

CREATING AESTHETIC SMILES

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ABSTRACT

The fundamental objective of every aesthetic treatment is the patient's satisfaction and hence the outcome of the treatment should meet the patient's expectation of enhancing his/ her facial aesthetics and smile. A patient constantly doubting the end result of the treatment, which is an irreversible procedure, can be motivated and educated through Digital Smile Designing (DSD) technique. Digital smile designing technique can provide a better insight for the patient about the final treatment outcome. This article describes the method of creating aesthetic smiles digitally. When the dentist first evaluates a new patient with aesthetic concerns, many critical factors may be overlooked. A digital photography and digital analysis protocol enables the dentist to visualize and analyse issues that he or she may not notice clinically. Drawing of reference lines and shapes over extra- and intraoral digital photographs can easily be performed using presentation software.

KEYWORDS: Aesthetic, Digital, Smile, Design, Mock-up technique.

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 society. Of course, the importance given to a beautiful smile is not new. The search for beauty can be traced to the earliest civilizations; both the Phoenicians (app 800 BC) and Etruscians (app 900 BC) carefully carved animal tusks to simulate the shape, form and hue of natural teeth. It was not until the 18th century that dentistry was recognized as a separate discipline and its various branches were established.

COMPONENTS OF ESTHETIC SMILE

Harmonizing an aesthetics smile requires a perfect integration of facial composition and dental composition. The facial composition includes the hard and soft tissues of the face. The dental composition relates more specifically to teeth and their relationship to gingival tissues. A smile design should always include the evaluation and analysis of both facial and dental composition.^[1,2]

Facial composition

Facial beauty is based on standard aesthetic principles that involve proper alignment, symmetry and proportion of face. Analysing, evaluating and treatment planning for facial aesthetics often involve a multidisciplinary approach which could include orthodontics, orthognathic

surgery, periodontal therapy, cosmetic dentistry and plastic surgery. Thus, aesthetic approach to patient care produces the best dental and facial beauty. There are two facial features which do play a major role in the smile design.

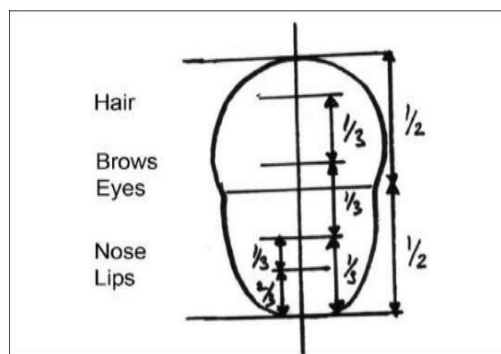
The interpupillary line and Lips

The interpupillary line should be perpendicular to the midline of the face and parallel to the occlusal plane. Lips are important since they create the boundaries of smile design. In classical terms, the horizontal and vertical dimensions for an ideal face are as follows:

Horizontal

The width of the face should be the width of five "eyes".

The distance between the eyebrow and chin should be equal to the width of the face.



Vertical

The facial height is divided into three equal parts from the forehead to the eyebrow line, from the eyebrow line to the base of the nose and from the base of the nose to the base of the chin.

The full face is divided into two parts, eyes being the midline.

The lower part of the face from the base of the nose to the chin is divided into two parts, the upper lip forms one-third of it and the lower lip and the chin two-thirds of it.

The basic shape of the face when viewed from the frontal aspect can be one of the following

- Square
- Tapering
- Square tapering
- Ovoid

The lateral profile of an individual can be any one of the following

- Straight
- Convex
- Concave

These factors play a role in determining the tooth size, shape and the lateral profile

- Age
- Symmetry and balance

Soft tissue components

- Gingival health
- Gingival levels and harmony
- Interdental embrasure and smile line.

Dental composition

The vital elements of smile designing include the following:

Tooth components

- Dental midline
- Incisal lengths
- Tooth dimensions
- Zenith points
- Axial inclinations
- Interdental contact area
- Incisal embrasure
- Sex, personality

EVOLUTION OF DIGITAL SMILE DESIGN

Coachman and Calamita described DSD^[1,2] as a multi-use conceptual tool that can support diagnostic vision, improve communication, and enhance treatment predictability, by permitting careful analysis of the patient's facial and dental characteristics that may have gone unnoticed by clinical, photographic diagnostic cast-based evaluation procedures.^[3]

Christian Coachman in 2017 has proposed this evolution in generations^[4,5]

Generation 1: Analogue drawings over photos and no connection to the analogue model. Digital dentistry by now was not introduced.

Generation 2: Digital 2D drawings and visual connection to the analogue model. With the advent of digital world, certain software like PowerPoint were familiarized which permitted digital drawing. The drawing could be visually connected to the study model but physical connection still lacked.

Generation 3: Digital 2D drawings and analogue connection to the model. The very first drawing software specific to digital dentistry was introduced which linked 2D digital smile design to 3D wax-up

Generation 4: Digital 2D drawings and digital connection to the 3D model. Now was the time when digital dentistry progressed from 2D to 3D analysis.

Generation 5: Complete 3D workflow.

Generation 6: The 4D concept. Adding motion to the smile design process.

REQUIREMENTS FOR DSD

DSD technique is carried out by digital equipment already prevailing in current dental practice like a computer with one of the DSD software, a digital SLR camera or even a smart phone. A digital intraoral scanner for digital impression, a 3D printer and CAD/CAM are additional tools for complete digital 3D workflow.

TYPES OF DIGITAL SMILE DESIGN SOFTWARES

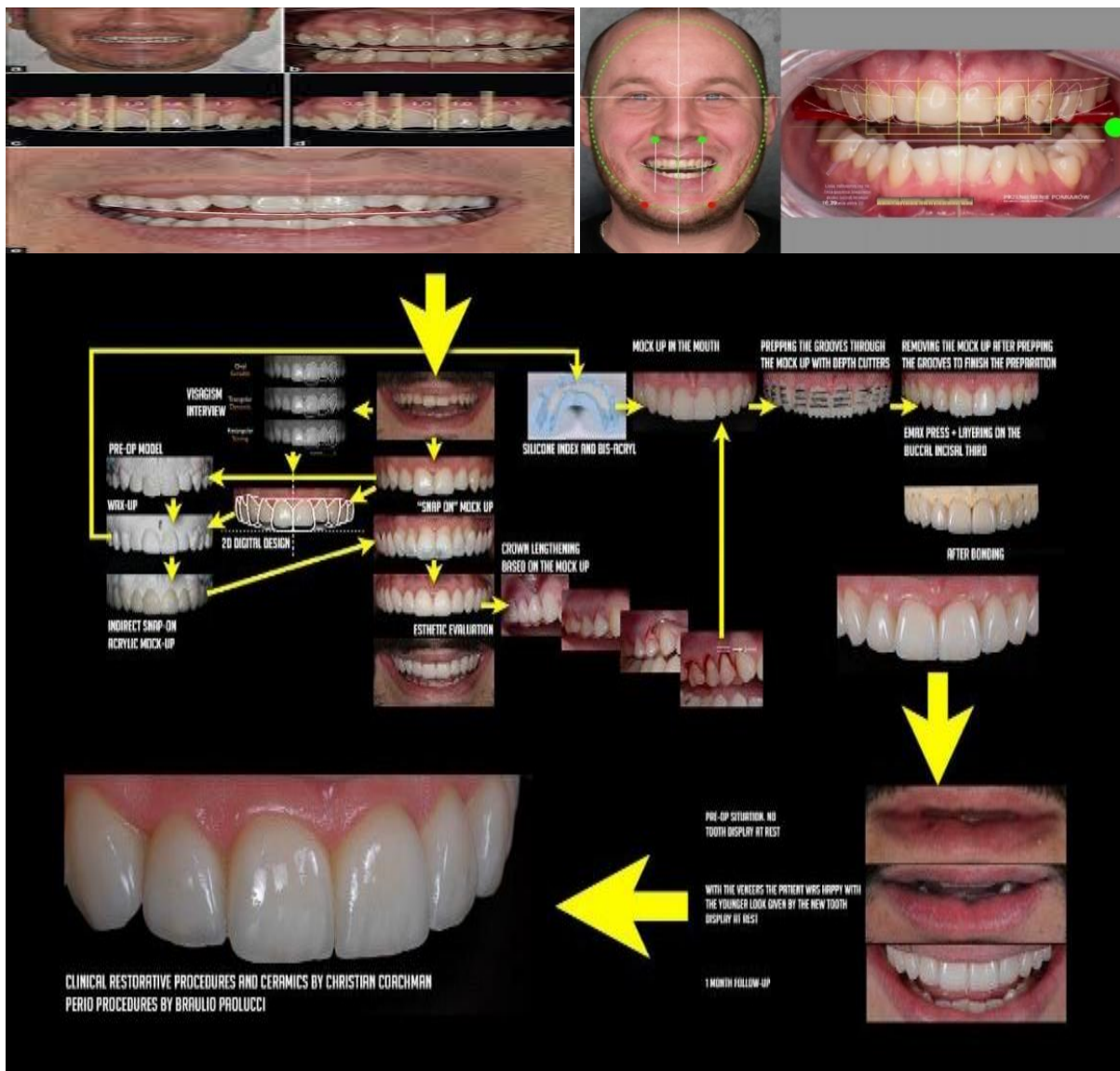
1. Photoshop CS6 (Adobe Systems Incorporated),
2. Microsoft PowerPoint
3. Smile Designer Pro (SDP) (Tasty Tech Ltd),
4. Aesthetic Digital Smile Design (ADSD -Dr. Valerio Bini),
5. Cerec SW 4.2 (Sirona Dental Systems Inc.),
6. Planmeca Romexis Smile Design (PRSD) (Planmeca Romexis®)
7. VisagiSMile (Web Motion LTD)

PROCEDURE OF CARRYING DSD

Although the inclusion of aesthetic parameters in different DSD software varies, basic procedure of smile designing remains the same. All the DSD software allows for aesthetic designing through the drawing of reference lines and shapes on extra- and intraoral digital photographs. Facial analysis is done using reference lines from which uniform parameters are developed for frontal view of the face. The horizontal reference lines consist of the inter-pupillary and inter-commissural lines that deliver a complete sense of balance and horizontal over view in the aesthetically pleasing face while the vertical reference line includes the facial midline, passing the glabella, nose, and the chin. The horizontal and vertical lines are crossed against each other to measure symmetry and cant of the face.^[6]

The facial photograph with a wide smile and the teeth apart is moved behind this cross to determine the ideal horizontal plane and vertical midline which permits a comparative analysis of the teeth and face. After facial analysis, dento gingival analysis is done. The length of the upper lip at rest and in a smile is checked to determine the gingival display. Smile curves established by correlating the curvature of the incisal edges of the maxillary anterior teeth. The dental contour is made according to the lower lip proportions and the anterior-posterior curvature of the teeth. This facial photograph is then cropped to show only the intraoral view. Three reference lines are marked on the teeth, a straight horizontal line drawn from canine tip to canine tip, one more horizontal line on the incisal edges of central incisors and another vertical line passing through the dental midline (passing through the interdental papillae). This supports in reproducing the cross, that is, the reference inter-pupillary and facial midline on the face onto the intraoral view. Few additional lines are drawn such as the gingival zenith, joining lines of the gingival and incisal battlements for complete dental analysis.

For adequate teeth dimension the ideal size of dental width to length ratio can be incorporated by any one of the published theories which includes Golden proportion^[7,8], Pound's theory, Recurring aesthetic dental proportion, Dentogenic theory, or Visagism.⁹ Required changes are carried out with the help of a digital ruler which can be calibrated on the photograph by measuring the width of the central incisors in the study model. Changes can be modified, decreased or adapted to different situations, depending on the aesthetic requirement and individual needs of the patient. After the new smile design is attained it can be digitally presented to the patient to seek out appreciation and feedback. This digitally approved smile design at this stage can be used to create physical mock-up which can be tested aesthetically in the patient's mouth. The mock-up allows for not only visualization of the shape integrated to the gingiva, lips, face, but also to phonetics during the evaluation period. As such, the patient may evaluate, provide opinion, and approve the final shape of the new smile before any irreversible procedures are performed.



MOCK UP TECHNIQUE

In addition, a powerful tool commonly used to support digital treatment planning is the mock-up technique; as it gives the patient and dentist, a tridimensional visualization of the final result of the proposed treatment is one of its big advantages. While in the diagnostic wax-up, one can only see the desired shape for the teeth, the mock-up allows the visualization of the shape integrated to the gingiva, lips, face, and phonetics, during the evaluation period. As such, the patient may evaluate, provide opinion, and approve the final shape of the new smile before any irreversible procedures are performed such as dental wearing. The mock-up is considered a fast, easy, and efficient tool for the diagnosis and planning of rehabilitating aesthetic treatments. This technique should be used as a routine protocol by the clinician since it permits the professional to work with higher predictability of results and smaller margin of error in more complex cases. The mock-up must also be seen as a marketing tool to help the patient accept the proposed treatment, because one technique complements the other, as in the case presented here.^[10,11]

ADVANTAGES

Digital imaging and designing helps patients to visualize the expected final result before the treatment itself starts which enhances the predictability of the treatment. The clinician can address patients concern by showing digitally the final outcome, motivating and educating them about the benefits of the treatment. It improves clinician diagnosis and treatment plan.^[12] The patient may evaluate, provide opinion, and approve the final shape of the new smile before any treatment procedures are performed thus enhancing patients satisfaction. It leaves no scope of regret post treatment where the irreversible procedures once carried out cannot be undone. It also helps to evaluate and compare pre and post treatment change.

LIMITATIONS

1. As the diagnosis and treatment plan depends on photographic and video documentation, inadequacy in them may distort the reference image and may result in an incorrect diagnosis and planning.
2. For complete 3D digital work flow, 3D softwares with updates, intraoral scanner, 3D printer and CAD/CAM are required which makes it economically expensive.^[13]
3. Training and handling for certain software are necessary which further increases time and cost

CONCLUSION

The Digital Smile Design is a multi-use tool that can assist the restorative team throughout treatment, improving the dental team's understanding of the aesthetic issues and increasing patient acceptance of the final result. The placement of reference lines and other shapes over extra- and intraoral digital photographs widens the dental team's diagnostic vision and helps to evaluate the

limitations, risk factors, and aesthetic principles of a given case. These critical data will lead to improved results in all phases of treatment.

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