



DIGITAL ADVANCEMENTS IN SMILE DESIGNING – A REVIEW

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Conflicts of Interest: Nil

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Abstract:

Smile forms the basis for our perception of others and ourselves. A pleasing appearance is the main objective in cases of smile designing. The digitalization and advent of technology has provided us with numerous treatment options such that smile designing can be done in a more patient friendly and efficient way. The various technological advancements have revolutionized the way dentistry is practiced today. This article reviews the various digital advancements in the field of smile designing.

Keywords: smile designing, digital dentistry, technology

Introduction

Smile designing has become an important aspect of dentistry as the demand for esthetics has become one of the primary concerns of patients. Smile forms the basis for our perception of others and ourselves. A pleasing appearance is the main objective in cases of smile designing. The digitalization and advent of technology has provided us with numerous treatment options that can be conducted in a more efficient way.

Technology has touched every aspect of the treatment protocol now. It has made it easier to preview the end result. The technological changes taking place have revolutionized the way dentistry is practiced today. The treatment can be modified and made easier with the help of many technological aids. These include:

- Extraoral video camera
- Intraoral video camera
- T scan
- CAD CAM
- Lasers
- Abrasive technique
- Digital smile designing

EXTRAORAL VIDEO CAMERA

Extraoral video camera allows to record the details of the patient before, during and after the treatment.

It allows us to have a detailed record of the patient's face while moving and talking- a much more helpful tool than a still photograph. This enables the clinician to obtain a record of the myriad facial expressions of the patient along with all the minute details that would have gone unnoticed otherwise. Through Computer imaging this record can be

shown to the patient. The patient can visualize the various profiles and smiles that can be applied to his face and choose the desired treatment option.

The anterior tooth display varies during the different facial expressions like speech or smiling. The anterior tooth display can be evaluated in all aspects by taking a video clip. The video camera captures roughly 30 frames per second; this method usually produces a five-second clip, for a total of 150 frames. The smile portion of the clip is approximately 12-20 frames, allowing pre- and post-treatment smiles to be compared.⁶ A digital video camera is used to record the dynamic range of each subject's smile.

Smile documentation can be either static or dynamic. It could also be taken by direct biometric measurements on the patients' face. However, static records are simply not adequate to analyze a dynamic process such as a smile.¹

INTRAORAL VIDEO CAMERA

Intraoral video camera is used during smile designing as it provides the ease of operation due to its compact size as well as produces good quality images. Images can be obtained from as close as 2mm from the tooth from every angle. The smallest possible details can be recorded. Treatment options and various conditions can be explained much more accurately with help of these images than with mirrors and x rays. Intraoral cameras can be integrated with a computer imaging system to capture the detailed images of the patient's oral cavity. These images can be modified according to the proposed treatment options and shown to the patient. At the click of the mouse a particular tooth can be elongated or widened, the effect of which can be shown to the patient for his approval.²

Intraoral camera has a mouthpiece that is inserted in the patient's mouth and kept at the desired location. This helps in recording the minute details of the mouth.

T SCAN

By using T scan, buccolingual width of the jaws as well as the location of anatomic features such as the mandibular canal and the maxillary sinus can be determined which helps in esthetic placement of an implant.

T-Scan is a digital occlusion analysis system. It has a thin, flexible, pressure-sensitive bite transducer that helps in measuring the exact tooth contact and force in real time setting. This transducer is embedded in a recording sensor. Two or three dimensional analysis of the graphical occlusal data obtained from T scan can be done. Stepwise analysis of data can also be performed. The occlusal force distribution, interferences in occlusion, and the relative force of each interference can be determined from the recorded occlusal data.³

CAD CAM

With CAD/CAM (Computer assisted design/ Computer assisted manufacture) technology we can design veneers and crowns to enhance smile while the patient waits. The so called "mock- up" of a planned cosmetic treatment also has been shown to be quite useful. The clinician can visualize the potential challenges that may occur during the course of treatment and prepare for them adequately. The desired results can be visualized and accordingly the treatment is planned.

The advent of CAD/CAM has enabled the dentists to design esthetic and long lasting restorations while utilizing the skill of computers. There has been introduction of numerous high strength ceramic materials owing to the increased demand for safe and esthetically pleasing dental materials.⁴

All CAD/CAM systems consist of three components:

1. A digital scanner that converts the geometry into a set of digital data that can be processed by the computer
2. Software that processes data and produces a data set for the product to be fabricated
3. A production technology that transforms the data set into the desired product.⁵

A diagnostic wax-up is a useful tool to achieve the goal of an objective materialization. It improves the communication between patient, clinician, and technician and gives a three-dimensional representation of the tentative treatment outcome.⁶

However, such a technique is time consuming and requires technical efficiency as well as time.

CAD CAM enables building of a virtual prototype that where different versions can be tried-in without

significantly increasing the time invested and with no impact on the costs involved. The smile makeover using restorations, ceramic veneers etc can be virtually shown to the patient.

LASERS

LASER stands for light amplification by stimulated emission of radiation.

The armamentarium for esthetic dental practice employs the use of mainly five types of lasers This includes argon, carbon dioxide, diode, erbium, and pulsed neodymium doped: Yttrium aluminum garnet (Nd:YAG) lasers.⁷

Smile designing aiming for the best results also focus on the gingival architecture. The way gingival tissue is handled has changed considerably with lasers being used instead of scalpels.

The gingiva can be altered conservatively with the help of lasers. A harmonious, natural and symmetric recontouring of the gingiva can be done to provide the best cosmetic appearance. This ability is critical because even with the most incredible looking restorations, if the gingival tissue is not taken into consideration, then the treatment could be considered an aesthetic failure.⁸

Lasers can be used in various arenas in smile designing like

- 1) Improving gingival shape and contour,
- (2) Lengthening crowns,
- (3) Idealizing tooth proportionality, and
- (4) Resolving crown/height asymmetries.⁹

Abrasive Technology

Abrasive technology is a minimally invasive approach in which aluminium oxide particles (27 or 50µm) are blasted against teeth under a range of pressure 30-160 psi with variable particle flow rates. In this technique, the stained areas are removed with a jet air stream comprised of micro abrasive particles. It doesn't require anesthesia and is a painless procedure consuming less time. It can be used easily without the risk of damaging healthy tooth structure for any depth of decay. Composite build up of tooth structure can be done after the removal of the stained areas. It is also useful during repairs to existing composite or porcelain restorations because it roughens these surfaces allowing the reparative materials to bond them more rapidly.²

Digital smile Designing

Digital smile designing i.e. DSD is a technological advancement that allows a visual assessment of the treatment outcome by using digital software. The patient can visualize the end result of the treatment that increases their compliance and understanding of the treatment protocol. It allows personalization and satisfaction of the

aesthetic desire with a healthy patient and dentist interaction.

The digital smile design (DSD) is an esthetic treatment designing tool that helps increase the understanding between the interdisciplinary teams as well as the technician by enhancing the diagnostic vision thereby providing the best treatment results.¹⁰

Previsual is the image that allows the best explanation to the patient regarding the treatment outcome. It helps the patient to appreciate the changes that might follow after the treatment is completed.

The patients can easily understand the changes through an effective previsualization and mock up and give their suggestions or approval thereof.¹¹

The following advantages are provided by the DSD protocol:

- Esthetic diagnosis
- Communication
- Feedback
- Patient management
- Education

Conclusion

The advent of technology in dentistry has made smile designing more patient friendly and convenient. All aspects of the face can be analysed and visualized in a three-dimensional way. This has helped improve patient compliance and increased efficiency of treatment. Still,

further research is needed in various aspects of smile designing.

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