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RESEARCH ARTICLE

SMILE ESTHETICS

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ABSTRACT

Aesthetics is the word which is derived from the Greek as "perception", which deals with beauty and the beautiful. It may be divided into two dimensions as objective (admirable) and subjective (enjoyable) beauty. Objective beauty implies that the object possesses properties that make it unmistakably praiseworthy. Subjective beauty is value laden, and is related to the tastes of the person contemplating it. Contemporary techniques in orthodontics should lend objective aesthetics to the entire oro-facial complex, involving unity, form, structure, balance, colour, function, and display of the dentition.

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INTRODUCTION

Smile is defined as a facial expression characterised by upward curving of the corners of the mouth, is often used to indicate pleasure, amusement or derision. Humans learned to pose a smile during evolution. Smile also influences a person's perceived attractiveness and is the cornerstone of social interaction. Divine proportions can also be found in nature, the way the seed head of a sunflower is structured i.e the arrangement of the seeds in the blossom and the symmetry of leaves in the pine apple or scales of a fircone. Even the primitive forms of life, such as the spira nautilus, have a shape based on divine proportions. Golden proportions is often associated with aesthetics and harmony in many fields such as architecture, sculpture, music, poetry, morphology of flowers, seashells, mammals and human face. Ricketts found a relationship between divine proportions and facial beauty in young women. The orthodontic specialty has recently focused its attention on the multifactorial nature of the smile, combined with a shift toward patient-driven esthetic diagnosis and treatment planning. In the art of treating the smile, we orthodontists must establish a diagnosis that identifies and quantifies which elements of the smile need correction, improvement or enhancement and a visualised treatment strategy must be created to address the patient's chief concerns. The complete treatment effort must include facial balance and smile aesthetics.

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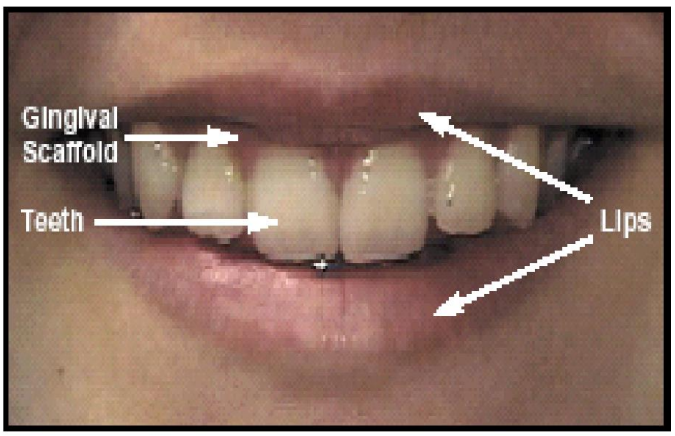
ANATOMY OF SMILE

Muscles for smile are Orbicularis oris, Buccinator, Levatorangulioris, Depressor angulioris Zygomaticus major, Risorius. These muscles insert into the modiolus, Group II muscles inserted into the upper lip and Group III muscles insert into lower lip.



MUSCULAR BASIS OF SMILE

The smile is formed in two stages

1. The first stage raises the upper lip to the nasolabial fold by contraction of the levator muscles originating in the fold and inserting at the upper lip. The medial muscle bundles raise the lip at the anterior teeth and the lateral muscle groups raise the lip at the posterior teeth. The lip then meets resistance at the nasolabial fold because of cheek fat.
2. The second stage involved further raising superiorly of the lip and the fold by three muscle groups: The levatorlabii superior muscles of the upper lip, originating at the infraorbital region, The zygomaticus major muscles, Superior fibers of the buccinator.

Records in the treatment of smile: With the demands of treating all dimensions in orthodontics, records must provide the information and documentation required in the new soft tissue dominated treatment planning regimen. Orthodontic records fall into three separate categories:

1. Static records, 2.Dynamic records, 3.Direct biometric measurement

Static records

In clinical practice, standard records include film or digital photographs, radiographs and study casts.

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.A close-up image of the posed smile: This view now is recommended as a standard photograph for careful analysis of the smile relationships

Oblique on smile: The oblique view of the smile reveals characteristics of the smile not obtainable on the frontal view and certainly not obtainable through any cephalometric analysis.

Oblique close-up smile: This allows a more precise evaluation of the lip relationships to the teeth and jaws than is possible using the full oblique view.

Dynamic recordings: The dynamic recordings of smile and speech is accomplished through the use of digital videography. Digital video and computer technology currently enables the clinician to record anterior tooth display during speech and smiling at the equivalent of 30 frames per second.

Types of smile

1. **Commisure smile**: In the commisure smile, the corners of the mouth turn upward because of the pull of the zycomaticus major muscles. This is referred as the Mona Lisa smile.
2. **Canine smile**: In this smile, the upper lip is elevated uniformly without the corners of the mouth turning upward; iethe entire lip rises like a window shade.
3. **Complex smile**: In the complex smile, the upper lip moves superiorly as in the canine smile, but the lower lip also moves inferiorly in similar fashion.

Smile mesh

This 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.

Smile quantification

Evaluation of facial and dental appearance should be done in three steps:

1. Macro-esthetics: The face in all three planes of space. Problems that are to be noted would be asymmetry, excessive or deficient face height, mandibular deficiency or excess etc.
Facial Aesthetics versus facial proportions. Because a major reason for orthodontic treatment is to overcome psychosocial difficulties relating to facial and dental appearance and enhance the quality of life in doing so, evaluating dental and facial aesthetics is an important part of the clinical examination.

Frontal Examination. The first step in analyzing facial proportions is to examine the face in frontal view. Low set ears, or eyes that are unusually far apart (hypertelorism) may indicate either the presence of a syndrome or a microform of a craniofacial anomaly. If a syndrome is suspected, the patient's hands should be examined for syndactyly, since there are a number of dental-digital syndromes. In the frontal view, one looks for bilateral symmetry in the fifths of the face and for proportionality of the widths of the eyes/nose /mouth.

Prior to the advent of cephalometric radiography, dentists and orthodontists often used anthropometric measurements. It is important to note the cause of vertical problems such as excessive display of the maxillary gingival, which is done best by examining the position of lips and teeth relative to the vertical thirds of the face.

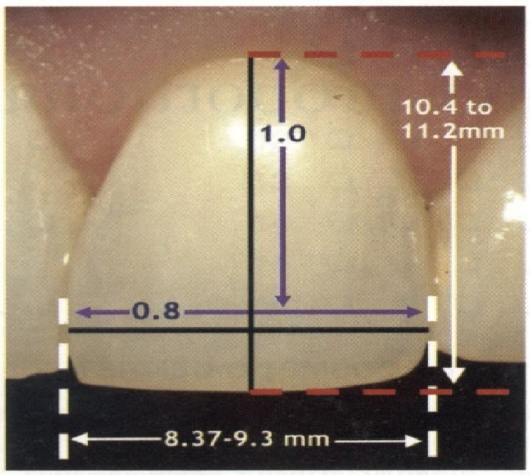
Smile Analysis

Facial attractiveness in defined more by the smile than by soft tissue relationships at rest. For this reason, it is important to analyze the characteristics of the smile, and to think about how the dentition relates to the facial soft tissues dynamically as well as statically.

There are two types of smiles: the posed or social smile, and the emotional smile. The social smile is reproducible, and is the one that is presented to the world routinely. The emotional smile varies with the emotion being displayed (for instance, the smile when you're introduced to a new colleague differs from the smile when your team just won in the year's biggest upset) The social smile is the focus of orthodontic diagnosis

Transverse Dimensions of the Smile Relative to the Upper Arch: Depending on the facial index, i.e, the width of the face relative to its height, a broad smile may be more attractive than a narrow one. A dimension of interest to prosthodontists, and more recently to orthodontists, is the amount of buccal corridor that is displayed on smile, that is, the distance between the

maxillary posterior teeth (especially the premolars) and the inside of the cheek.



Connector and Embrasures: The connector also referred to as the interdental contact area is where adjacent teeth appear to touch, and may extend apically or occlusally from the actual contact point. In other words, the actual point is likely to be a very small area, and the connector includes the contact point and the areas above and below that are so close together they look as if they look as if they are touching. The normal connector height is greatest between the central incisors, and diminishes from the centrals to the posterior teeth, moving apically in a progression from the central incisors to the premolars and molars. The embrasures the triangular spaces incisal and gingival to the contact ideally are larger in size than the connectors, and the gingival embrasures are filled by the interdental papillae.

Black triangle in adults usually arise from loss of gingival tissue related to periodontal disease, but when crowded and rotated maxillary incisors are corrected orthodontically in adult, the connector moves incisally and black triangles may appear, especially if sever crowding was present for that reason, both actual and potential black triangles should be noted during the orthodontic examination, and the patient should be prepared for reshaping of the teeth to minimize this aesthetic problem.

Tooth shade and colour

The colour and shade of the teeth changes with increasing age. The teeth appear lighter and brighter at a younger age, darker and duller as aging progresses.

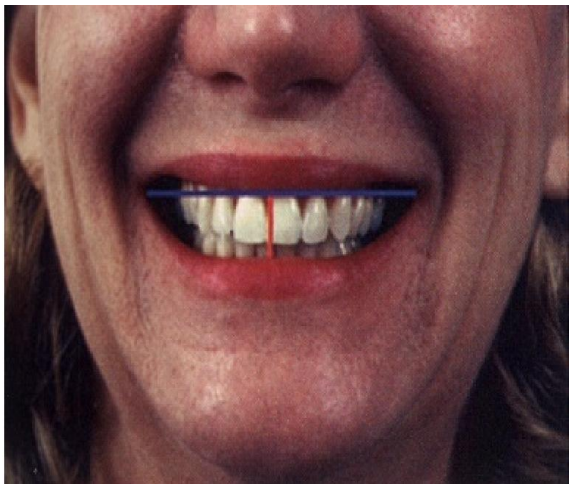
Systematic measurement of restingtooth-lip relationships, and how the dynamics of thesmile also interact with the maxillary teeth affect theappearance of the smile, virtually lead the clinician to correct treatment plan.

Smile index

A smile index was developed by Ackermann and Ackermann to describe the display zone of a smile. This is determined by dividing intercommisural width by theinter-labial gap during smiling. Commissure height is measured from a line constructed from the alar bases through subspinale, and then from the commissures perpendicular to this line. Interlabial gap is the distance in millimetres between the upper and lower lips when lip incompetence is present. This ratio is useful for comparing smiles among patients. The lower the smile index, the less youthful the smile appears.

$$\frac{\text{Inter commissural width}}{\text{Inter labial gap}} = \text{Smile index}$$

The percentage of incisor display, when combined with crown height, helps the clinician decide how much tooth movement is required to improve the smile index.



Smile index

MODIFIED SMILE INDEX: Yet another index to describe the smile with facial esthetics. It enables a smile to be compared with time –tested indices like facial index and mandibular width-facial height index.The various facial types had different MSI values that couldnot be correlated. Any change in the mandibular width – facial height will have a negative impact on MSI values.

Dutch personality index

This index was used for participant's personality assessment and assess smile attractiveness. It is the one of the most frequently used personality assessment questionnaires in the Netherlands and has been used successfully before in dental – psychological studies. According to the hypothesis that attractiveness can be related to traits concerning neuroticism, self-esteem, and extraversion. It focuses on emotional stability and extraversion.

The Dutch personality index measures on seven scales: neuroticism (suffering from vague anxieties, bodily symptoms, depression and feelings of inferiority), social inadequacy (tendency to avoid social contacts and feeling uncomfortable in dealing with social contacts), rigidity (holding on settled habits and principles), self- centeredness (a strong feeling of satisfaction with oneself combined with disinterest in others and their problems), dominance (self confidence, taking the

initiative and managing others), and self esteem(appositive attitude toward self, life and work, adjusted and active)

Vertical characteristics of the smile

The vertical characteristics of the smile are categorized broadly into two main features:

1.Those pertaining to incisor display
2. Those pertaining to gingival display.

The patient shows all tooth or does not, and shows the gingiva or does not. Inadequate incisor display can be a combination of vertical maxillary deficiency, limited lip mobility, and short clinical crown height. If short clinical crown height is the primary contributor to the in adequate tooth display, one must differentiate between a lack of tooth eruption (which may take care of itself as a child gets older), gingival encroachment (treated with crown lengthening) and short incisors secondary to attrition, treated by restorative dentistry with laminates or composite build-ups.

Another feature of vertical smile characteristics is the relationship between the gingival margins of the maxillary incisors and the upper lip. The gingival margins of the canines should be coincident with the upper lip, and the lateral incisors should be positioned slightly inferior to the adjacent teeth. That the gingival margins should be coincident with the upper lip in the social smile is generally accepted. However, this is very much a function of the age of the patient because children show more tooth at rest and gingival display on smile than do adults.

Transverse characteristics of the smile

Three important influences on the characteristics of thesmile in the transverse plane of space are

(1) Buccal corridor width,
(2) Arch form
(3) The transverse cant of the maxillary occlusalplane.

Buccal corridor

The Buccal corridor is one of the evaluation points in smile aesthetics. It is a space between the maxillary lateral teeth and corner of the mouth during smile, which appears as a black or dark space. The narrow maxillary arch and extraction in the upper dentition were thought to be the causes of the buccal corridor. There seems to be a difference of opinion among investigators about the Aesthetic value of buccalcorridors. Some concluded that they have no aesthetic value, others believe that visible buccal corridors are unattractive.

Johnson and Smith evaluated the effects of premolar extraction on the visibility of negative space and found no relationship between extraction pattern. More recently, orthodontists have emphasized the diminished aesthetics of an excessively wide buccal corridoroften referred to as "negative space." In orthodontics as in prosthodontics, the proportional relationship between the width of the dental arch and the width of the face must be kept in mind.

The buccal corridor is measured from the mesial line angle of the maxillary first premolars to the interior portion of the commissure of the lips. The corridor often is represented by a ratio of the intercommissure width divided by the distance from the first premolar to first premolar.

Buccal corridor percentage

By trial and error Moore et al developed and defined a range of buccal corridors and described them by the corresponding smile fullness. They defined buccal corridors of 28% as medium- narrow, 15% as medium, 10% as medium- broad, and 2% as broad smile fullness.

Arch form

Arch form plays a pivotal role in the transverse dimension of the smile. In patients whose arch forms are narrow or collapsed, the smile also may appear narrow, which is less appealing aesthetically.

Orthodontic expansion and widening of collapsed arch form can improve the appearance of the smile dramatically by decreasing the size of the buccal corridors and improving the transverse smile dimension. The transverse smile dimension (and the buccal corridor width) is related to the lateral projection of the premolars and the molars into the buccal corridors. The wider the arch form in the premolar area, the greater the amount of the buccal corridor that is filled.

Transverse cant

The last transverse characteristic of the smile is the transverse cant of the maxillary occlusal plane. A true transverse cant usually is related to asymmetric vertical growth of the mandible resulting in a compensatory cant to the maxilla and, if present, may be an indication for orthognathic surgery.

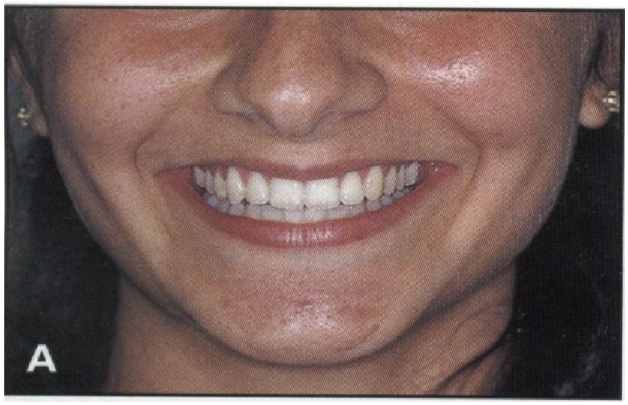
Oblique Characteristics of the Smile

The oblique view of the smile reveals characteristics not obtainable on the frontal view and certainly not obtainable through any cephalometric analysis. The contour of the maxillary occlusal plane from premolar to premolar should be consonant with the curvature of the lower lip on smile. Deviations include a downward cant of the posterior maxilla, upward cant of the anterior maxilla, or variations of both.

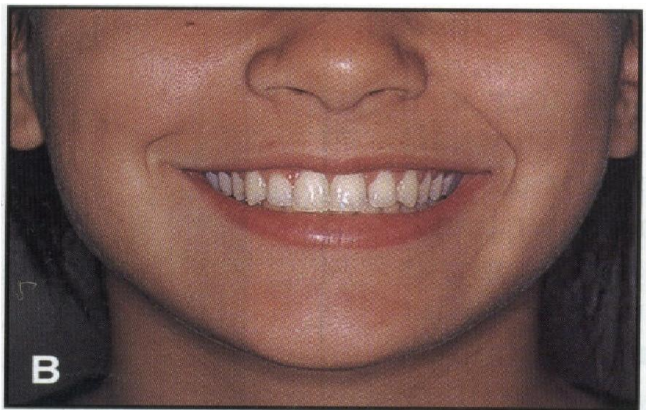
Lip thickness during growth and maturity

It was observed in Subtelny's study that the upper lip attained a greater thickness in the vermillion region than over point A. This increase in thickness at the vermillion border was approximately equal to the increase in length of the lip. In both males and females the lip increased in thickness from ages 1-14. After the age of 14 the lips continued to become thicker in males but not in females Gingival smile line or gummy smile: For some people, the smile at its fullest exposes the gingiva

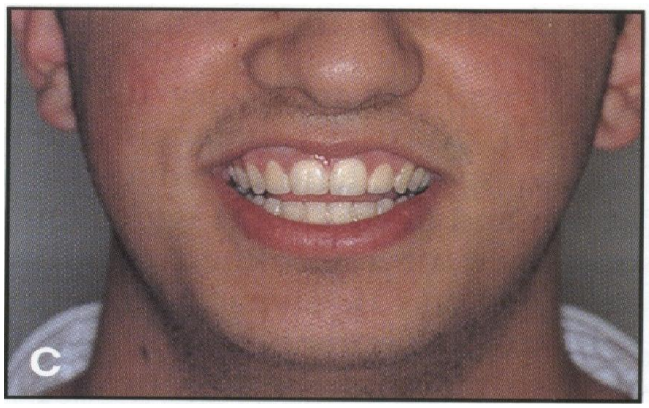
superior to the maxillary anterior teeth. This anatomical feature defines a gingival smile line (GSL). The "gummy" smile, which can be defined as 2mm or more of maxillary gingival exposure in full smiling.



Upward curvature



Straight curvature



Downward curvature

Conclusion

In our modern competitive society, a pleasing appearance often means the difference between success and failure in both our professional and personal lives.

A charming smile can open doors and knock down barriers that stand between us and a fuller, richer life. The concepts of smile esthetics are not new, but are too often overlooked in orthodontic treatment planning. The components of the smile should be considered not as rigid boundaries but as artistic guidelines to help orthodontists treat individual patients who are today, more than ever, highly aware of smile Aesthetics. It is important for orthodontists to make every effort to develop a harmonious balance that will produce the most attractive smile possible for each patient being treated.

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