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Smile Design: The New Clinical Reality

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Abstract
Smile design is the collective scientific and artistic principles that can create a beautiful smile. These principles are designed through data collected from patients, diagnostic models, dental research, scientific measurements, and basic artistic concepts of beauty. From patient's point of view beauty measures that individual's perception of beauty as noted in the saying: ''Beauty is in the eye of the beholder.'' These may be influenced by cultural, ethnic, or racial concepts of beauty.Esthetics has become one of the most important outcomes of dental treatments. Regardless of the complexity of the case, patients are seeking better-looking smiles. 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.
Digital Smile Design support diagnostic vision, enhance communication, and improve treatment predictability by allowing careful analysis of the patient's facial and dental features which may have gone unnoticed during by clinical, photographic or diagnostic cast-based evaluation.Digital Smile Design is a multi-use conceptual dental treatment planning tool that is used in interdisciplinary esthetic dentistry to strengthen diagnostic vision, improve communication/education and enhance predictability throughout the course of the treatment.
Key words: *Smile design, Esthetics*
Clinical Significance:*The goal of an esthetic makeover is to develop a peaceful and stable masticatory system, where the teeth, tissues, muscles, skeletal structures and joints all function in harmony*

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Smile design is the collective scientific and artistic principles that can create a beautiful smile.From patient's point of view beauty measures that individual's perception of beauty as noted in the saying: ''Beauty is in the eye of the beholder.'' These may be influenced by cultural, ethnic, or racial concepts of beauty.Harmonizing an esthetics 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.

The Digital Smile Design Concept seeks to present to the world a new face of Dentistry, more human, emotional and artistic, but also more efficient and precise through digital technology, further enhancing our noble profession in society, because after all there are not many things in this life that are more important than a healthy, natural, confident and beautiful smile. Digital Smile Design is a multi-use conceptual dental treatment planning tool that is used in interdisciplinary esthetic dentistry to strengthen diagnostic vision, improve communication/education and enhance predictability throughout the course of the treatment.

DIGITAL SMILE DESIGN

By enabling careful analysis of the patient's facial and dental features that might have gone unnoticed during clinical, photographic, or diagnostic cast-based evaluation, Digital Smile Design was described as a multi-use conceptual tool by Coachman and Calamita. This tool may support diagnostic vision, enhance communication, and improve treatment predictability. Digital tools already used in dentistry practises, such as a computer, smartphone, or digital SLR camera, are used to carry out the digital smile design process. an intraoral digital scanner that creates a digital impression. For a full digital workflow, other technologies include 3D printers and CAD/CAM. Since thorough face and dental analysis depends on preparatory images on which

alterations and designing are created, an accurate photographic documentation is required.Video documentation is also necessary for dynamic analysis of teeth, gingiva, face and lips during smiling.

The idea of a virtual smile design was first presented by editing the patient's digital dentofacial photographs using commercially available computer presentation software, such as Keynote from Apple Inc. or PowerPoint from Microsoft Corp., and simulating the desired aesthetic result with a personalised 2-dimensional (2D) virtual smile design. In order to assist later clinical treatments, such as computer-aided design and computer-aided manufacturing (CAD-CAM) restorations, the 2D virtual grin design in the presentation software may subsequently be transformed into either a traditional or virtual diagnostic examination. The residual dentition (including intraoral soft tissue), cranial hard tissue, and extraoral soft tissue are all precisely combined into one entity in a 3D virtual patient. The remaining dentition's digital data can be obtained through intraoral scanning.

PROCEDURE FOR CARRYING DIGITAL SMILE DESIGN

Although various DSD software includes different aesthetic features, the fundamental process of generating a smile stays the same. Through the sketching of reference lines and shapes on extra- and intraoral digital pictures, any DSD software enables aesthetic designing. Reference lines are used in facial analysis to create uniform parameters for the frontal aspect of the face. The facial midline, which passes the glabella, nose, and chin, is included in the vertical reference line. The horizontal reference lines are made up of the inter-commissural and inter-pupillary lines, which provide the face a complete sense of balance and horizontal overview. To determine the symmetry and cant of the face, the horizontal and vertical lines are crossed one against the other. 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.

Dento gingival analysis is completed after facial analysis. To determine the gingival show, the length of the top lip is measured both at rest and during smiling. By comparing the curvature of the incisal margins of the maxillary anterior teeth, the smile curve is determined. The lower lip proportions and the anterior-posterior curve of the teeth are taken into account while creating the dental contour. The intraoral view is then all that remains of this facial image after cropping. Three reference lines are drawn on the teeth: a vertical line through the dental midline, a horizontal line from canine tip to canine tip, and a third horizontal line on the incisal borders of the central incisors (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.

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 mockup which can be tested aesthetically in the patient's mouth. As such, the patient may evaluate, provide opinion, and approve the final shape of the new smile before any irreversible procedures are performed.

TYPES OF DIGITAL SMILE DESIGN SOFTWARE

1. Photoshop CS6 (Adobe Systems Incorporated),
2. Microsoft PowerPoint (Microsoft Office, Microsoft, Redmond, Washington, USA).
3. Smile Designer Pro (SDP) (Tasty Tech Ltd),
4. Aaesthetic Digital Smile Design (ADSD - Dr. Valerio Bini),
5. Cerec SW 4.2 (Sirona Dental Systems Inc.),
6. PlanmecaRomexis Smile Design (PRSD) (PlanmecaRomexis®),
7. VisagiSMile (Web Motion LTD),
8. DSD App by Coachman (DSDApp LLC),
9. Keynote (iWork, Apple, Cupertino, California, USA)
10. Guided Positioning System (GPS)
11. DSS (EGSolution)
12. NemoDSD (3D)
13. ExocadDentalCAD 2.3

CEREC SMILE DESIGN (SIRONA)

The lab software and the cerec chairside software both include a software tool called cerec Smile Design. Only a frontal full-face smiling shot will do for this software. 16 feature points are marked on the image once the file has been imported into the cerecprogramme. These feature points, which must be chosen, are displayed on a software-generated avatar image. The distance between the two lateral corners of the eye is measured to accomplish dimensionally precise calibration. The 2D image is then converted to 3D, and the 3D

model is then projected onto the avatar. It is important to create dental congruency between the teeth in the 3D model and the teeth in the frontal full-face smile photo.During the CAD design process, the cerec smile design tool can be activated from the tool bar. This makes it feasible to create aesthetic anterior restorations directly in three dimensions. This system has a unique feature called BioCopy CAD design mode. In this method, a mock-up can be directly scanned intraorally and used as a 1:1 reference guide for creating the final repair.

DIGITAL SMILE DESIGN (DSD)

This idea, which Christian Coachman mostly created, was initially presented in 2012. Using this method, presentation software like Keynote or PowerPoint is typically used for smile creation. Only videos are used by the DSD system. The following eight video protocols are used: 12 o'clock, casual interview, closeup phonetics, intra oral function, and intra oral structural,facial frontal retracted / unretracted, facial profile rest / grin, occlusal (direct), and facial frontal retracted / unretracted. The four temperaments can be reflected in the design of 2D Smile Frames using twelve different templates. The wax up can be made using traditional or digital techniques. Two versions of the DSD link software tool for digitization released were classic and pro. The 3D model is placed above the 2D Smile Frame utilising the see-through concept. Two independent software solutions for designing DSD Smile Frames in 2D and 3D were recently introduced.

DIGITAL SMILE SYSTEM (DSS)

There are two versions of this standalone programme available (easy and pro). The ability to take frontal full-face photos while the patient is wearing special eyeglasses with reference points for the accurate replication of proportions is a unique feature. The patient must be photographed in frontal full-face views while smiling genuinely and with her lips slightly pulled back. The DSS programme does not allow for the creation of see-through templates; it can only design smiles. The 3D models can only be imported as snapshots for comparison with the virtual setup. Nine readymade templates with various surface profiles are included in the system, and it also has the potential to incorporate more tooth libraries.

G DESIGN (HACK DENTAL)

The same developers who designed the DSD Connect Software also produced this independent software programme, which is available in two editions (light and pro). A classic 2D Smile Frame can be made using the G design software, as well as a see-through template that can serve as a reference for other CAD systems. A retracting frontal full-face smile shot is required for this system. The pupils' automatic recognition as landmarks for the horizontal reference axis is a unique feature. Axis and grin curve computations, as well as image alignment, are all done automatically by the software at the same time. All reference lines can also be manually modified.

ROMEXIS SMILE DESIGN (PLANMECA)

Planmeca requires frontal full-face images of the patient with their lips drawn back and a real smile. The software automatically creates a silhouette of teeth with automatically computed W/L ratios after the full-face view has been manually aligned. Up to 14 teeth and five distinct character types can be added to the modifiable template. Romexis Smile Design includes several unique characteristics, including: A colour picker tool allows the user to recognise and choose colours from a photograph of the existing teeth and incorporate them into the virtual diagnostic wax-up. A slider can be used to change the shade and translucency of teeth in the 2D Smile Frame. VITA Classial and VITA 3D-Master tooth shades (vita) are saved in its smile libraries.

SMILE COMPOSER (3SHAPE)

A part of the CAD design programme Dental System 2015 is called Smile Composer. A frontal full-face smile photograph is needed for this system, which must first be imported and aligned. When at least four corresponding points have been marked, Smile Composer has the unique ability to automatically align the 3D image to match the 2D image. Smile Composer's 3D smile design suggestions are extremely realistic because of its highly realistic colour representations of both restorations and intra orally scanned teeth. The user can select from more than 50 tooth libraries and use the colour picker tool to match the shades of already-existing teeth. Recently, 3Shape began providing a unique feature designed exclusively for creating digital wax-ups.

SMILE DESIGNER PRO (TASTY TECH)

The latest version of this standalone software utility is 1.45. To make 2D Smile Frames, this technique needs a frontal full-face smile shot as well as extra views, like the view at 12 o'clock. There are five readymade tooth shape templates among the features. The software's interface and appearance are reminiscent to the classic Photoshop programme. An additional technique is utilised to mimic tooth whitening. A traditional see-through template that can be placed over the 3D model can be created using the Pro version.

ADVANTAGES, LIMITATIONS& FUTURE PROSPECTS

Digital smile designing helps to visualize the final outcome thereby motivating and educating patient about the benefit of treatment. It helps in customization of smile by patients through which they can also play a major role. This helps in smiling with confidence. Patient gets satisfaction and there won't be any post treatment regret. There is fast simulation of outcome as it is all about virtual planning. The treatment is inexpensive. Smile design improves communication by making it mainly visual. This has a backward planning approachthus can be used in implant, restorative dentistry and orthodontics.

There are also some limitations in digital smile design. It is very challenging to convert 2D photographs into 3D images. A real 3D overlay mode that takes all viewing angles into account is not yet available. Perspective distortion and conversion inaccuracy may therefore occur.For complete 3D digital work flow, 3D softwares with updates, intraoral scanner, 3D printer and CAD/CAM are required which makes it economically expensive.

Complete 3D digital workflow is still not extensively used which in future may come into practice far and wide when more and more clinician will adopt digital scanner, 3D printers, CAD/CAM, then the need for time-consuming impressions, plaster and wax will become far less necessary. In the future, machine learning and artificial intelligence will automate most, if not all, aesthetic evaluation, planning, design, and treatment processes to provide customized dental care that is truly patient centered, natural looking, and in harmony with facial and other features. In the long term, bioengineering and the ability to regenerate and grow teeth, soft tissues, and bone may eliminate these tools and restore or create dentofacial aesthetics in a truly natural way if they can be offered in an economically affordable manner.

CONCLUSION

In today's world, the smile is considered as an important component of an individuals over all appearance and wellbeing.Esthetics has become one of the most important outcomes of dental treatments. Regardless of the complexity of the case, patients are seeking better-looking smiles.The aim of smile design must be less tooth structure reduction and greater esthetics and durability. By understanding the fundamentals of smile design and artistic approach, including psychology and visual perception, today we have the ability to provide the patients with restorations based on individual characteristics, personality, needs, circumstances and desires. It is imperative to balance formulas with artistic views. The smile is a function of weight balance, dimension, configuration and gestalt in the patients smile and face.With new advances in CAD/CAM technology, the potential for virtual treatment planning and subsequent exclusively digital treatment appears feasible and promising.Digital Smile Design is a multi-use conceptual dental treatment planning tool that is used in interdisciplinary esthetic dentistry to strengthen diagnostic vision, improve communication/education and enhance predictability throughout the course of the treatment.Thus,digital smile design is the new clinical reality.

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