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Smile Design

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Abstract

A systematic approach is required to evaluate, diagnose and resolve esthetic problems predictably. It is of outmost importance that the final result is not dependent only on the looks alone. Our ultimate goal as clinicians is to achieve satisfying composition in the smile by creating an arrangement of various esthetic elements. This article shows the various principles that govern the art of smile designing. The literature search was done using PubMed search and Medline. The article will give a basic knowledge to the reader to bring out a functional stable smile.

Introduction: Analysis of smile is important in the diagnosis and treatment planning phases of aesthetic dentistry.

Aim: To evaluate the components of smile among students of a dental institution.

Methods: Frontal view digital photographs with posed smile of dental student was taken. Smile characteristics evaluated included; smile line, smile arc, smile design, upper lip curvature, labiodental relationship and number of teeth displayed. Data were analyzed using SPSS version . Pearson chi-square test was used to determine the gender based differences for various parameters.

Results: Average smile line (43.2%), consonant smile arcs (46.2%), cuspid smiles (40.9%), upward lip curvature (41.9%), maxillary anterior teeth not covered by lower lip (60.2%) and teeth displayed up to first premolars (38.7%). Gender based differences were not statistically significant except for smile arc (p value = 0.01) and number of teeth displayed (p value < 0.001). There was a significant relationship between lip curvature and smile pattern (p value

< 0.002) and lip curvature and smile arc (p value = 0.08) revealing that upward lip curvature was associated with commissure type smiles and consonant smile arcs.

Conclusions: The smile characteristics should be considered before beginning the aesthetic treatment of the patient to obtain adequate results in oral rehabilitation.

Keywords: Elements of smile designing , dmile arc, esthetic smile, smile designing, smile proportions

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 is comforatble 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) 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. Pierre Fauchard (1678–1761) of France, the leader of the movement, together with several colleagues modernized and promoted dentistry and also advocated esthetic practices.This article reviews the various principles that govern the art of smile designing.The principles of smile design require an integration of esthetic concepts that harmony with facial esthetics with the dental facial composition and the dental composition. The dental facial composition includes the lips and the smile as they relate to the face. The dental composition relates more specifically to the size, shape, and positions of the teeth and their relationship to the alveolar bone and gingival tissues.[1]

It is very important that when planning treatment for cases of compromised esthetics, to not isolate smile design from a comprehensive approach to patient care. Achieving a successful, healthy and functional result requires an understanding of the interrelationship among all the supporting oral structures, including the muscles, bones, joints, gingival tissues and occlusion.

Ideal Smile

Margaret Hungerford wrote in 1878 that ―beauty is altogether in the eye of the beholder‖. Therefore, it is almost impossible to define the ideal smile because there is much variation across individuals, ages, cultures, and civilizations. Despite these variations, the media have

tended to depict an almost uniform image of the ideal smile, as a row of perfectly aligned ivory teeth in an envelope of bright red lips.[2]

There are a number of parameters that constitute the natural smile of an individual. These include smile line, smile arc, smile design, upper lip curvature, labiodental relationship, teeth display, buccal corridor, and position of incisal edge.

Fig. 1

Fig. 2

Evolution of digital smile designing

From the past two decades smile designing has progressively evolved from physical analogue to digital designing which has advanced from 2D to 3D. From the earlier times when hand drawing on printed photos of the patient were used to communicate with the patients of how the end result would look like, it has now progressed into complete digital drawing on DSD

software on computer. This can be easily be edited and can be done and undone anytime to achieve the final design balancing patients aesthetic and functional needs.

Generation 1. Analogue drawings over photos and no connection to the analogue model. It was the time when drawing with pen was done on printed copy of photographs to visualize the treatment result but that could not be co-related with the study model.[3]

Generation 2. Digital 2D drawings and visual connection to the analogue model like PowerPoint were familiarized which permitted digital drawing. It was more accurate and less time consuming than hand drawing. The drawing could be visually connected to the study model but physical connection still lacked.[3]

Generation 3. Digital 2D drawings and analogue connection to the model. This was the beginning of digital-analogue connection. The very first drawing software specific to digital dentistry was introduced which linked 2D digital smile design to 3D wax-up. Facial integration to smile design was also introduced at this stage, but connection to 3D digital world was missing.[3]

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. 3D digital wax-up could be done involving facial integration and predetermined dental aesthetic parameters.[3]

Generation 5. Complete 3D workflow[3]

Generation 6. The 4D concept. Adding motion to the smile design process.[3]

METHOD -

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.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 the 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 curve is 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, dental proportion; Dentogenic theory or Visagism.

After the new smile design is attained it can be digitally presented to the patient to seek out appreciation and feedback. This digitally approved the smile design at this stage can be used to create physical mockup 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. The patient may evaluate, provide opinion, and approve the final shape of the new smile before any irreversible procedures are performed.

ADVANTAGES

Digital imaging and designing helps patients to visualize the final result before the treatment itself starts which enhances the predictability of the treatment. The clinician could 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 by aesthetic visualization of patients problem through digital analysis of facial, gingival and dental parameters that will analyse the smile and the face in an objective and standardized manner.[4]

DSD leads to customization of smile design by increasing the participation of patient in their own smile design which result in a more aesthetically driven, humanistic, emotional and confident smile. 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 changes. With the digital ruler, drawings, and reference lines, easy comparisons can be made between pre- and post-treatment photographs.

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.
3. Training and handling for certain software are necessary which further increases time and cost.

CONCLUSION

Digital smile design concept is a tool in aesthetic visualization of the patient's problem. It not only helps patients to vision their treatment outcome but also improves clinician's diagnosis and treatment planning.

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