

A review on Conceptual methods of Smile evaluation

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ABSTRACT: *Esthetics in orthodontics has been defined mainly in terms of profile enhancement, but if you ask lay people what an orthodontist does, their answers will usually include something about creating beautiful smiles. This article is an overview of smile esthetics and its analysis in orthodontics.*

KEYWORDS: *Smile, Esthetics, Smile analysis*

1. INTRODUCTION:

People with a normal dental appearance are judged more socially attractive over many personal characteristics than those with malocclusions. (Shaw et al AJO 1985).¹

In Oxford dictionary, smile is defined as a pleased, kind, or amused facial expression, typically with the corners of the mouth turned up and the front teeth exposed. A bright smile is not just esthetics, but has strong association with intelligence, sympathy, extroversion, and attractiveness.

Basic requirements for assessing Dentofacial esthetics²

1. A dynamic and static 3-dimensional evaluation of the face primarily through examination of the patient clinically.
2. A determination of lip – tooth relationships and anterior tooth display at rest and during smile.
3. An analysis of the dental and skeletal volume of the face as it affects the soft tissue facial mask. This is mainly an interactive process with the patient and is best facilitated via computer simulation.

2. METHODS OF SMILE ANALYSIS³

● **Facial Photographs.**

For ideal photographic representation of the face, the camera should be positioned in the “portrait” position to maximize use of the photographic field. Orienting the camera in “landscape” position captures much of the background that is unneeded and detracts from the image by diminishing the size of the face in the picture.

The following facial photographs are recommended as the expected routine for each patient

1. Frontal: The patient assumes a natural head position and looks straight ahead into the camera. Four types of frontal photographs (Fig: 10) are useful:

- a. Frontal at rest. If lip incompetence is present, the lips should be in repose and the mandible in rest position.
- b. Frontal view with the teeth in maximal intercuspation, with the lips closed even if this strains the patient.
- c. Frontal dynamic (smile). The smiling picture demonstrates the amount of incisor show on smile (percentage of maxillary incisor display on smile) and any excessive gingival display.
- d. A close-up image of the posed smile. This view now is recommended as a standard photograph for careful analysis of the smile relationships.

2. Oblique (three-quarter, 45-degree): Patient in natural head position looking 45 degrees to the camera. Three views are useful

- a. Oblique at rest. This view is useful for examination of the midface and is particularly informative of midface deformities, including nasal deformity.
- b. Oblique on smile

3. Two profile images are useful :

- a. Profile at rest. The lips should be relaxed. Lip strain is illustrated better in the frontal view, so a profile photograph with the lips strained in closure is unnecessary.
- b. Profile smile. The profile smile image allows one to see the angulation of the maxillary incisors, an important aesthetic factor that patients see clearly and orthodontists tend to miss.

4. **An optional submental view:** Such a view may be taken to document mandibular asymmetry In patients with asymmetries.

5.

- **Digital videography** ⁴

□ Standardized digital videography allows the clinician to capture a patient's speech, oral and pharyngeal function, and smile at the same time. On first viewing of the Quick Time video clip, the clinician should assess tongue posture and lip function, particularly during speech. Immature oral and pharyngeal function with unfavorable tongue posture can easily be detected. With video clips of this type, one can review the video clip on a computer screen for repeated playback or set up a printout sequence that reflects the "smile curve," which is a series of frames chosen to reflect the animation of the smile from start to finish. This gives the clinician an opportunity to both visualize the smile from start to finish in dynamic viewing and see the individual frames in sequence to visualize the sustained smile.

- **Direct Biometric measurements:** Smile analysis should involve evaluation of certain elements in specific sequence ⁵ :- □

1. **Dento-facial analysis-** i. Midline □ ii. Philtrum and commissure height
2. **Dento-labial analysis-** i. Incisor display ii. Smile arc iii. Smile symmetry iv. Buccal corridor □
3. **Dento-gingival analysis-** i. Gingival health ii. Height and contour of gingiva □
4. **Dental analysis-** i. Contacts and connectors ii. Embrasures iii. Crown height and width iv. Mesiodistal width

3. DENTO-FACIAL ANALYSIS

MIDLIN : The starting point of the esthetic treatment plan is the facial midline. One of the goals of the orthodontic treatment is to achieve maxillary and mandibular midlines that are coincident-both with each other and with the facial midline. The most practical guide to locate the facial midline is to use two anatomical landmarks as references :- Nasion, the base of the philtrum. A line drawn between these landmarks not only locates the position of the facial midline but also determines the direction of the midline. Ideally the maxillary central incisor midline should coincide with the facial midline.

PHILTRUM HEIGHT : Measured in mm from subspinale (base of the nose) to most inferior point of the portion of the upper lip on the vermilion tip of the cupid bow.

COMMISSURE HEIGHT : The height of the Commissure is measured from a line constructed from the alar bases through subspinale and then from the commissures perpendicular to this line In young children and adolescents the philtrum height is shorter than the commissural heights and can be explained in the differential in vertical lip growth.

4. DENTO-LABIAL ANALYSIS⁶

i. MAXILLARY INCISOR DISPLAY AT REST : The average maxillary incisor display at rest is 1.91 mm in men and 3.40 mm in women. The amount of incisor show at rest is the most important esthetic parameter because decreased incisor display is characteristic of ageing:⁷

ii. Maxillary incisor display on smile / Lip line : The lip line is the amount of vertical tooth exposure on smiling i.e the height of the upper lip relative to the maxillary central incisors. The lip line is optimal when the upper lip reaches the gingival margin, displaying the total cervico- incisal length of the maxillary central incisors, along with the interproximal gingiva while smiling.

iii. SMILE SYMMETRY: An asymmetry in the smile can be due to:- Asymmetric smile curtain or Transverse cant of the maxillary occlusal plane.

iv. BUCCAL CORRIDOR: Buccal corridor refers to dark space (negative space) visible during smile formation between the corners of the mouth and the buccal surfaces of the maxillary teeth. It is measured from the mesial line angle of the maxillary first premolar to the interior portion of the commissure of lips. It is represented by a ratio of the intercommissure width divided by the distance from the first premolar to first premolar.

5. DENTO-GINGIVAL ANALYSIS

i. GINGIVAL HEALTH : It is of utmost importance that the gingival tissues are in a complete state of health prior to the initiation of any treatment

ii. HEIGHT, SHAPE AND CONTOUR OF THE GINGIVA : Establishing the correct gingival levels for each individual tooth is the key in the creation of pleasing and harmonious smile. The gingival margins of the central incisors should be at the same level or slightly incisal to that of the canines. The gingival margins of the lateral incisors should be towards incisal when compared to central incisors and canines. The discrepancies in the levels of gingival margin may be caused by □attrition of the incisal edges, ankylosis due to trauma in a growing patient, severe crowding.

6. DENTAL ANALYSIS ⁸

i. CONTACTS AND CONNECTORS : There is distinction between a connector space and a contact point. The contact points between the anterior teeth are generally smaller areas that can be marked by passing articulating ribbon between the teeth. The connector is a large, broad area that can be defined as the zone in which two adjacent teeth appear to touch.

- The contact points of maxillary teeth move progressively gingivally from the central incisors to the premolars, so that there is a progressively larger incisal embrasure, whereas connectors decrease in size from the centrals posteriorly. An esthetic relationship exists between the interproximal connectors of anterior teeth that is referred to as the 50-40-30 rule

ii. EMBRASURES: The incisal embrasures are the triangular spaces incisal to the contact point. Ideally these should display a natural, progressive increase in size or depth from the central to the canine. Ideally the embrasures show progressive increase in size or depth from the central to the canine. The contact point moves apically as we proceed from central to canine

iii. CROWN HEIGHT AND WIDTH: Crown height combined with percentage of incisor display is the deciding factor in the amount of tooth movement required to improve the smile index. The vertical height of the maxillary central incisors in the adult is normally between 9 and 12 mm. In one of a recent study the optimal width-to-length ratio for the maxillary central zone was found to be between 75% and 85% of the length.

iv. MESIO-DISTAL WIDTH: The centrals must be the dominant teeth in the smile and they must display pleasing proportions. They are the key to the smile. The shape and location of the centrals influences or determines the appearance and placement of the laterals and canine. The apparent width of the lateral incisor should be 62% of the width of the central incisor. The apparent width of the canine should be 62% of that of the lateral incisor. The apparent width of the first premolar should be 62% of that of canine. This ratio of recurring 62% proportions appears in a number of other relationships in human anatomy is referred to as the “Golden proportion.”

● The smile mesh ⁹

Ackerman et al. developed a multimedia computer program, the smile mesh, to analyze photographs of posed smiles and test the reproducibility and reliability of the smile. Statistical analysis revealed that a posed smile is indeed reproducible. However, because not all patients have individually repeatable smiles, a good procedure is to take three smile images of the patient and select the most natural

or representative smile for the application of the smile mesh. An adjustable grid (the smile mesh) is constructed of three horizontal lines and four vertical lines, which can be moved with the cursor and placed on the images of the smile.

7. CONCLUSION:

Although the concept of smile analysis is not new but is often not incorporated in orthodontic treatment planning. It is therefore emphasized that all the above discussed elements of smile analysis should be considered as guidelines and reference points for beginning esthetic evaluation, treatment planning and subsequent treatment .

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