

Smile Esthetics – A Literature Review

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Abstract: *Esthetic dental treatment involves artistic and subjective components design to create the illusion of beauty. An organised systematic approach is required to evaluate, diagnose and resolve esthetic problems predictably. Our ultimate goal is to achieve pleasing composition in the smile by creating an arrangement of various esthetic elements. One of the most important tasks in esthetic dentistry is creating harmonious proportions between the widths of maxillary anterior teeth when restoring or replacing these teeth This review article describes application of the Golden Proportion and Red Proportion in dentistry also the smile design for completely edentulous and for full mouth rehabilitation. Also the future scope for designing smile .*

Key Words: *Smile design, smile proportions, elements of smile designing, denture esthetics.*

I. Introduction:

Smile, a person's ability to express a range of emotions with the structure and movement of the teeth and lips, can often determine how well a person can function in society¹. The goal for esthetic treatment should be an enhanced but natural appearance that imparts a vibrant and believable appearance to the patient. The goal of esthetic dentistry should be "bright, beautiful, but believable"². One of the important features, predicting the attractiveness of the face is the 'smile' and most often the need for 'esthetics' motivates the patient to seek dental treatment³. The goal of an esthetic makeover is to develop a stable masticatory system, teeth, tissues, skeletal structures, muscles and joints all function in harmony. When planning treatment for esthetic cases it is to be noted that smile design cannot be isolated from a comprehensive approach to patient care. A smile design should always include the evaluation and analysis of both facial and dental composition¹.

ESTHETICS IN RESTORATIVE DENTISTRY:

Why it is important?

Esthetic or cosmetic dentistry has become one of the main areas of dental practice emphasis and growth for several years. Increasingly, patients seeking treatment for their oral condition with the primary concern of an esthetic enhancement². In social interactions, our attention appears mainly on mouth and eyes of the face of the person speaking. As the mouth is the centre of communication in the face, the esthetic appearance of the oral region during smiling is a conspicuous part of facial attractiveness⁴. The last 50 years have witnessed an unimaginable amount of change in restorative dentistry. Silicate cements and acrylic resin have been completely replaced by composite resins. Major improvements in physical and mechanical properties, particularly wear resistance, have permitted a general substitution of composite resins for silver amalgam in posterior teeth. Another area of major change has been the ceramic restoration. Throughout the last few decades, however, a number of other luting agents have been added to the clinician's list which includes composite resins, glass ionomers and self-etching cements. The introduction of composite resin cements brought about a major competition which provides a greater potential for shade matching, higher compressive strengths, and enhanced resistance to fracture when used in conjunction with ceramic restorations. Plus this class of cements characterized by a significant reduction in solubility, improved marginal wear resistance and less microleakage. Human esthetic implies a sense of beauty, a pleasing impulse, naturalness, and a youthful appearance relative to one's age. The treatment should be really conservative which allow the patients future options as new technologies has developed².

WAY'S TO ASSESS SMILE:

There are certain vital elements of smile designing which includes the following:

VITAL ELEMENTS OF SMILE DESIGNING: (Dental composition)

1. Tooth components
 - a. Dental midline
 - b. Incisal length
 - c. Tooth dimensions
 - d. Axial inclinations
 - e. Zenith points
 - f. Incisal embrasures
 - g. Interdental contact area and Interdental contact points

- h. Sex, personality and age
- i. Symmetry and balance
2. Soft tissue components
 - a. Gingival health
 - b. Gingival level
 - c. Smile line
 - d. Interdental embrasure

❖ **Dental Midline:**

These are least noticed by the patients and dental personnel. As long as the midline is parallel with the long axis of the face, midline discrepancies of up to 4 mm will generally not be perceived as unesthetic. Slight corrections of midline can be corrected by restorative dentistry. The ideal treatment is orthodontics².

❖ **Incisal Length:**

Published reports have shown that the average 30-year-old woman displays about 3.5 mm of maxillary incisor tooth structure when the lips are at rest. The prosthodontic literature has generally recommended setting denture teeth so that 2 mm of tooth structure is displayed at rest⁵. If patient displays less than 4 mm of the maxillary centrals at rest, the teeth need to be lengthened and this length will be achieved by adding to the incisal edge.

❖ **Tooth Dimensions:**

If the incisal display at rest is 3 mm to 4 mm, and it is determined that the teeth are too short, then surgical crown lengthening procedures should be considered². If there is insufficient tooth display at rest, normal lip mobility, the teeth are the correct length, and there is inadequate tooth display during smiling, then this is diagnostic of vertical maxillary insufficiency. This is not a case that should be treated with esthetic tooth lengthening. This is an orthognathic problem and should be referred for proper treatment⁶.

❖ **Axial inclinations:**

Tooth inclinations compares the vertical alignment of maxillary teeth, visible in the smile line, to central vertical line. The evaluation of axial inclination can be done on a photograph of the anterior teeth in a frontal view. A line is sketched on each tooth from the midline of the incisal edge through the midline of the tooth at its gingival interface¹.

❖ **Zenith points:**

The gingival zenith point is the most apical point of the gingival tissues along the long axis of the tooth.

❖ **Incisal embrasures and contact points:**

From central to canine, an open space is formed between the proximal surfaces of incisal edges from the contact points. These embrasure spaces terminate at the contact points with the adjacent teeth. Failure to provide adequate depth and variation to the incisal embrasure will make the teeth appear too uniform and contact areas too long which gives box like appearance of the dentition¹.

❖ **Sex, age and personality:**

Minor differences in the length, shape and positioning of the maxillary teeth allow for dramatic differences.

- For Female, the maxillary incisors should be round smooth, soft delicate and for male, should be cuboidal, hard and vigorous.
- Youthful teeth: unworn incisal edge, defined incisal embrasure, low chroma and high value
Aged teeth: shorter; so less smile display, minimal incisal embrasure, high chroma and low value.
- Personality: maxillary canine
Aggressive, hostile angry: pointed long “fangy” cusp form, passive ,soft: blunt, rounded , short cusp form¹.

❖ **Symmetry and Balance:**

Lip symmetry involves the mirror image appearance of each lip when smiling. Independent evaluation of upper and lower lip is essential when analyzing both symmetry and fullness. Sometimes plastic surgery is necessary to provide results desired by the patients. Balance is observed as the eyes move distally from the midline, so that both the sides of the smile are well balanced¹.

SOFT TISSUE COMPONENT OF SMILE DESIGN:

❖ **Gingival health, level and harmony:**

The gingival frame the teeth and add to the symmetry of the smile. The health, colour and texture of the gingival tissues are paramount for long term success and the esthetic value of the treatment. Healthy gingiva is usually pale pink in colour, stippled, firm and should exhibit a matte surface. A normal healthy gingival sulcus should not exceed 3 mm in depth.

❖ **Smile Line:**

Its an imaginary line drawn along the incisal edges of the maxillary anterior teeth. In an esthetic smile, the edges of the maxillary anterior teeth follow a convex or gull-wing course matching the curvature of the lower lip ². In a reverse smile line, the centrals appear shorter than the cuspids along the incisal plane. Lip line should not be confused with the smile line.

❖ **Interdental embrasures:**

The darkness of the oral cavity shouldn't be visible in the interproximal triangle between the gingival and the contact area. The black triangles will be avoided if the most apical point of the restoration is 5 mm or less from the crest of the bone. Sometimes this will require long contact area and will be extended towards the cervical. Which encourage the formation of healthy pointed papilla instead of the blunted tissue form that often accomplishes a black triangle ⁷.

FACIAL COMPOSITION:

❖ **Lip line:**

When smiling, the inferior border of the lip as it relates to the teeth and gingival tissues is the lip line. Dentistry has arbitrarily classified 3 types of smiles that, relating the height of the upper lip relative to the maxillary anterior central incisors which are referred to as presenting a low lip line, middle lip line, high lip line.

Average lip line-exposes the maxillary teeth and only the interdental papilla.

Low lip line: exposes no gingival tissues when smiling.

High lip line: exposes the teeth in full display also gingival tissues above the gingival margins ⁸.

In cases where there is a high lip line and an excessive gingival display exists, an unwanted 'gummy smile' become evident. There are many corrective options available. The vertical maxillary excess can be determined with cephalometric analysis. Orthodontics and orthognathic surgery to impact the maxilla are ideal when these conditions are confirmed as skeletal dysplasia's in nature ⁹.

❖ **Interpupillary line:**

This should be parallel with the horizon line and perpendicular to the midline of the face. Also it should be parallel with the commissure line and occlusal plane.

ESTHETIC SMILE:

GOLDEN PROPORTIONS:

The concept of the 'golden proportion' has often been offered as a cornerstone of smile design theory ¹⁰. The term 'golden proportion' has been used for centuries. The golden proportion mathematically denotes that the ratio of a smaller to a larger length is equal to the ratio of the larger length to the total length. Application of golden proportion to dental esthetics was first documented by Levin in 1978. He explained the association of proportion with an esthetically pleasing dentition and smile. A portion between 2 adjacent parts which is repeated across enhances the unity within the diverse part of the composition³. This ratio is approximately 1.61803:1; that is, the smaller section is about 62% the size of the larger. The uniqueness of this ratio is that the ratio of the smaller part to the larger part is the same as the ratio of the larger part to the whole¹¹.

Lombardi was the first to propose the application of the golden proportion in dentistry, stating, 'it has proved too strong for dental use' also he defined the idea of a repeated ratio which implies that in an optimized dentofacial composition from the frontal aspect, the lateral to central width and the canine to lateral width are repeated in proportion¹². Maxillary central incisors, because of their position in front of the arch, should appear to be the widest, whitest, and therefore ,the most predominant teeth when viewed from the frontal aspect.

Clearly, for the golden proportion to be most useful in esthetic dentistry, it must be adapted for easy bilateral analysis of the teeth. Snow has advocated the use of the 'golden percentage' as a means of applying the golden proportion across the midline to encompass the total canine-canine width¹³.

MAXILLARY TOOTH	GOLDEN PROPORTION RATIO	GOLDEN % CALCULATION(RATIO)
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Right canine	0.618	0.618/6.472 (10%)
Right lateral incisor	1.000	1.000/6.472 (15%)
Right central incisor	1.618	1.618/6.472 (25%)
Left central incisor	1.618	1.618/6.472 (25%)
Left lateral incisor	1.000	1.000/6.472 (15%)
Left canine	0.618	0.618/6.472 (10%)
TOTAL	6.472	6.472/6.472 (100%)

The Golden Proportion has been applied to the total canine-canine width to become the “Golden Percentage”: 10%:15%:25%:25%:15%:10%. This is more meaningful tool to analyse the esthetic properties of a smile. The principle of the golden percentage in evaluation and treatment planning appears to be of significant benefit in esthetic smile design.

RECURRING ESTHETIC DENTAL (RED) PROPORTION:

The successive width proportion when viewed from the facial aspect should remain constant as we move posteriorly from midline which offers great flexibility to match tooth properties with facial proportions-Ward¹. Generally the values of the RED proportions used are between 60% and 80%. Once the ideal size of the central incisor has been calculated, the width of the central incisor is multiplied by the desired RED proportion to determine the frontal view width of the lateral incisor. The resulting lateral incisor width is multiplied by the same RED proportion to yield the desired frontal view of the canine. A mathematical formula has been arrived to calculate the width of the maxillary central incisor for any RED proportion given a fixed view width. And this width is determined by measuring the frontal view width between the distal aspects of the 2 maxillary canine teeth which is $(\text{frontal view of the anterior 6 teeth})/2(1+\text{RED}+\text{RED}2) = \text{width of central incisor}^{14}$.

CHU’S ESTHETIC SCALE:

Dr.Chu’s research supports Levin’s RED concept and refutes the golden proportion. Chu’s esthetic gauges also called proportion gauge enables an objective mathematical appraisal of tooth size rangers in a visual format for the clinician. By this instrument the clinician can apply esthetic value and measurement to a patient either by chair side or in the lab for projected treatment planning and outcome. The correct incisal edge position and tooth size must be determined prior to any irreversible esthetic periodontal procedure like root coverage or lengthening. The Chu’s is designed in such a way with T-bar and In-line tips screwed into the handle at apposing ends. T-bar gauge to measure a crowded dentition and In-line to measure crowded dentition¹⁵. The measurement of Chu’s gauge are based on clinical research of range and mean distribution values of individual tooth size with and proportion ratios¹⁶. Thus Chu’s gauge allows for fast, simple analysis and diagnosis of tooth length and width problems and gingival length discrepancies. Also colour coding which defines proportion of the tooth easier and quicker to read than any other instrument. All these are used as a guide rather than a rigid mathematical formula. Most authors recommend to create balance and harmony by eye through proper adjustment and evaluation of professionals than any other formula¹⁷.

SMILE DESIGN IN PROSTHODONTICS:

SMILE DESIGN FOR FULL MOUTH REHABILITATION:

Full mouth rehabilitations deals with the science of treating a mutilated dental situation which involves treatment of many or all teeth and helps them function in harmony with the surrounding muscles and the TM joint. Full mouth rehabilitation is needed when the teeth are worn down, broken, missing or if u experience pain in the jaw joint, headaches, muscle tenderness or clicking of the jaw. This utilizes current technologies to reshape and rebuild one’s teeth, gums and surrounding areas.

SMILE DESIGN FOR COMPLETE DENTURE PATIENTS:

Proper harmony and balance between a person’s smile and facial design incorporates tooth size, shape, and position as well as the visual impact that their inter-relationship has on the patient’s appearance. Mondial denture teeth is a type of teeth can be used for the replacement for implant-supported dentures, because they demonstrate life-like opalescence, high abrasion resistance, biocompatibility, colour stability, plaque resistance and strength. The nano fillers in the Mondial denture teeth create life-like optical characteristic such as depth and natural light dynamics¹⁸.

II. Discussion:

Esthetics has become increasingly important in the practice of modern dentistry. The demand for esthetic motivates the patient to seek dental treatment which is often dictated by cultural, ethnic and individual preferences. The factors which govern the restoration of natural appearance for edentulous patients often

discussed but frequently misunderstood. This dental art does not always occur automatically or are present in the nature, but is carefully incorporated into the treatment plan which creates an attractive smile which enhances the acceptance of an individual in our society.

III. Conclusion:

From the above discussion, it is vivid that the smile we create should be esthetically appealing and functionally sound too. We the dentist should carefully diagnose analyze and deliver the best to our patients by considering all the above factors. In today's world, the smile is consider an important component of an individual's over all appearance and well being. Scientific analysis of beautiful smiles has shown that the principle of Golden Proportion or RED proportions and Chu's esthetic gauges can be systematically applied to evaluate and to improve denture esthetics in predictable ways. The aim of smile design must be less tooth structure reduction and greater esthetics and durability.

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