Mini and Micro Esthetics in Orthodontics: Review on Clinical Considerations in Orthodontic Diagnosis

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ABSTRACT:
The concept of esthetics has been slowly and steadily gaining momentum. From the past two decades, interest in esthetics from orthodontists, medical professionals & the general population has increased dramatically & certainly continues to rise. Orthodontics plays a pivotal role in enhancing the esthetics of an individual. The contours of the face reflect the underlying facial skeleton & inevitably affect the facial soft tissues. Orthodontic diagnosis & treatment planning is in a period of remarkable change, from the former emphasis on dental & skeletal components towards the soft tissue paradigm in which the primary goal of treatment is to obtain best possible adaptation & proportions of soft tissues of face & mouth & the secondary goal is functional dental occlusion. This article intends to present mini and micro esthetical considerations in orthodontic treatment to explore the new concepts that underlie clinical application of the soft tissue paradigm.

Keywords: Aesthetics, Clinical considerations, Diagnosis, Proportions.

INTRODUCTION:
From the past two decades, interest in esthetics among Orthodontists, Medical Professionals and the general population has increased dramatically & will certainly continue to rise.1 The 18th century philosopher Alexander Baumgarten, established esthetics as a distinct field of philosophy and coined the term, “esthetics” which is derived from the Greek word, “aesthesis”, which connotes sensory perception of beauty and the beautiful. The philosopher Immanuel Kant (1790) said,“ beautiful is that which pleases universally without a concept”.2 Orthodontics plays a pivotal role in enhancing facial esthetics of an individual. The contours of the face reflect the underlying facial skeleton & inevitably affect the facial soft tissues. There has been a transition in Orthodontic diagnosis & treatment planning towards the soft tissue paradigm in which the primary goal of treatment is to obtain best possible
adaptation & proportions of soft tissues of face and mouth and the secondary goal is functional dental occlusion.3

One of the major goals of Orthodontics is to enhance anterior tooth display during speech and smiling.4

Mini and Micro Esthetics in Orthodontics are the considerations carried out during and at the end of orthodontic treatment to enhance the cosmetic appearance by improving the smile of the patient.5

Mini Esthetics consideration:
Includes:-
1. Smile types
2. Smile arc
3. Buccal corridors

Micro Esthetics Consideration
Includes:
1. Tooth proportions
2. Connectors area & embrasures
3. Tooth shade & color
4. Gingival height, shape & contours

MINI ESTHETICS CONSIDERATION

Smile:
Smile is a curve that sets everything straight - Phyllis Diller
Facial attractiveness is defined more by the smile than by the soft tissue relationships at rest.

A

Smile is a very important and positive social behaviour for human beings. Studies have shown that infants moods and responses to the environment can be influenced by parent’s smiles. Also recent research with functional magnetic resonance imaging (FMRI) technology suggests that adults actually respond neurologically to an attractive and happy face as if it were a reward stimulus.1 So no wonder, smile is attributed as the universal language! In 1862, Duchenne de Boulogne,5 a French anatomist wrote: “The emotion of frank joy is expressed on the face by the combined contraction of the zygomaticus major muscle & the orbicularis oris. The first obeys the will but the second is only put in play by the sweet emotions of the soul...”

Smile has been classified into many different ways, few are mentioned below:

Smile types involving different anatomic presentation of the elements of the display zone can be classified as: Social smile / posed smile and Enjoyment smile / unposed smile.6

Social smile / posed smile:
The social smile is reproducible and is the one that is presented to the world routinely. It is voluntary, unstrained and has static facial expression. (Figure 1A)

A

Figure 1: A) Social smile, B) Enjoyment smile

B
Posed smile does not demonstrate happiness, is highly variable, and is not reproducible. Facial muscles surrounding eyes do not contract in social smile.

**Enjoyment smile / unposed smile:**
This is an emotional smile which varies with the emotion being displayed. Involuntary, Dynamic, Natural and expresses authentic human emotions. Unposed smile shows crinkling around eyes as orbicularis oculi contract and corners of the mouth are usually brought upward and backward. (Figure 1B)

Social smile is the focus of orthodontic diagnosis. Smile types depending on Incisor & gingival display has been distinguished into 3 type by Anthony H. Tjan in 1984,7
- Low incisor display
- Average incisor display
- High incisor display

**Low**→ Less than 75% of maxillary incisor is displayed during a full smile. This type is seen in 20% of the population and is not an attractive characteristic of smile. (Figure 2A)

**Average**→ Most frequent type of incisor display. Seen in 70% of young adults population and reveals 75-100% of upper incisors display. More tooth display gives a more feminine & youthful smile.8 (Figure 2B)

**High (Gummy Smile)**→ Reveals the complete cervicoincisal length of upper incisors with a contiguous band of gingiva, seen in 10% of population. (Figure 2C)
Dental professionals have been conditioned to see a “gummy smile” as undesirable, but some gingival display is certainly acceptable, and is even considered a sign of youthful appearance. A gummy smile is often more esthetic than a smile with diminished tooth display. Gummy smile is usually greater with younger age group which lessens as the person grows older thus decreasing the incisor and gingival display during rest and smile.9 This is because as age advances upper lip coverage tends to increase.

Excessive gingival exposure during smile can be corrected by orthodontic intrusion, orthognathic surgery to move the maxilla up, & implant anchorage to intrude maxillary teeth. But over-doing intrusion of anterior teeth makes the smile less attractive & patient looks older.3

Figure 2: A) Average smile, B) Low smile, C) Gummy smile
If the tooth display is inadequate, elongating the upper teeth improves the smile, makes patient look younger. This can be achieved by extrusion mechanics with arch wires, judicious use of class II elastics to take advantage of their tendency to rotate the occlusal plane down anteriorly and anterior vertical elastics. In patients with maxillary deficiency rotating the maxilla down in front as it is advanced surgically can improve smile esthetics.³

The amount of proclination of maxillary incisors can affect how much they are displayed at rest & on smile. Flared max incisors tend to reduce incisor display & upright maxillary incisor tend to increase incisor display.⁹

**Smile arc (Smile curve):**

Smile arc is defined as the relationship of the curvature of the incisal edges of maxillary anterior teeth to the curvature of the lower lip during a social smile.¹⁰

Smile arc can be of 3 types:
- Parallel (Consonant) smile arc
- Straight (flat) smile arc
- Reverse smile arc

The parallel smile arc has the curvature of the maxillary incisal edges parallel to the curvature of the lower lip upon smiling and the term consonant (ideal) is used to describe this parallel relationship. (Figure 3A)

Goldstein¹¹ referred the consonant smile as “youthful smile”. A nonconsonant, or flat smile arc is characterised by the maxillary incisal curvature being flatter than the curvature of lower lip during smile. (Figure 3B)

Reverse smile arc is the one where canines are lower than the incisors in the maxillary arch and the arc formed by the maxillary anterior teeth is reverse in relation to lower lip curvature during smile. (Figure 3C)

The characteristics of the smile arc must be monitored during orthodontic treatment because it is surprisingly easy to flatten during orthodontic treatment procedures. Obtaining and maintaining a proper smile arc requires proper bracket positioning during orthodontic treatment. The traditional guideline for placing brackets is based on measurements from the incisal edge, so that the central incisor brackets are placed at the middle of the clinical crown, lateral incisor, 0.5mm closer to incisal edge and canine at the same level as central incisors.¹⁰Flat smile arc & reverse smile arc can be improved by placing the central incisor brackets more gingivally or by giving a step bend in the archwire, to
bring about extrusion of maxillary incisors.\textsuperscript{10}

**Buccal Corridors:**
Buccal corridors refers to the distance between the maxillary posterior teeth (especially premolar) and the inside of the cheek. This is of interest to Prosthodontists & more recently to Orthodontists. This was first introduced by Frush and Fisher,\textsuperscript{12} which defines the transverse dimension of the smile and is referred to in terms of “broadness of the smile”. (Figure 4)

![Figure 4: Buccal corridor](image)

Excessively wide buccal corridors have been referred to as “negative space”, which can be reduced orthodontically by transverse expansion of the maxilla.\textsuperscript{9} Esthetically, a broad smile is considered to be more attractive than a narrow one, but too broad a smile with no buccal corridor is also unesthetic.\textsuperscript{3}

**MICRO ESTHETIC CONSIDERATION INCLUDES**
- Tooth proportions
- Connectors area & embrasures
- Tooth shade and color
- Gingival height, shape and contours.

**Tooth Proportions:**
- **a) Width relationship:**
  An illustration of golden proportion shows that the ideal tooth width proportions from the frontal view is: 1.618:1.0:0.618. (Figure 5)

  ![Figure 5: Golden proportion](image)

  In an attractive smile, the apparent width of the lateral incisor is 62% of the width of Central incisor, width of canine is 62% of the width of lateral incisor and 1st premolar is 62% of the width of canine.\textsuperscript{2} The apparent width of maxillary anterior teeth on smile and their actual mesio-distal width, differ because of the curvature of dental arch. This recurring 62% proportion also appears in other relationship in human anatomy and is known as Golden Proportions.\textsuperscript{2} It is an excellent guideline in day to day practice in finishing cases when lateral incisors are disproportionately small or are missing.

- **b) Height/width relationship**
  The width of tooth should be 80% of its height. (Figure 6) If the height is less or width is more the tooth appears squarish. If the height is more and width is less, tooth appears tapered.\textsuperscript{13}

  ![Figure 6: Height/width proportion](image)

  Extensive changes in tooth proportions are needed when one tooth is to substitute for another and the most frequent is the
substitution of maxillary canine for congenitally missing lateral Incisor.

**Connector area and embrasures:**
Morley & Eubank recently introduced the term connector area as a useful tool and a visual goal to optimize smile esthetics in dental patients.14

Connector areas are larger, broader areas than the contact points between teeth and can be defined as the zone in which two adjacent teeth appear to touch.

The most esthetic relationship of connector area between the maxillary anterior teeth is referred to as the 50-40-30 rule.13 (Figure 7) This rule defines the ideal connector area between the two maxillary central incisors as 50% of their clinical crown length, the ideal connector area between central and lateral is 40% of central incisor clinical crown length and between lateral and canine it is 30% of clinical crown length of central incisor.

![Figure 7: Connector area](image)

The most important connector area is the one between two maxillary central incisors and should be maintained in orthodontically treated cases.

The embrasures (the triangular spaces incisal & gingival to the contact) ideally are larger in size than the connectors and the gingival embrasures are filled by the interdental papillae.

Short interdental papillae leave an open gingival embrasure above the connectors called “black triangles” which give an unesthetic appearance of the teeth during smile.14

In adults, they arise due to loss of gingival tissue but when crowded and rotated maxillary incisors are corrected orthodontically, the connectors move incisally and black triangles may appear. Reshaping of teeth by orthodontic root paralleling and flattening of the mesial surfaces of the central incisors, followed by space closure, will lengthen this contact area and move it apically toward the papilla and correct the black triangles.14

**Tooth Shade & Color:**
Aging brings about changes in the tooth color and shade. In young age teeth appear lighter and brighter. As age advances the teeth appear darker & duller. This is due to the formation of secondary dentin as pulp chambers decrease in size and thinning of enamel leads to decrease in its transparency and a greater contribution to darker shade.2

A normal progression of shade changes from midline posteriorly is an important contributor to an attractive & natural appearing smiles. The maxillary central incisors tend to be the brightest in a smile, lateral incisor less bright & canines the least, 1st and 2nd premolar are lighter and brighter than the canines and closely match lateral incisors.2

**Gingival height, shape & contours:**
Proportional gingival height is necessary to produce a normal & attractive dental appearance. The central incisor has the highest gingival level, lateral incisor is 1.5 mm incisal and canine is at the same level as central incisor. A difference of more than 2 mm in the gingival height is obvious. This is important in finishing all
orthodontic cases and also when tooth substitutions are planned.\textsuperscript{13}

Gingival shape refers to curvature of gingiva at the margin of the tooth. (Figure 8)

![Figure 8: Gingival height, shape and contours](image)

According to the accreditation criteria for the American academy of Cosmetic Dentistry “The shape of maxilllary lateral Incisor and mandibular incisors is symmetrical and half oval. Shape of maxillary centrals and canines are more elliptical and asymmetric”.\textsuperscript{13}

Gingival Zenith is the most apical point of gingival tissue and should be located distal to the longitudinal axis of maxillary centrals and canines while zenith of maxillary lateral and mandibular incisor should coincide with their long axis.\textsuperscript{13}

Correcting the gingival contours removes the excess gingival covering the clinical crowns and helps improve display of teeth and improves gingival contours and shape. This is carried out with gingivectomy procedure.

Gingival contouring can now be carried out effectively with the use of a diode lasers.\textsuperscript{15}

These concepts of smile esthetics are not new, but are too often overlooked in orthodontic treatment planning.\textsuperscript{14} In summary, an optimal smile is characterized by an average incisor display, consonant smile arc with minimal lateral negative space and harmoniously integrated dental and gingival components.

**CONCLUSION**

The major goal of orthodontic treatment for the great majority of patients in recent years is dental and facial esthetics. This goal is not “just cosmetic”. It reflects the patients’ desire to improve their social acceptability and eliminate discrimination based on appearance, which greatly affect their quality of life.

**REFERENCES**
