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General principles of smile designing in dentistry - A clinical approach

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Abstract

The quest for beauty may be traced back to the earliest civilizations, the Phoenicians (about 800 BC) and Etruscians (around 900 BC) carved animal tusks to mimic the shape, form, and hue of real teeth. Frenchman Pierre Fauchard (1678–1761) and a number of his contemporaries promoted aesthetic techniques including good mouth hygiene and the usage of gold shell crowns with enamel "veneers" in the 18th century. The field of dentistry currently takes for granted a wide range of methods that may be used in the provision of aesthetic dentistry. Artificial intelligence is being employed more and more in this digital age to enhance treatment modalities, which benefits the patient, which is the purpose of the dentistry profession. An attractive smile boosts one's social acceptance, and the characteristics of smile greatly influence one's appearance and personality. When treatment for aesthetic cases is being planned, the design of a patient's smile cannot be isolated from a thorough approach to patient care. Understanding each component of aesthetic dentistry and its application to create pleasing smile has become the need of the hour. Dental professionals need to be aware of the value of aesthetics and work to create smile designs that will make patients happy and result in an obvious, aesthetically beautiful smile.

Keywords: Smile, Artificial Intelligence, Component.

Introduction

The quest for beauty may be traced back to the earliest civilizations, the Phoenicians (about 800 BC) and Etruscians (around 900 BC) carved animal tusks to mimic the shape, form, and hue of real teeth. An appealing or pleasing smile increases a person's social acceptance, and the character of the smile has a

significant impact on the individual's beauty and personality. The design of a patient's smile cannot be separated from a thorough approach to patient care when treatment for esthetic cases is being planned. To produce a good, healthy, and efficient result, it is essential to comprehend the interactions between all the supporting oral components, such as the muscles, bones, joints, gingival tissues, and occlusion.

Dental professionals need to understand the importance of esthetics and try to design smile such that patients would feel content and get a visible, esthetically pleasing smile.

- The four major constituents of smile designing are:
- facial esthetics,
- gingival esthetics,
- micro esthetics,
- macro esthetics.

History

Frenchman Pierre Fauchard (1678–1761) and a number of his contemporaries promoted aesthetic techniques including good mouth hygiene and the usage of gold shell crowns with enamel "veneers" in the 18th century. They also developed a method for creating "incorrupt tible" teeth for use un dentures that are made of mineral, rather than ivory or bone.

Drs. M. Richmond and M. Logan created the first porcelain crown systems in the 1880s, which came before early direct tooth-colored filling materials. These crown systems were technologically advanced at the time, but they were unattractive and ill-fitting.

The first recorded description of porcelain veneers, held in place by zinc phosphate cement, dates back to the 1890s. Similar to the early porcelain crowns, these veneers had only mediocre aesthetic features.

A new era in cosmetic dentistry began in the 1960s with the advent of enamel etching and bonding by Michael Buonocore in 1955 and the creation of acrylic resins for dental applications.

Thereafter, resin composite systems were introduced for the esthetic restoration of teeth.

Today's era: The field of dentistry currently takes for granted a wide range of methods that may be used in the provision of aesthetic dentistry, like the development of the Bio clear Matrix and the arrival of Digital Smile Designing and Photoshop Smile Designing, to name just two recent advances. Artificial intelligence is being employed more and more in this digital age to enhance treatment modalities, which benefits the patient, which is the purpose of the dentistry profession.

Objectives of Smile designing

Goal of smile designing is to produce a healthy, esthetic and functional smile which would involve harmonious existence of all the intra oral hard and soft tissue structures along with extraoral structures and features.

There should be proper understanding of interrelation ship between all structures, occlusion muscles and tissues.

Fig 1: Classification of smile: a) commissural smile, b) complex smile c) cuspid smile Factors to be analysed for smile designing.

Factors to be assessed can be broadly categorized as:

- Facial component
- Dental component

Facial component

Standard Esthetic principles, such as appropriate alignment, symmetry, and facial proportion, are the foundation of facial beauty. There is frequently a multidisciplinary approach to facial esthetics. It could involve orthognathic surgery, orthodontics, cosmetic dentistry, plastic surgery, and periodontal therapy. So, the best results come from an aesthetic approach to patient care.

Important parameters to play a major role in Esthetic smile are:

- Interpupillary line
- Lips
- Dimensions of face
- Shape of face

Interpupillary line

An imaginary horizontal line drawn between centers of pupils of the eye. Interpupillary line must be parallel to the occlusal table and must be perpendicular to the midline of the face.

Lips

Lip line refers to the position of the inferior border of the upper lip during smile formation, which determines how much display of teeth or gingiva will be present at the junction of hard and soft tissues. The gingival margin and the lip line should be parallel in ideal circumstances, else there may be a 1-2 mm show of the gingival tissue.

Dimensions of face

Horizontal: The face should be approximately the width of five eyes. The width of the face should be equal to the distance between the eyebrow and chin.

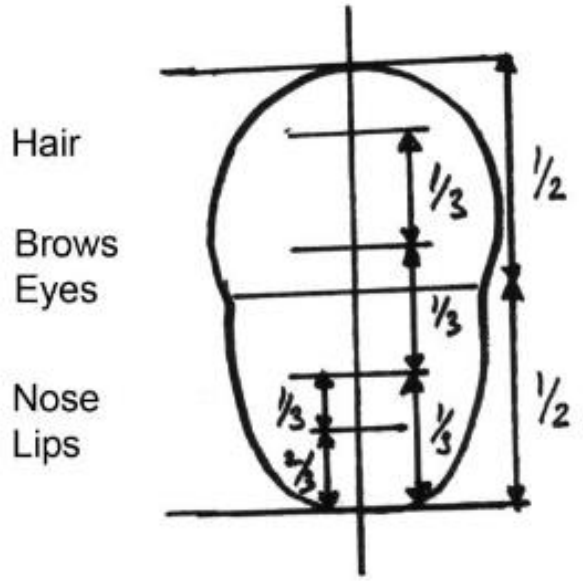

Fig .3: Horizontal dimensions of face

Vertical

Vertically dimensions of face should “follow rule of three” i.e., face is divided into three parts.

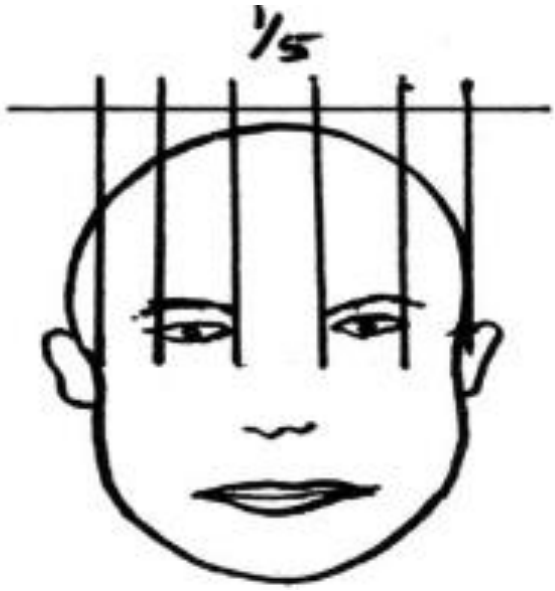

Fig. 3: Vertical dimensions of face

Cunningham and Michael R. have studied the physical beauty of persons in a mathematical frame. Their study included 50 women, more than half of whom were finalists at beauty contests, and study results are as follows.

- 3/10: Proportion of eye-width to overall face,
- 1/5: Proportion of chin length to overall face,

- 1/10: Proportion of the distance between the eyebrow and eye, to vertical length of the face.
- Shape and profile of the face:

Shape of the face could be

- Square
- Oval
- Tapering
- Square tapering

Profiles of the face could be:

- Straight
- Convex
- Concave

Dental component

- Dental midline
- tooth dimension
- Zenith points
- Tooth inclinations
- Interdental contacts
- embrasures
- SPA- sex, personality, age of patient
- symmetry
- gingival health
- smile line

Dental midline

The vertical contact interface between two maxillary centrals is referred to as the midline. It should lie parallel to the midline of the face and perpendicular to the incisal plane.

As long as the dental midline is parallel to the interpupillary line, a discrepancy of no more than 2 mm is occasionally acceptable from an aesthetic standpoint. One of these anatomical reference points with the best accuracy is the philtrum of the lip. It always resides in the middle of the face.

The papilla between the centrals should match the center of the philtrum, which is also the center of the cupid's bow. If the midline is incorrect and these two structures are identical, the issue is typically incisal inclination.

A real midline deviation is present if the papilla and philtrum do not match. In comparison to a midline that does not bisect the philtrum, one that does not bisect the papilla stands out more.

Tooth display

The position of the maxillary incisal edge is the most crucial factor in designing a smile because, once established, it serves as a guide for choosing the right tooth proportion and gingival levels. The degree of tooth display, phonetics, and patient feedback are the factors that are utilised to determine the position of the maxillary incisal edge. A young person should be able to see 3.5 mm of the maxillary central incisor when the mouth is relaxed and slightly open. Less teeth are visible as we age due to a reduction in muscular tone.

Tooth proportions

According to the principle of central dominance, the central teeth must be the dominant ones in the smile and have aesthetically attractive proportions.

Width to length ratio of the centrals must be 4:5.

Various standards exist for determining the right proportions in an aesthetically appealing smile.

- Golden proportion (Lombardi): When viewed from the facial, the width of each anterior tooth is 60% of the width of the adjacent tooth (mathematical ratio being 1.6:1:0.6). Patients' varying arch forms, lip structure, and face proportions make it challenging to apply. Strict adherence to calculations using the golden ratios discourages innovation and may result in superficial failure.

Recurring esthetic dental proportions (Ward): As we move posteriorly from the midline, the succeeding width

percentage should remain constant when viewed from the facial aspect. This gives great liberty to adjust tooth characteristics to fit your face.[7]

M proportions (Method): Using a software, this technique compares the width of the teeth to the width of the face. Since the entire study is performed on a computer, it relies more on mathematics than it does on creative analysis.[8]

Chu's esthetic gauges: Research by Dr. Chu disproves the golden proportion and sides Levin's RED concept. The intraoral analysis is done via a series of gauges.

The advantage of gauges is:

A quick, clear analysis and evaluation of issues with tooth width, tooth length, and gingival length;

Using colour coding, which is quicker and simpler to interpret than any other device, predefines the required tooth proportions;

Utilised as a reference manual between the lab technician and the clinician, which lowers the likelihood of communication errors.

Zenith points

The most apical point on gingiva where there is greatest scalloping. The point usually lies distal to the vertical line drawn from the center of the tooth.

Tooth inclinations

Axial inclination compares the central vertical midline to the vertical alignment of the maxillary teeth, which are apparent in the smile line. Each succeeding anterior tooth's mesial inclination should naturally and gradually grow from the central to the canine. With the centrals, it should be the least obvious, followed by the laterals, the canines, and finally, it should be more apparent.[10]

Interdental contacts Interdental contact area- broad zone of contact between two teeth. It must follow rule of 50:40:30. Where the area of contact decreases according to the proportion from anterior to posterior.

Embrasure

When there is no gingiva present in the space below the interproximal contact, the area is referred to as having open gingival embrasures, often known as "black triangles." They contribute to persistent food retention and periodontal issues in addition to aesthetic issues.

SPA- Sex, personality, age:

According to these characteristics form of teeth can vary, some of the examples are:

Sex

- Male- cuboidal shaped, squarish form of teeth
- Female- round smooth shaped.

Personality

Aggressive, hostile angry: pointed long "fangy" cusp form

- Passive: blunt, rounded, short cusp form

Age

- Young-unworn incisal edge, defined incisal embrasure, low chroma and high value
- Old-shorter; so less smile display, minimal incisal embrasure, high chroma and low value

Gingival health

Normal features of gingiva would be a key factor for an esthetic and functional smile. Colour of gingiva, zenith points, absence of inflammation, well contoured and firm gingiva and adequate display of the same adds to the beauty of smile.

Smile line

The term "smile line" refers to an imaginary line between the incisal edges of the upper maxillary teeth that, when a person smiles, should match the curvature of the upper border of the lower lip. Central incisors should appear slightly more or of equal length as that of canines as the patient smiles. Smile line helps to asses

proportionate display of white and pink components of oral cavity.

Conclusion

Dental professionals via their thorough knowledge and skill must try to achieve aesthetic results for patients. This would increase patient's acceptability to dental treatment. It is our responsibility to thoroughly diagnose, examine, and provide for our patients, taking into account all of the previously mentioned factors. In contrast to the past, the smile design we create must be as conservative as feasible. Less tooth structure loss, together with improved aesthetics and durability, must be our goal. This simply means that all treatments, including orthodontics, periodontics, and surgical operations, must be carried out as needed in the multispecialty sector of cosmetic dentistry.

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