Digital Smile Design: Case Series

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ABSTRACT

Aesthetic treatment is done to improve one's appearance. Digital Smile Design, Computer-aided design and Computer-aided manufacturing (CADCAM) dentistry have revolutionized aesthetic dentistry. First, involving patients in treatment planning increases patient confidence and a happier outcome. Secondly, decreased appointments and decreased overall treatment time also facilitate patients in today's busy lifestyle. However, this treatment method is uncommon in Pakistan due to a lack of knowledge and expensive equipment. This article aims to create awareness among the dentists so newer advanced treatment modality is adopted in Pakistan, bringing us at par with other countries.

Keywords: Computer-aided design computer-aided manufacturing, Crowns, Digital dentistry, Esthetics, Smile design, Veneers

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INTRODUCTION

A smile is an integral part of an individual's personality. Ideally proportioned display of teeth and gingiva leads to an esthetically pleasing smile. This enhances the individual's self-confidence and creates a lasting image in others' minds. Thus it is of utmost importance that the patient's concern regarding his/her smile is addressed with great care and an excellent esthetic sense.[1]

The need for smile designing arises when an individual is dissatisfied with their smile appearance. This may be due to excessive gingival, asymmetrical tooth contours, chipped off or discoloured anterior teeth, reverse smile arc, diastema etc.[1] Therefore, the patient's smile must be examined thoroughly, keeping in mind the natural proportions, ideal contours, and the patient's concerns and expectations.[2]

Digital Smile Designing (DSD) is an advancement of conventional laboratory wax-up. Using an intra-oral digital scan and pictures of patients, one can do a digital esthetic trial of the anterior crowns or veneers. The patients can give their valuable feedback, and the design can be modified accordingly in the software while the patients sit beside the dentist behind a computer screen.[3] This has revolutionized dentistry leading to a Single Visit Smile Makeover using DSD software for designing and Computer Aided Designing-Computer Aided Manufacturing (CADCAM) to mill prostheses and cement the restorations all in one visit.[4]

Although common in developed countries, very few dental setups have been able to incorporate DSD into their practice in Pakistan. This is due to expensive equipment, inadequate skills and lack of knowledge.[5] We had access to this latest technology at the Armed Forces Institute of Dentistry. The system available is Sirona Cerec Acquisition Center with Blue Cam Intra Oral Scanner and MCXL inLab Milling Machine. However, few cases that have been done are presented to share the knowledge regarding the process involved in DSD and to spread awareness and create interest. Hence, it has gained popularity in Pakistan as well.

CASE REPORT-1

A 40-year-old male Pakistani patient, belonging to Chakwal, now a resident of the United States of America, presented to the prosthodontics department of AFID in December 2017 with poor esthetics due to discoloured chipped components. Eight maxillary teeth from tooth number 14 to 24 had componeers. They had been placed two years ago. The components had yellow discolouration, and the restoration on teeth #21 and #12 was cracked (Figure-1a). The patient had no significant medical history.

After radiographic and diagnostic evaluation of articulated diagnostic casts and discussion with the patient, it was decided to remove the components and provide the patient with CADCAM milled veneers. The material selected was Shofu hybrid ceramic (Shofu Dental Asia-Pacific Pte. Ltd.) since this material has excellent colour stability and esthetics. In addition, this

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material allows the provision of the prosthesis on the same day with minimum inconvenience to the patient. Finally, the patient consented to document and present their data for academic purposes.

Components were removed by grinding using tapered diamond bur, taking care not to grind the enamel as teeth were already prepared. After removing the veneers, the preparation margins were finished with dental stones (Figure-1b).

A digital impression of the prepared teeth was recorded using the intraoral scanner. Extra oral pictures were also taken for the DSD process. Then, the patient was told to wait in the waiting room.

Virtual casts of the scan were created in the software. The patient's extra-oral photos were imported into the software, and important landmarks were identified. The software then created a virtual 3D image of the patient with the virtual models of teeth superimposed (Figure-1c). The veneers were designed using built-in tools, and the esthetics were evaluated using the 3D model. Occlusion was also checked within the software.

Next, the patient was called, and the digital design was shown. Adjustments were made according to the patient's input. Once the design was finalized, veneers were milled using the milling machine. It took 10 minutes to mill one veneer with 80 minutes to mill all veneers. The patient was in the waiting room during this.

The veneers were tried in the mouth, and necessary adjustments were made. Next, the patient was shown the veneers intraorally. Once the patient was satisfied, veneers were cemented using a Variolink veneer cementation kit (Ivoclar Vivadent). Finally, the veneers were polished using composite polishing cups. Post-op instructions were given, and the patient was dismissed (Figure-1d).

Figure-1: a) Pre-op, b) after removing old veneers, c) digital smile design (DSD), d) post-op.

Two years follow up showed no discolouration or wear of the veneers. The patient was satisfied with the treatment.

CASE REPORT-2

A 24 years old Female patient, a resident of Mianwali, presented to the prosthodontics department at AFID in March 2018 with the complaint of poor dental aesthetics. She was getting married in one week and needed quick treatment. On clinical examination, she suffered from dental fluorosis, causing discolouration of her teeth. Both her maxillary central incisors had chipped off incisal edges. Another main concern was spacing between her teeth. She also had missing central incisors in the mandible. A panoramic radiograph was done for the evaluation of teeth and jaw bones. The patient's consent was taken to document and present their data for academic purposes.

After discussion with the patient, the following treatment plan was finalized: 1) Provision of the four-unit bridge from tooth number 32 to 42. 2) Provision of veneers on anterior six maxillary teeth from tooth number 13 to 23. The prosthesis were made using CADCAM as the patient had very little time before her marriage.

The teeth were prepared, and the digital impression was recorded. Extra-oral photos were taken for DSD. The software created virtual casts and superimposed them with the 3D image of the patient's face. The lower bridge and upper veneers were designed, and the patient finalized the design. The prosthesis was milled from Brilliant Crios Hybrid ceramic material blocks (Coltene Holding, Switzerland).

The next day, the cementation was done using a Solocem Veneer cementation kit (Coltene Holding Switzerland). After try-in and necessary adjustments, the mandibular bridge and maxillary veneers were cemented. This whole treatment was done in two days (Figure-2).

Figure-2: Digital smile design work flow.

At two years follow up, the veneers and bridge were in good shape with no discolouration or wear. Oral hygiene instructions were reinforced.

CASE REPORT-3

A 38-year-old female patient, married, resident of Islamabad, presented to the department of Prosthodontics AFID in Jan 2019 with the complaint of discoloured and unaesthetic composite veneers. She also complained of swollen and bleeding gums. Her dental history revealed she got the composite veneers from a dentist in Srilanka 3 years ago as her teeth had yellow-brown discolouration. On clinical examination, teeth number 13, 11, 21, 22, and 23 were veneered. Tooth number 12 had a metal-ceramic crown. The veneers were over contoured, leading to plaque accumulation and gingivitis. Teeth also had multiple carious lesions. A panoramic radiograph was done to evaluate the teeth and jaw bones. It revealed that tooth number 12 was root canal treated. A periapical radiograph was done to evaluate the RCT and was satisfactory. The patient's consent was taken to document and present their data for academic purposes.

After discussion with the patient, it was decided to remove the veneers and metal-ceramic crowns and provide the patient with CADCAM porcelain veneers and all-ceramic crowns. The veneers were removed using diamond fissure burs, while the crown was removed by sectioning. Preparations were finished, and a digital impression was recorded. In addition, extra oral photographs of the patient were recorded.

DSD was done, and the designs were finalized with the patient. Veneers and crowns were milled using Shofu hybrid ceramic (Shofu Dental Asia-Pacific Pte. Ltd.) material blocks. Next, the restorations were tried in, and necessary adjustments were made. Finally, they were cemented using a Variolink veneer cementation kit (Ivaclor Vivadent Inc., USA) (Figure-3).

Figure-3: Pre and post operative.

The prostheses were in good condition at one year follow up. The patient was advised to maintain good oral hygiene.

DISCUSSION

The outcome of aesthetic veneers in conventional dentistry is either in the dentist's mind or can be depicted using diagnostic wax-ups made in the laboratory. In both cases, the patient has minimal involvement, and the patient is largely unaware of the treatment outcome.[5] This creates anxiety in the patient, and the patient may not be happy with the final look of the veneers. Digital dentistry has helped resolve this issue. Now the patients can see the smile makeover on a computer screen while sitting with their dentist. In this way, patients can give their valuable input and have more confidence and trust in the dentist's abilities.[6,7]

Another issue addressed with this is the reduction of the number of appointments. Digital Dentistry has brought the concept of "Smile in a day." Previously it took multiple appointments spread over weeks for a smile makeover. With the advent of CADCAM, this can be done in a single day.[8-10]

The patients that presented all wanted a smile makeover but had little time. In addition, they were all nervous about the outcome as it was a costly treatment, and they wanted to be sure beforehand. Therefore, they were shown a digital mockup of their smile, and once the design of the veneers was agreed upon, the veneers were made using CADCAM. This provided them with quick treatment. For now, this concept is very new in Pakistan. This is due to a lack of knowledge and skill required to operate a CADCAM system and the initial cost of the equipment. However, these case reports aim to create awareness among Pakistani dentists, so this very common technology in the USA and Europe also gains popularity here.

DSD and CADCAM are the latest modalities available for dentists, which bring innovation to treatment planning and prosthesis delivery. The patient gets satisfied as they are involved in treatment planning. Clinicians should strive to gain knowledge and skill to use DSD and CADCAM successfully in everyday practice.

Conflict of Interest: None.

Author Contribution

HAM: Literature review, manuscript writing, MI:, AA:, ANA: Treated patient, MMA: Supervised edited manuscript.

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