

Non-surgical lip enhancement: systematic preoperative assessment

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Detailed knowledge of the anatomy is important prior to any surgical or non-surgical intervention in this complex area. **Dr Samizadeh** takes us through her pre-procedure analysis.

The most frequent location for facial volumising procedures is reported to be the lips [1-4]. The lips are a key aesthetic component of the face, and have significant functional roles in: mastication, speech, phonetics, oral seal, a soft tissue boundary for dentition, facial aesthetics, facial expression, tactile sensory organ and are also an erogenous zone [5-7].

Lip augmentation can be carried out surgically or non-surgically, with the latter becoming very popular in recent years. Various types of dermal fillers are commercially available, amongst which hyaluronic acid is currently the most widely used material due to its degradability and good safety profile. Indications for lip augmentation include the following [8]:

- Medical
- Aesthetic
 - Enhancement
 - Correction of lip symmetry
 - Enhancement of volume and fullness
 - Improvement of lip definition
 - Rejuvenation
 - Ageing
 - Genetics.

The perioral region and the lips have a complex anatomy. Hence, knowledge and understanding of the precise structure of the subcutaneous tissue, vascular supply and changes which occur with disease and

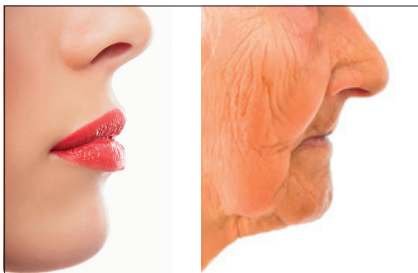


Figure 1: Changes in lip morphology with ageing: Loss of fullness and projection, increased upper lip length, flattening and widening of the cupid's bow, loss of philtrum columns, perioral rhytids, loss of vermillion border, lengthening of the cutaneous upper lip. Source: Shutterstock

ageing (Figure 1) are required for carrying out safer non-surgical enhancement of the lips. The following article aims to provide overall guidance on these topics; however, it is beyond the scope of this article to thoroughly discuss all of these factors in depth. For a thorough understanding of evidence-based findings and systematic analysis, the interested reader should refer to Dr Naini's papers and his reference book *Facial Aesthetics: Concepts and Clinical Diagnosis*.

Youthful lips are characterised by [5,9]:

- Fullness of upper and lower lips
- Positive vector of the oral commissure
- Well-defined philtrum columns
- Increased visibility of the wet-dry border
- Lip curvature on lateral view
- Central cutaneous lip: anterior projection
- Less acute angle from the commissure to the peak of the cupid's bow.

Morphological changes with ageing include [5,10,11]:

- Loss of fullness
- Loss of projection
- Increased upper lip length
- Flattening of the cupid's bow
- Widening of the cupid's bow
- Flattening and loss of philtrum columns
- Reduced vermillion exposure
- Reduction and loss of vermillion border
- Lengthening of cutaneous upper lip
- Increased resting tone of the muscle
- Development of perioral rhytids
- Lower lip may develop ptosis, resulting in lower dental show.

Assessment

It is essential to assess the parameters, units and relationships between units and subunits that result in ideal proportions and an attractive smile. A thorough understanding and assessment process will result in a better understanding of the aesthetics of the lips and consequently a more successful treatment plan and outcome. Patients should be examined in natural head position at rest and while



Figure 2: Computed tomography (CT) scan of facial bone 3D, case of facial asymmetry, a 56-year-old female. Maxilla, mandible and the dentition are the skeletal support for the soft tissues of the midface, lower face and the lips. Source: Shutterstock

animating. The maxilla, mandible and the dentition directly and indirectly affect the position of the lips [13] (Figure 2). In addition, it is paramount to keep in mind that the lips are only one factor of an attractive smile.

The components of an attractive smile that should be examined prior to treatment [14] (Figure 3):

- Skeletal components
 - The relative position of the mandible to maxilla
 - The dentitions, gingivae and alveolar bone
- Soft tissue factors
 - The lips
 - Soft tissue morphology
 - Prominence of the chin
 - Prominence of the nose.

Skeletal components

The relative position of the maxilla to mandible plays an important role in facial profile aesthetics, and those of the lower face and lips. For example, discrepancies between the maxilla and mandible can



Figure 3: A young man with well supported lips and an elder edentulous gentleman with lack of support for the upper and lower lips. Source: Shutterstock

result in a concave or convex facial profile. Furthermore, a retrognathic mandible or maxilla can make lip seal difficult [5].

Dentoalveolar components

The inclination of the maxillary and mandibular incisor dentition and dentoalveolar inclination (distance of the dentoalveolus to the respective lip) directly affect the soft tissue profile of the lips. The dentoalveolar protrusion and retrusion is different from maxillary or mandibular retrusion and protrusion. As an example, protrusion of the dentoalveolar can result in disproportionate prominence of the lip. Proclination of the upper teeth can have the same effect on the lip, in particular, if the lip is not thick. In the presence of a true sagittal deficiency of the mandible, the lower lip is everted and hides behind the maxillary incisors, and the mentolabial fold appears accentuated [5].

Dr Farhad Naini has published an ideal and systematic clinical evaluation of the lips [5]. This is recommended to be adopted by all aesthetic practitioners prior to treatment planning and execution.

The acronym LAMPP can be used (Dr Farhad Naini) [5]:

- L: Lip lines
- A: Activity (function)
- M: Morphology (form)
 - Lip height
 - Lower lip / chin height
 - U and L vermillion height
 - Lip thickness
 - Lip contour and posture
- P: Posture
 - Normal muscular tone without excessive muscle contraction at rest
- P: Prominence
 - In relation to the nose and the chin.

Lip lines

The vertical position of the lips relative to the anterior (front) teeth determines the lip lines. In an ideal situation, the upper lip covers the upper anterior teeth, exposing only 2-3mm of the incisal edges and the lower lip covering the lower teeth completely. Lip closure is done with little to minimal contracture. Excessive exposure of the upper anterior teeth and the gums can result in the appearance of a 'gummy' smile. A high or low lower lip line can result in retrusion or protrusion of the upper incisor teeth [5]. A high lower lip line can result in more eversion of the lower lip in comparison to the upper lip and a deep labiomental angle.

Lip activity

Examining lip function at rest and during animation is critical, in particular when treatment planning for lip enhancement. Hypertonicity or hypotonicity of the lips can affect the choice of dermal fillers. In hypertonic lips, there is higher chance of nodule formation if the chosen hyaluronic acid dermal filler has high cohesivity and poor tissue integration. In addition, displacement of the product may also be an issue. In cases of underlying deformity (dentoskeletal), it would be preferable to refer the patient for correction that allows normal lip function [5]. The anterior oral seal should also be examined. Exaggerated mentalis muscle contraction for an anterior

oral seal would affect the position of the upper and lower teeth and hence the soft tissue morphology of the region [5]. The dentoskeletal relationship affects all above parameters.

Lip morphology

Lip morphology can be examined by analysis of the following parameters while keeping sexual dimorphism and ethnicity in mind [5]:

- Lip height
- Upper and lower lips
- Lower lip / chin height
- Ratio of upper lip to lower lip / chin height
- Interlabial gap (gap between the lips at rest)
- Upper and lower lip vermillion height

Lip thickness

Lip thickness is directly associated with lip prominence and is significantly influenced by ethnic background. Unlike thick lips, thinner lips usually more readily follow the teeth and jaw movements. Lip thickness can be measured from the labial surface (front) of the upper incisors to the vermillion border of the lip [5].

Lip contour

Lip contour should be examined in frontal and profile views to analyse the anterior lip curvature and lip inclination. Lack of dentoskeletal support can result in reduced / diminished or reverse upper lip curvature [5].

Lip inclination

The upper lip inclination depends on various factors, including the inclination of the upper (maxillary) incisors, the tonicity and thickness of the soft tissue of the upper lip, and also on the space between the dentoalveolus and the mucosal surface of the lip. This inclination varies with age, sex and ethnicity [5,15] and plays an important role in facial profile attractiveness [15,16]. Lower lip inclination is also determined by hard and soft tissue factors including the morphology and posture of the lip, inclination of the lower incisors, and the mandibular dentoalveolus [5].

Lip posture

Lip posture refers to the lip posture and lip seal in natural head position in repose. This will determine the position of the lips at rest and also if the patient has a complete

“Examining lip function at rest and during animation is critical, in particular when treatment planning for lip enhancement.”



Figure 4: Skeletal components including the maxilla, mandible, dentoalveolar, and the dentition provide support for the lips. Superior and inferior labial arteries have a highly variable course and can change layers as they travel through the lips. Source: Shutterstock

lip seal (can close lips together without excessive contraction of the prioral muscles) or an incomplete lip seal [5,17].

Lip prominence

In profile, the prominence of the lips can be assessed relative to the prominence of the nose and chin. The prominence of the lips can vary due to soft tissue factors such as lip thickness, dentoalveolar factors such as position of the incisor teeth, or skeletal factors [5].

Smile analysis

Smile analysis is an important stage in pre-treatment assessment. An aesthetic smile is dependant on various factors including lip aesthetics (lip lines, lip-maxillary incisor relationship, dynamic upper lip curvature), symmetry and curvature, and the dentition (alignment of the transverse and sagittal occlusal plane, dental midlines, buccal corridors, inclination of the maxillary and mandibular teeth). Assessment should be carried out in both frontal and profile views [5].

Vasculature

The upper lip is mainly supplied by the superior labial artery. Other arterial branches supplying the upper lip include the subseptal arteries and the subalar arteries [18]. The main arterial supply of the lower lip is the inferior labial artery with other arterial branches supplying the lower lip including the horizontal and vertical labiomental arteries [18,19]. It is important to keep in mind that the superior labial artery and the inferior labial artery are absent in some cases. The course of these arteries can be tortuous and highly varied and inconsistent between individuals [20].

Available studies report that the superior labial artery and the inferior labial artery mainly run in the submucosal layer and are not likely to be found subcutaneously (Figure 4). These vessels change layers throughout their course and the superior labial artery is found superficially in the midline [11]. The anatomical heterogeneity in the vascular supply of this region impacts the ability to draw and use landmarks to recommend safe injection depths.

A word of caution

Vascular complications can result from intravascular injection or vascular compression. In rare and severe cases, retrograde injection from the labial arteries to the ophthalmic arteries can result in visual disturbance and blindness. This serious complication is life-changing and practitioners should take all measures possible to prevent its occurrence. The pressure, speed and amount of dermal filler injected play a role in severity of the complications if dermal filler is inadvertently injected intravascularly [21]. Furthermore, although cannulae above 27G reduce the risk of intravascular injection, the risk is not completely eliminated.

Tips to avoid unnatural looking lips:

- Avoid augmenting one site or one lip only.
- Intramuscular injections are prone to dislocation by constant muscle movement, and may cause lumping.
- Do not inject a bolus greater than 0.1ml per injection.
- Avoid needle injections in the deep muscular plane.
- Avoid forceful insertion of cannula (usually done to overcome resistance in the muscular plane).
- Injection to be carried out above the orbicularis oris muscle.
- Filler should not be injected deep into the muscle layer.
- Filler should not be injected close to the mucosal side.

The lips represent an important area in facial aesthetics and a detailed knowledge of the anatomy with a thorough analysis of the structure is important prior to initiating any form of surgical or non-surgical intervention.

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