

REVIEW ARTICLE

SMILE DESIGNING: A REVIEW

¹Ravneet Kaushal, ²Rohit Wadhwa, ³Arvind Arora, ⁴Shefally, ⁵Harleen Kaur

^{1,2}Senior Lecturer, ³Professor, ^{4,5}Reader, Department of Conservative & Endodontic, Deshbhagat Dental College & Hospital, Mandi Gobindgrah, Punjab, India

Correspondence:

Ravneet Kaushal

Senior Lecturer, Department of Conservative & Endodontic, Deshbhagat Dental College & Hospital, Mandi Gobindgrah, Punjab, India

Email: ravneet.kaushal11@gmail.com

Received: 18 April, 2022

Accepted: 20 May, 2022

ABSTRACT

A person's ability to communicate a variety of emotions through the form and movement of their teeth and lips is frequently a determining factor in how effectively they can function in society. Of course, the value placed on a lovely grin is not new. It is critical that the final result is not just determined by appearances. As doctors, our ultimate objective is to create a nice composition in the smile by arranging diverse aesthetic aspects.

Key words: Smile Design, esthetics

INTRODUCTION

A person's ability to communicate a variety of emotions through the form and movement of their teeth and lips is frequently a determining factor in how effectively they can function in society. Of course, the value placed on a lovely grin is not new. The quest for beauty may be traced back to the oldest civilizations; the Phoenicians (about 800 BC) and Etruscians (around 900 BC) carved animal tusks to mimic the shape, form, and colour of real teeth. Dentistry was not acknowledged as a separate field and its many sections were not founded until the 18th century. The movement's head, Pierre Fauchard (1678–1761) of France, updated and promoted dentistry, as well as aesthetic techniques, with the help of other associates¹.

SMILE DESIGNING OBJECTIVES

The objective of an aesthetic makeover is to create a calm and stable masticatory system in which the teeth, tissues, muscles, skeletal structures, and joints all work together in perfect harmony (Peter Dawson). When planning therapy for aesthetics issues, it is critical to remember that smile design cannot be separated from a holistic approach to patient care. Understanding the interrelationships among all the supporting oral components, including as the muscles, bones, joints, gingival tissues, and occlusion, is essential for achieving a successful, healthy, and functional outcome.²

THE SMILE'S ANATOMY

The smile is a distinct depiction of the facial structures and is elicited by facial movements. The perioral musculature is divided into three categories:

Group I muscles: Buccinator, orbicularis oris, levatorangulioris, depressor angulioris, risorius, zygomaticus major.

Group II muscles: Levatorlabii superioris, levator labii superioris alaeque nasi, zygomaticus minor

Group III muscles: Depressor labii inferioris, mentalis, platysma.

Group I muscles insert into the modiolus, Group II muscles inserted into the upper-lip, and Group III muscles insert into lower-lip.

The smile's display zone is framed by the upper and lower lips. The teeth and the gingival scaffold are the components of the smile inside this framework. The zygomaticus major muscles, which enter into the modiolus of the orbicularis oris at each corner of the mouth, are the principal effectors of the grin. Lip thickness, inter labial gap, inter commissure width, smile index (width/height), and gingival architecture are soft-tissue factors of the display zone.³

SMILE'S MUSCULAR BASE

The nasolabial fold has been identified as the cornerstone of the smiling mechanism by previous researches. A grin is generated in two stages, according to them. The levator muscles tighten in the first step, raising the top lip to the nasolabial fold. The levatorlabii superioris, zygomaticus major, and buccinator muscles lift the lips further higher in the second stage. The last stage is frequently marked by the appearance of squinting. It is the periocular musculature contracting to promote maximal upper-lip elevation through the fold.⁴

SMILE ANALYSIS

Smile analysis is generally done in three dimensions: frontal, oblique, and sagittal, as well as across time. To visualise and quantify the frontal grin, Ackerman and Ackerman established the smile index (inter commissural width/interlabial gap). The ratio is used to compare patients' smiles. The younger the grin seems, the lower the smile index.⁵

The shape of the maxillary occlusal plane is seen in the oblique view. On a grin, the maxillary occlusal plane should match the curve of the lower lip. Overjet and incisor angulations are best observed in the sagittal dimension. Orthodontic treatment of overjet requires both macro and soft-tissue aspects, such as jaw patterns and nasal projection.⁶

Orthodontic patients are classified as preadolescent, adolescent, or adult according on their age. The appearance of both resting and smiling presentations is influenced by the growth, maturation, and ageing of the perioral soft-tissues. According to orthodontic cephalometric study, profiles flatten on average throughout time.⁷

DESIGNING A DIGITAL SMILE

Everyone wants a beautiful, confident grin. A physician can utilise the Digital smile designing (DSD) tool when a patient wants to get that smile but is hesitant to undergo treatment because he or she cannot picture the treatment outcome. The DSD idea is to assist clinicians by improving the aesthetic picture of the patient's problem, providing comprehension of the potential remedy, and teaching and motivating them about the treatment's advantages, so increasing case acceptance. Digital grin design is a digital mode that allows us to design and project a new smile by simulating and previsualizing the final result of the suggested treatment. A digitally created design involves patients in the designing process of their own self-smile design, resulting in customization of smile design based on individual needs and desires that complement the patient's morpho psychological characteristics, relating the patient to an emotional level, increasing their confidence in the process, and better acceptance of the anticipated treatment.⁸

ADVANTAGES OF DiSD

Digital imaging and design allows patients to see the projected ultimate result before the therapy begins, increasing the treatment's predictability. The doctor can address the patient's concerns by digitally displaying the end result, inspiring and teaching them about the treatment's benefits. It enhances physician diagnosis and treatment plans by providing an aesthetic image of the patient's condition using digital analysis of facial, gingival, and dental characteristics to examine the smile and face in a standardised and objective manner.⁸

DSD encourages patients to participate in their own smile design, resulting in a more aesthetically pleasing, humanistic, emotive, and confident smile. Before any treatment operations are conducted, the patient may view, offer feedback, and approve the final shape of the new smile, increasing patient happiness. It eliminates the possibility of post-treatment remorse because irreversible operations cannot be reversed once performed. It also aids in evaluating and comparing changes before and after therapy. Easy comparisons between pre- and post-treatment images may be done using the digital ruler, sketches, and reference lines.⁸

It enhances communication not just between physicians and patients, but also between members of the multidisciplinary team, such as clinicians, clinicians, and lab technicians. During the diagnostic and therapy phases, all team members may access this information whenever they need to evaluate, update, or add components, even if they are not in the same area or at the same time. Visual communication is improved, transparency is improved, teamwork is improved, and multidisciplinary treatment planning is improved. In order to make any required changes, the lab technician collects feedback from the patient about tooth form, arrangement, and colour. This constant double-checking assures the final product's quality.⁸

Gabriele Cervino et al. undertook a review of 24 papers on DSD published up until the year 2018 with the goal of determining the effectiveness of the usage of Digital Smile Design techniques and if Digital Smile Design is improving patient comfort and treatment outcomes. It takes into account the software's "communicative" capabilities, treatment planning, and patient aesthetic and functional rehabilitation. The authors concluded that this instrument delivers essential information to the doctor and patient based on all of the studies in the literature about Digital Smile Design. Patients may see their rehabilitations before they begin, which can serve crucial medico-legal purposes.⁸

SMILE LINE AND ANTERIOR OCCLUSAL PLANE

The following horizontal reference lines/planes can be used to assess for any horizontal discrepancy:

- Interpupillary line
- Incisal occlusal line
- Gingival margins
- Intercommissure line

The following references may be evaluated and analysed digitally using high-quality facial photos. The plane of the incisal margins of maxillary anterior teeth should be parallel to the interpupillary line and perpendicular to the face midline in ideal circumstances, but if the eyes are under different planes, the inter commissure line should be used as a reference. The incisal margins of the maxillary front teeth should be aligned with the horizon when none of the horizontal reference planes is employed.⁹

An unsatisfactory treatment result is a tilted anterior occlusal plane, which should be avoided at all costs. A tilted occlusal plane can be avoided with the use of a facebow, KoisDento-Facial Analyzer, photographic pictures, and effective laboratory communication. The smile line's orientation can be planned once the anterior occlusal plane has been established. The smile line is an imaginary line that runs along the incisal borders of the maxillary anterior

teeth and is meant to simulate the curvature of the top border of the lower lip when smiling, commonly in a convex or gull-wing pattern. The incisal margins of the central incisors are below the tips of the canines in a youthful grin line or "gull-wing" form.¹⁰

When the tips of the canines or premolars are longer than those of the central incisors, a reverse grin line can be seen in the old or worn dentition. In my experience, patients frequently prefer a very "flat" grin line, maybe influenced by smiles seen in the media, and dialogue is necessary to provide options. The bottom third of the face, often known as the "dental zone," has the most critical function in determining facial attractiveness, emphasising the importance of meticulous planning in restorative dentistry.¹¹

WIDTH: LENGTH RATIO OF CENTRAL INCISORS

The location and size of the central incisors are critical, and all other teeth should be formed around them; they should be the most prominent teeth in the smile. Depending on face dimensions, the width-to-length ratio should be between 75 and 85 percent; these teeth are more dominant at the upper level.¹²

BUCCAL CORRIDOR

The buccal corridor is the dark gap (negative space) seen between the corners of the mouth and the buccal surfaces of the maxillary teeth while forming a grin. The upper canine marks the beginnings of the buccal corridor and the breadth of the grin. Laypeople consider a broad grin with a minimum buccal corridor to be the most aesthetically pleasant; nevertheless, a broad smile without a buccal corridor may be seen as false. The buccal corridor is less important if the patient does not have a big grin.¹³

AXIAL INCLINATION

As the teeth shift further from the midline, the long axis of the maxillary anterior teeth progresses. From the central incisor to the canine, the teeth tilt distally in the inciso-apical direction, with the degree of inclination increasing.¹⁴

EMBRASURES AND CONNECTORS

The inter-incisal angles, or embrasures, follow a pattern that starts with the central incisor and proceeds laterally. As you go away from the midline, the size and volume of the embrasure space grows. A narrow inverted "V" should exist between the upper central incisors; an asymmetrical inverted "V" should exist between the central and lateral incisors; and a large inverted "V" should exist between the lateral incisor and the canine. The contact regions where the top anterior teeth appear to meet are known as connectors.¹⁵

From the incisors to the posterior teeth, the site of interdental contact tends to advance apically. When determining the material to employ in a certain repair, the length of the accessible contact area is important; metal ceramic only requires 6mm, zirconia requires 9mm, and IPS max requires 16mm. These measures are crucial if the crown height is low or if the occlusal space is limited.^{16,26}

FACIAL AND DENTAL MIDLINES

To grasp the notion of dental midline, you must first grasp the concept of face midline. The vertical line drawn between the forehead, nose columella, dental midline, and chin was designated by Donovan et al as the facial midline.^{18,27,28}

It also symbolises a vertical imaginary line that goes from the nasion to the subnasal point, interincisal point, and pogonion. According to many research, the facial mid-line is perpendicular to the interpupillary line and placed in the middle of the face. The dental

midline is a fictitious vertical line that does not always correspond to the face midline. The vertical contact line between two upper central incisors is denoted by this term.^{19,29}

When the midline meets the midline of the face, it is deemed perfect. The angle to the incisal plane should be 90 degrees. Dental midline anomalies are the least noticed of all the cosmetic features by both patients and dental professionals. Slight variations between the midlines of the face and the midlines of the teeth are acceptable and undetectable. It has been found that people do not detect dental midlines that are 4 mm off the facial midlines as long as the dental midline is parallel to the long axis of the face. Midline differences of up to 4 mm are usually not considered unattractive.^{20,30}

Anatomical cues such as the midline of the nose, forehead, chin, philtrum, and interpupillary plane can be used to determine the midline. The philtrum of the lip is the most accurate anatomic land mark, and it is usually in the centre of the face, except in certain circumstances such as surgery affecting the lip or cleft lip, or accidents.^{21,31}

The papilla between the two central incisors should match to the centre of the philtrum, which creates the centre of the cupid's bow. When the centre of the philtrum does not conform to the midline of the interdental papilla, incisal inclination becomes problematic. On the other hand, if the philtrum and papilla do not match, a real midline shift might occur, which can be troublesome. The midline that does not bisect the papilla is more noticeable than the one that does not bisect the philtrum. Face bow transfer adjusted parallel to the interpupillary plane can provide useful information on midline inclination and slanted incisal plane.^{22,32}

Observing a grin in real time is the greatest approach to imagine dental midline. When viewed from the front teeth in a grin, the gap between the two upper central incisors is most appealing, and it should be centred between the right and left sides of the face. The dental midline, on the other hand, does not have to necessarily correlate to other topographies of the face.^{23,33}

Using the philtrum as a guide, the maxillary midline corresponded with the midline of the face in 70% of instances. Furthermore, minor deviations in the centre midline had no significant effect on aesthetics. In 75% of cases, the maxillary and mandibular midlines did not coincide, according to research.^{24,34}

As a result, the lower midline should not be utilised to draw the upper midline. The mismatch of upper and lower midlines has no effect on the natural aesthetic of teeth since the lower teeth are not exposed when smiling. Lower midline isn't particularly important in aesthetic dentistry. Because of the constraint and uniform size of the mandibular incisors, picturing the centre point might be difficult at times.^{25,35}

CONCLUSION

A pleasant grin may open doors and break down obstacles that stand between us and a larger, richer existence in today's competitive environment. It's important to realise that there is no such thing as a "perfect" grin. In orthodontics, the most essential aesthetic aim is to develop a "balanced" smile. The components of the smile should be viewed as artistic suggestions to aid the orthodontist in treating specific individuals, rather than as hard limitations.

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