



DIGITAL SMILE DESIGNING: A NEW ERA IN AESTHETIC DENTISTRY

Prosthodontics

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ABSTRACT

The search for beauty can be traced to the earliest civilization by both the Phoenicians (app. 800 BC) & eutrarians (app. 900 BC). Carefully carved animal tooth (tusks) to similarize form, shape & color of natural tooth. [1] Smile is the most important key to elicit positive response among communication. [2] Smile design is a branch of cosmetic dental procedure that leads to correction of imperfections of teeth & restores dental health & appearance of person. [3] Digital smile designing is recently introduced concept & software used to modify & analyze the smile of individual. [2] Smile designing is an irreversible procedure, so patient can be motivated & educated through DSD technique. [4] DSD is changing the future of dental practices worldwide. This article reviews the evolution of smile designing, basic concepts of DSD, various methods, uses, advantages, disadvantage & limitations of Digital Smile Designing.

KEYWORDS

Digital Smile Designing, Facial esthetics, Digital photography.

INTRODUCTION

Smile expresses range of emotions with structural & coordinated movements of lips & facial muscles with respect to teeth. Beautiful smile & harmonic facial esthetics contributes well-being of patient.[5] Main goals of smile design are: -

1. Esthetic diagnosis
2. Communication
3. Feedback
4. Patient management
5. Education

DSD presents many advantages over more traditional treatment planning methods. DSD is digital planning tool for esthetic dentistry which evaluations between teeth, gingiva, smile & face obtained via lines & digital drawings on facial & intraoral photographs of patient. [6]

Evolution of DSD

Evolution proposed by Christian Coachman (2017) as follows [7]: *Generation 1:- Pictures are drawn on printed images to visualize treatment results where there is no co-relation of study model.

*Generation 2:- 2-D digital diagrams are drawn on software where these diagrams can be connected to study models but there is no physical connection with study models.

*Generation 3:- First drawing software was introduced where 2-D digital drawing was linked with 3-D wax-up.

*Generation 4:- Transition occurred from 2D to 3D where 3-D digital wax-up was carried out with facial integration & predetermined facial esthetic framework.

*Generation 5:- Complete 3-D smile designing has been performed.

*Generation 6:- 4-D Digital smile designing concept was introduced. [16]

Advantages of DSD

DSD offers following advantages[8, 14]:

1. Esthetic diagnosis: - Digital photography & Digital analysis protocol enables dentist to visualize & analyze issues that may not be noticed clinically.
2. Communication: - DSD enables the transfer of information from oral structures to 3-D wax-up for final restoration. Also, DSD is effective communication tool among dentists, technician & patient for discussion of treatment strategies & prognosis.
3. Feedback:- DSD makes the comparison between pre & post-treatment photographs easier which helps to determine whether treatment is following the pre-determined treatment plan or not.
4. Patient management: - DSD is useful for motivation & education of patient about treatment planning and comparison of before-after photographs in due course of treatment[17].
5. DSD acts as a useful library of treatment modalities as clinicians

can revisit treatment performed years ago & can learn from past results.

Disadvantages of DSD

Listed below are disadvantages of DSD[7, 14]:

1. DSD is not cost effective as it requires expensive equipment's & software.
2. Handling & training for few software's are time consuming and costly.
3. Even a minor inadequacy may result in incorrect diagnosis & treatment plan depends on photographic & video recording.

Various Software's Used in DSD

Different Softwares available for Digital Smile Designing are as follows[3, 8]

1. Smile Designer pro
2. Aesthetic Digital Smile Design
3. Keynote
4. Cerec (Sirona) CAD/CAM Design[12]
5. Photoshop CS6
6. DSD App by Coachman
7. Planmeca Romexis Smile Design
8. VisagiSMile
9. NemoDSD
10. Exocad DentalCAD 2.3 [Fig. 1]

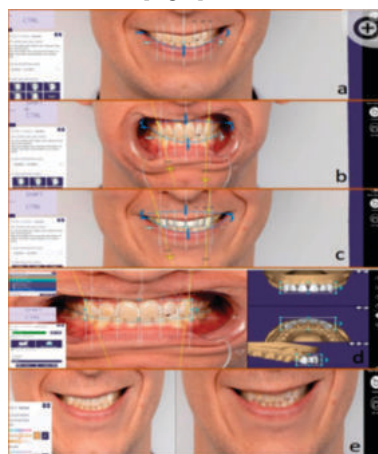


Figure.1: Digital Smile Designing Done with Exocad 3D Software

Methods

Three basic photographic views are necessary[9, 10, 11]

1. Full face with wide smile and teeth apart
2. Full face at rest
3. Retracted view of full maxillary arch with teeth apart.

Also short video is recorded for patient's expectations and to capture all possible dental and smile positions, including 45 degree and profile review.

Photographs and videos are downloaded and inserted into slide presentation.

Then DSD works as follows[10]:

1. Two lines are drawn crossing each other and placed on the facial photographs with teeth apart.
2. Horizontal (Interpupillary and Intercommissural) and vertical (Passing through Glabella, nose, chin) reference lines are estimated. [Fig.2]



Figure. 2: Facial View With Horizontal And Vertical Reference Lines

3. Smile analysis: Dragging of horizontal line over mouth allows initial evaluation of relationship of facial line with smile. Midline, occlusal plane shifting and canting can be easily detected.
4. Smile simulation performed to fix incisal edge position, canting, shifting, tooth proportion and soft tissue outline.
5. Transferring cross intraoral images to analyse intraoral photo in accordance with facial references.

Transferring is done by using three reference lines drawn over the smile view[9]: [Fig.3]

Line 1: From tip of one canine to tip of contralateral canine (Guides size and canting).

Line 2: From middle of incisal edge of one central incisor to middle of incisal edge of contralateral central incisor (Guides incisal edge position).

Line 3: Over the dental midline from tip of midline interdental papilla to incisal embrasure (Guides the midline position).



Figure.3: Three Reference Lines Drawn Over Smile View

6. Comparisons of tooth proportion with that of ideal one in literature by placing a rectangle with ideal length / width proportion over the edges of both centrals. [Fig.4]

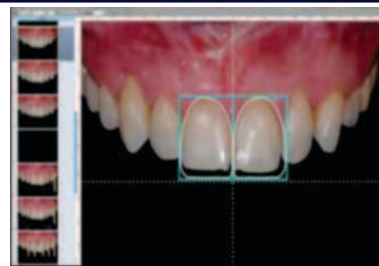


Figure.4: Placement Of Rectangular Guide Over The Edges Of Both Central Incisors For Comparison With Ideal Tooth Proportions

7. Drawing the final teeth outline showing relationship between preoperative situation and ideal design. [Fig.5]

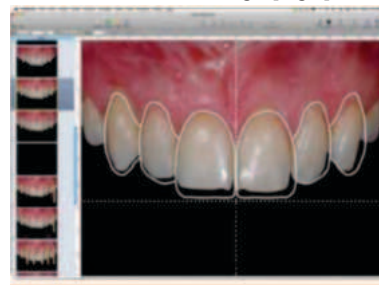


Figure.5: Final Teeth Outline Drawn To Show Comparison Of Ideal Design With Preoperative Condition

8. White and Pink aesthetic evaluation for correction of discrepancy between facial and dental midlines. [9, 13] [Fig.6]



Figure.6: Digital Ruler Used To Assess The Changes To Be Done In Soft Tissue

(To see if crown lengthening or root coverage procedures are required or not)

- Midline and occlusal plane canting
 - Soft tissue disharmony
 - Relationship between soft tissue and teeth
 - Papillae height
 - Gingival marginal level
 - Incisal edge design
 - Tooth axis
9. Calibration on slide by shrinking or stretching the digital ruler until it matches measurements done on cast.
 10. Transferring all the changes done digitally to the cast. [Fig.7]



Figure.7: Changes Done Digitally Are Transferred To The Cast

At this stage, all information necessary to develop a precise wax up is available on both slides and cast.

Then diagnostic wax up is fabricated using cross and morph

physiology design as guides. [15] Then clinical try in is done.

If accepted by patient further treatment line will be tooth preparation to get final restoration.

CONCLUSION

The digital smile designing is a great innovative tool in visualizing the aesthetic problems of the patient. It not only helps the patients to preview the treatment outcome ahead of time but also helps clinicians for proper treatment planning. Although it has few limitations like high cost and difficult handling. It has proven to show accurate results.

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