



Parameters of smile esthetics

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Abstract

An attractive smile helps in the improvement of a patient's appearance and self-confidence. A harmony between teeth and soft tissue produces the most attractive and esthetic smile. A detailed study of orthodontic parameters of smile esthetics adds an important dimension to analyzing the results of orthodontic treatment.

This article discusses salient features of the Ideal smile, the classification of smile esthetics, how to record smile, analysis of smile esthetics, and studies done regarding the comparison of smiles of patients who have undergone orthodontic treatment with that of untreated patients, and patients who have undergone orthodontic treatment with extraction versus non-extraction and conclusion.

Introduction

Human recognition and communication depend heavily on facial appearance. People today are very worried about their looks, because everyone wants to appear attractive.¹ The primary goal of orthodontic treatment is to enhance the facial and dental esthetics of patients. During the orthodontic treatment of every patient, Orthodontists should make every possible effort to develop a harmony between the skeletal, dental, and soft tissues & thereby produce the most attractive smile possible.

Smile is the most efficacious way to address emotions. A clinical practice combined with orthodontic science and art helps in attaining harmony between hard tissues and soft tissues which gives the much-needed attractiveness to the smile.

Apart from cephalometric parameters, esthetic smile depends on various factors such as

(1) width of stomodeum, (2) tonicity of facial muscles and balanced bilateral nerve supply of the corners of the mouth, (3) shape of the arch, (4) total facial expression

(i.e. the combined result of the action of all muscles supplied by the facial nerve that controls facial expression).²

Smile consists of a complex neurological process, which involves the human face. For an esthetic smile, proper activation of the musculoskeletal system is mandatory. Repetitions of smiling act train the Central Nervous system and Neural system for the same.⁷

Orthodontic considerations for an Ideal Smile

Esthetic Proportion is the ratio of width to height of maxillary central Incisors. Ideally, it should be 75 – 85%. The vertical position of maxillary incisors helps to achieve an attractive & young smile. The incisal edge of maxillary central incisors must be below the cuspal tip of canines, thereby signifying the dominance of central incisors. Incisal edges of maxillary central incisors should be 1 – 1.5 mm below that of maxillary lateral incisors in women and 0.5 – 1 mm in men. Peg-shaped lateral incisors

should be restored as they contribute to an unesthetic appearance of the smile. Treatment of midline diastema & closure of all spaces in the maxillary anterior is mandatory for having an esthetic smile. Gingival margins of central incisors should be at a level of 0.5 – 1 mm below that of canines. The gingival margin of lateral incisors should be 0.5 mm below that of central incisors. To achieve an ideal smile design multidisciplinary treatment may be required.

Overintrusion of central incisors during orthodontic treatment causes the excessive gingival display on a smile, so it should be avoided. An intermediate buccal corridor helps in imparting attractiveness to a smile, whereas a wide buccal corridor creates an unesthetic smile. Maxillary expansion should be done to eliminate the buccal corridor. Midline shift of 2 mm or more and changes in tooth angulation must be corrected. Dental bleaching is recommended in patients with tooth discoloration to achieve an attractive smile. Interproximal contacts should be adjusted to eliminate potential black spaces. Enameloplasty or veneer placement on a fractured tooth should be done. Precaution should be taken during retraction of anterior teeth to avoid negative impact on lip volume.³

Many orthodontists have classified smiles based on several parameters. According to EK Janzen, five variations were found based on the display of dental/periodontal tissues. These are maxillary only, maxillary with 3mm or more gingival display, mandibular dentition only, maxillary and mandibular dentition only, and neither maxillary and mandibular dentition only.³ Tjan and Colleagues

classified smile as high, average, and low. In a high smile, the total cervical-incisal length of the maxillary anterior teeth and a continuous band of gingiva is visible. In an average smile, 75-100% of the maxillary anterior teeth and the interproximal gingiva is visible. While in a low smile, less than 75% of the anterior teeth are visible.⁴

According to Sarver and Ackermann, smile is classified as a Social Smile or Greeting Smile, and an Enjoyment Smile resulting due to maximum contraction of the levator labii elevator or depressor muscles.⁵ Rubin stated 3 neuromuscular smile patterns namely- Commissure Smile, Cuspid Smile, and complex smile. A commissure smile is the most common, Cuspid smile is found in approx. 31% of the population, while a Complex smile is rarely found.⁶

An esthetic smile can be classified broadly into macroesthetics, miniesthetics, and microesthetics. Macroesthetics includes the Facial assessment in three planes. Facial asymmetry, Increased and decreased facial height, maxillary excess, and deficiency, and mandibular excess and deficiency are assessed. The Miniesthetics smile framework includes an assessment of facial problems such as buccal corridors, anterior tooth display, gingival heights, and gingival display during a smile. In Microesthetics, assessment of black triangles, width as well as the height of tooth, embrasures, shape, and contour of the gingiva, and shades of the tooth are done.⁸

How to Capture Smile

Nowadays, Orthodontic treatment planning should be done after proper assessment of the soft tissue profile of the

patient. Pretreatment records are further divided as dynamic, static and direct biometric measurements. Pretreatment photographic records should also include profile photographs, frontal and oblique view of smile. Digital Videography is used for the dynamic recording of smiles and speeches. Videos should be recorded with DSLR Camera at a fixed distance from the patient. During videography, the patient's head should be in the Natural Head Position.⁶ A gummy smile gives an unesthetic appearance to the smile. It is further classified as a Dento-gingival gummy smile, a Muscular gummy smile, a Dento-alveolar gummy smile & Mixed gummy smile.⁹

Craig Kirkham Naylor used Grid Analysis System for analysing smile. He proposed 4 steps in which the first step is to check for facial symmetry using an esthetic grid, second step is characterised by recording of upper lip height during a full smile using a photograph, third step includes taking photograph of the dentition with the lips retracted, and the fourth step involves drawing specific lines on the photograph which coincides with midline, contact area of maxillary anteriors, incisal plane and lip line.⁷

Newer techniques for Smile Evaluation like SmileCurves Digital Template which includes superimposition of intraoral photographs and viewing the smile from a shorter distance. Digital Smile Designs software has been developed to assist orthodontists in smile esthetic parameters, dental, gingival as well as esthetic functions. Computer-Aided Photographic Analysis is another methodology adopted for appropriate analysis of an esthetic smile.^{10,11,12}

Emotional Smile evaluation includes knowing the patient's viewpoint about his or her smile. Questionnaires prepared for the patient by the clinician are as follows: Do you like the appearance of your teeth and smile? Do you ever turn your face when smiling or hold your hand up in front of your mouth while talking to others? Do you wish to have a similar smile to that of people having beautiful smiles? Do you use your lips to cover any aspect of your smile? Are you embarrassed to visit a dentist? Do you feel confident during smiling? Do you feel nervous, when smiling in front of strangers? Do you hold back your laugh because you feel uncomfortable about your smile? What are your thoughts on getting an esthetic smile? What changes would you expect in your smile?

Discussion

Orthodontic treatment plays a significant role in enhancing the smile esthetics of the patient. Smile esthetics of patients with severe malocclusions has considerable improvement on undergoing Orthodontic treatment. Deep Overbite cases can be treated by extrusion of posterior teeth, intrusion of maxillary anterior teeth or by combination of both. In patients with a gummy smile, Periodontal surgery should also be done supplementary to the intrusion of incisors. An intrusion arch or Utility arch can also be used. Esthetic improvement is a key motivator in undergoing orthodontic treatment.⁹ A commonly done mistake in an orthodontic practice is over-intrusion of maxillary incisors which tend to mask the maxillary incisors behind the upper lip during speech and with increasing age, it results in drooping of the upper lip and

consequently unesthetic display of the smile.¹³

Smile esthetics, Perception, and comparison of treated and untreated smiles: - Isıksal, Hazar, and Akyalçın concluded that though orthodontic treatment emphasizes on correction of occlusal relationships, nowadays more attention is now paid towards enhancing facial esthetics & profile of the patient. This study was conducted to compare smile esthetics among extraction and non-extraction patients and to assess the role of certain dentofacial characteristics in enhancing the smile aesthetics of patients in respective groups.¹⁴

Smile esthetics after orthodontic treatment with and without extraction of four first premolars: - Darryl K. Johnson and Richard J. did a study in which smiling facial photographs of 60 patients were taken in frontal view; Group A of 30 patients were treated with fixed orthodontic treatment and extraction of first premolars and Group B of 30 patients with fixed orthodontic treatment but without extractions. Smiles of all patients were analyzed by a panel comprising 10 laypersons. There were no significant differences in the mean esthetic score of extraction and non-extraction patients.¹³

Due to extraction, the reduction in arch size creates unesthetic black triangles and negative spaces that hamper the smile. Fixed appliances appear to be more effective in improving the variables that quantify posttreatment smile outcomes.^{15,16} Due to age progress, upper lip fullness reduces. Smile exercises help in restoring the fullness of the upper lip.¹⁷

Clostridium botulinum toxin has been of therapeutic usage since the 1970s, Scott popularised the clinical use of botulinum toxin in the treatment of strabismus. BOTOX treatment is done by injecting Botulism toxin into extraocular muscles that cause selective muscle paralysis and improved ocular alignment. Conditions like dystonias (i.e., blepharospasm and torticollis), involuntary muscle hyperactivity (i.e. hemifacial spasm, tremors), and spasticity (as in multiple sclerosis and cerebral palsy) can be treated successfully with BOTOX treatment. Facial revitalisation has been revolutionized due to BOTOX treatment in the past 15 years. Clinicians should administer Botulinum toxin in therapeutic dosages to obtain excellent cosmetic results.¹⁸ Recently Tissue engineering techniques are gaining popularity for improving function and smile esthetics.¹⁹ Further studies and systematic reviews²⁰ are required for smile analysis and understanding current trends.

Conclusion

To achieve smile aesthetics, dentition, facial profile, gingival display, and lip contour should be evaluated thoroughly. Smile esthetics is not a new concept, but it is often overlooked during orthodontic treatment planning. Ideal components of the smile should be considered as artistic guidelines to help orthodontists in enhancing patient smiles. Smile perception remains a topic of vast debate as some people have pleasant and esthetic smiles despite having some dental and periodontal discrepancies.

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