an open bite. This type of tongue-thrust appears to be inherent or endogenous and is often associated with abnormality of speech (sigmatism). These cases are difficult to treat.

**Soft tissues i.e. lip, cheek and tongue, act as a mould into which the dento-alveolar structures develop. As soon as the teeth erupt, they come under the influence of certain environmental forces. These forces may be divided as:

a) Bucco-lingual forces: The lips and cheeks provide buccal force and the tongue provides the lingual force. They provide passive forces at rest (muscle tones) and active forces during function i.e. during swallowing, mastication, speech, expression etc.

b) Mesio-distal forces: These forces are mainly exerted by adjacent teeth. Teeth also have an inherent mesial force in addition to eruptive force.

c) Occlusal force: Occlusal force is provided by the opposing teeth during occlusion. It is therefore important to study the morphology and behavior of the lip, cheeks and tongue and their effects on dental arches and occlusion.

Tongue thrust

A thrust of the tongue between the teeth during various activity of tongue such as swallowing, speech etc is known as tongue thrust.

Types:

1. endogenous tongue thrust.
2. Adaptive tongue thrust.
 - I. Anterior.
 - II. Lateral.

Endogenous tongue thrust:

Endogenous tongue thrust is an inherited atypical pattern of tongue movement due to neuromuscular activity. Its control is very difficult due to strong intensity. It is often associated with abnormality of speech.

Adaptive tongue thrust:

Is a less vigorous thrust of the tongue during the various activity of tongue that is according to functional need? It has less thrust because it occurs in the maintenance of an anterior oral seal to close the gap in between upper and lower incisors in case of Sk paltern class II & incompetent lip posture.

Effects of tongue thrust:

1. Anterior open bite.
2. Posterior open bite.
3. Unilateral cross bite.
4. Bilateral cross bite.
5. Increased over jet.
6. Bilateral proclination.
7. Incomplete & reduced overbite.
8. Spacing of teeth.
9. Narrowing of the upper arch.
10. Disproportion of dental base.

Treatment:

1. Tongue guard to prevent tongue thrust.
2. Habit practice.

ABNORMAL LABIAL FRENUM

Abnormal labial frenum is commonly seen in upper arch. It has the following

Characteristic feature

- Frenum is thick wide & fleshy than normal.

- It passes between the central incisions to run in to the incisive papilla, from the lips.
- The palatal mucosa blanches on lifting the upper lip.

Radio graphically – A ‘v’ shaped notch can be seen in the crest of the alveolus, which indicates persistence of fibrous tissue in inter-premaxillary suture seen as a dark line.

Effects –

- Median diastema (rarely) associated with – crowding in ant segment that is in region.
- Aesthetically ugly.

Treatment –

- Wait for the eruption of upper lateral incisors & canine – in most cases the diastema will close when these teeth erupt.
- If after eruption of lateral incisors & canine – Diastema remains – it is due to abnormal frenum then – frenum is removed together the fibrous tissue of the inter – maxillary suture and closure of the diastema mechanically.

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Dedicated To

My Mom, Zubaida Shaheen
My Dad, Md. Islam
&
My Only Son
Mohammad Sharjil

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