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ESTHETIC SMILE RESTORATION USING DIGITAL SMILE DESIGN PROTOCOL AND CERAMIC LAMINATES- A CASE REPORT

Prosthodontics

Dr. Mohan Mahajan* Prosthodontist, Department of Prosthodontics and crown & bridge, King George's Medical University, U.P, Lucknow. *Corresponding Author

Dr. Akanksha Gautam Prosthodontist, Department of Prosthodontics and crown & bridge, King George's Medical University, U.P, Lucknow.

Dr. Niraj Mishra Professor, Department of Prosthodontics and crown & bridge, King George's Medical University, U.P, Lucknow.

Dr. Pooran Chand Professor and Head,Department of Prosthodontics and crown & bridge, King George's Medical University, U.P, Lucknow.

ABSTRACT

The following report presents a clinical case of esthetic rehabilitation using digital smile designing. The chief complaint was unesthetic appearance due to discolored teeth. Treatment planned was esthetic ceramic veneers following digital smile designing principles. Ceramic Lithium di silicate (E-max) veneers were fabricated using minimally invasive preparation and cemented using resin cement. one year follow up was done. The Digital smile designing (DSD) protocol performed in this case allows application of smile designing principles for predictable treatment outcomes. DSD enhances patient communication, effective risk assessment and management.Digital smile designing using appropriate material, enhances esthetic outcomes and patient satisfaction

KEYWORDS

Ceramics, veneers, esthetics, tooth discoloration, resin

INTRODUCTION

Cosmetic is very subjective concept as it is influenced by cultural, social and psychological elements that changes as function of time, the values of life and age of individual.[1] Anterior teeth plays very vital role in smile as well as aesthetics, thus planning is the most important stage of restorative treatment.[2] In order to achieve aesthetic goals, the dentist, patient, and laboratory worker must have great communication skills. To achieve the greatest clinical efficacy and success of these restorations, each case must be carefully chosen and the course of treatment must be meticulously planned.[3,4]

The aesthetics of the smile depends on a variety of factors, including the colour, shape, texture, gingival contour, dental alignment, and proximity to the face. Digital smile design (DSD) planning offers an aesthetic examination of the dentofacial assembly where anatomical axes are plotted as a guide to generate a good gingival contour, form, and dental alignment through the analysis of extra- and intraoral digital photos.

The DSD enables the patient to anticipate their course of therapy, and involvement in planning. The DSD protocol aims to enhance aesthetic diagnosis, interdisciplinary communication, critical aesthetic analysis of the treatment, management of expectations, education, and motivation. Diagnostic mock-ups enhances communication with patient.[5]

Ceramic laminates becomes the material of choice because of their conservative preparation design, excellent optical properties, durability, longevity and good flexural strength.[6]New ceramic systems reinforced with leucite and lithium di silicates can be used in thin thickness of (0.1 to 0.7 mm) without interfering in the material strength.[7]

This article presents a case of smile restoration with ceramic laminates using Digital Smile Designing protocol.

Case presentation-

A 25 yr old female patient reported to the Department of prosthodontics,with the chief complaint of unesthetic appearance due to spacing and discoloration in front teeth with no significant medical history . On intraoral examination patient had midline diastema between 11 and 21,discoloration of teeth wrt 21,33,43 and attrition of mandibular anteriors (Figure 1). Professional oral prophylaxis was performed prior to starting of treatment. In clinical and radiographic examinations, we evaluated the facial features, the smile, the gingival contour, and dental characteristics. With the consent of the patient, the proposed method of choice for treatment planning was Digital Smile Design following all the basic principles of smile designing.

The face and intraoral photographs of the patient was taken to enable the digital planning including patients full face with wide smile and retracted smiling image (Figure 2). Intraoral scanning was performed using intraoral scanner(trios 3Shape,Germany) (Figure 3).3D intraoral scanning along with patients photographs data were transferred to exocad designing software. A photograph of the full face with a wide smile showing teeth was positioned behind horizontal (interpupillary line) and vertical (facial midline) reference lines allowing a comparative analysis between tooth and face.Patients photographs were analysed using previously determined facial references (Figure 4) .Golden proportion was selected for digital smile designing. Tooth mould was selected from digital library by applying SPA concept(Figure 5).During planning, it was possible to verify the need of clinical crown augmentation to improve smile hormony and modify gingival zenith . DSD allows 3D visualization of proposed smile of patient digitally before undergoing actual treatment.

A silicone putty (Zermack ElliteHD+) index of the 3D printed model was made. Crown lengthening procedures were carried out using electrocautery. Bis-acrylic resin (Luxatemp Automix Plus, DMG America, Englewood, NJ) was then inserted into the silicone index to obtain mock up in the patient's mouth (Figure 6).Temporaries were adjusted for optimized occlusion, phonetics, and esthetics. After assessing esthetics, phonetic and functional adaptation to prosthesis, provisional were scanned using intraoral scanner. Provisionals will act as guide for fabrication of definitive prosthesis. Based on the patient's complaint and after clinical, radiographic and photographic analysis, the proposed treatment planning was ceramic laminates using IPS e.max – lithium disilicate (Ivoclar Vivadent, Leichtenstein).Minimally invasive approach was performed for tooth preparation of ceramic laminates. After tooth preparation, single retraction cord (Ultrapak Cord #0; Ultradent Products, Inc., South Jordan, UT)14 was used for mechanical gingival displacement(Figure7).Tooth preparation was scanned using intraoral scanner. Shade for laminates were selected using shade guide (Vita- Pan 3D master, Vita)

During final prosthesis fabrication in EXOCAD software, intraoral scan of temporaries and tooth preparation were superimposed. Temporaries scan helped in providing correct vertical dimension , level of incisal edge, size and form for definitive prosthesis fabrication (Figure 8). Laminates of lithium disilicate (IPS e.max; Ivoclar Vivadent, Schaan, Liechtenstein) were fabricated in the chosen tooth color. Cement colour was selected with the aid of the try-in paste Variolink (Ivoclar Vivadent, Leichtenstein). After the color selection of the cement, the laminates were washed to remove the try-in paste.

Next, the laminates were etched with 10% hydrofluoric acid for 20 seconds. The laminates were copiously washed with water/air jets to remove the residues of the acid etching and dried. Silane agent (Dentsply, York ,PA, USA) was applied for 1 minute, then, the laminates were dried with air jet, and an adhesive agent (Adper Single Bond 2, 3M ESPE) was applied.

Prior to the cementation of the laminates, the teeth underwent relative isolation with cotton rolls and a retraction cord #000 (Ultrapack, Ultradent, USA) was inserted into the gingival sulcus of the teeth. The teeth were cleaned with pumice and water with the aid of a Robinson brush at low speed. Then, the teeth were etched with 37% phosphoric acid(AVUE etch, Dental Avenue) for 30 seconds, washed and dried with water/air jet. The adhesive agent (Adper Single Bond 2, 3M ESPE) was applied without light-curing. The cementation of the laminates was performed individually, with light-cured resin cement (RelyX Luting 2, 3M ESPE).The cement was mixed, applied onto the laminates, which were put into position. Prior to the light-curing for 40 seconds, all cement excess was removed with the aid of dental floss.

Occlusal adjustment was performed to achieve a mutually protected occlusion—vertical and horizontal overlaps were adequate after occlusal adjustment. Function, form, and phonetics of the restorations were satisfactory, and the patient was satisfied with the final esthetic outcome (Figure 9,10).No postoperative complications were detected after 1 year of the restorations in function. The patient remained satisfied with the 1-year esthetic and functional outcomes.

DISCUSSION

This clinical report described how to obtain predictable esthetic and functional outcome with ceramic laminates using digital smile designing. Specialized digital planning software were used for smile designing. A thorough evaluation that comprises a facial analysis, dental-facial analysis, and dental analysis was performed for planning of aesthetic rehabilitation. The DSD protocol performed in this case allows application of smile designing principles in sequential manner using patients extraoral, intraoral photographs and intraoral scanning. the DSD protocol provides a greater predictability of treatment and facilitates the communication between the dentist and the dental technician and patient. Digital protocol widens the diagnostic vision and helps to measure the treatment limitations and risk factors such as asymmetries, disharmonies, and violations of esthetic principles. It serves as a guide to conduct the diagnostic wax-up.[8]

Ceramic laminate is considered a conservative treatment option because it enables minimally invasive veneer preparation designs. Ceramic of choice was lithium disilicate because of its better adaptation and optical quality, smaller resistance to fracture, and they can be adhered to the dental structures because the ability to be etched and silanize.[9] Color of the resin cement was established through the try-in pastes.

The porcelain laminate veneer technique includes the bonding of a thin porcelain laminate to the tooth's surface with adhesive techniques and resin cement. For the longevity of this treatment, the strength and durability of the adhesion formed between the veneers and the tooth complex are crucial. Improved new adhesives and resin luting cement has been proven to increase bond strength between ceramic veneer and tooth.[10]

In the present case report, esthetic restoration of smile was adequately performed using Digital Smile Designing protocol, resulting in satisfactory esthetics.

CONCLUSION

As per above case report, Digital smile designing is proven to be efficient tool for predictable diagnosis and treatment planning, patient communication and to obtain optimum esthetic outcomes. Esthetic rehabilitation using appropriate materials and techniques provides satisfactory clinical outcomes and patient satisfaction.

Fig. 1. Intraoral frontal view

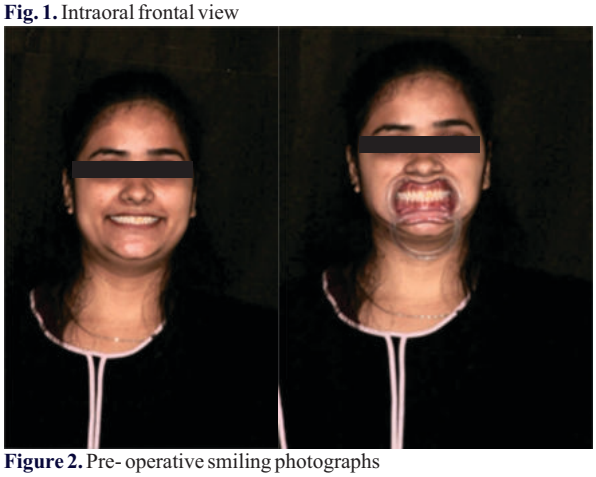

Figure 2. Pre- operative smiling photographs

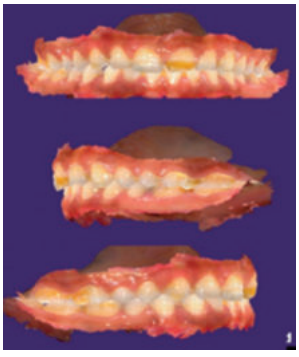

Figure 3. Intraoral scanning using digital scanner

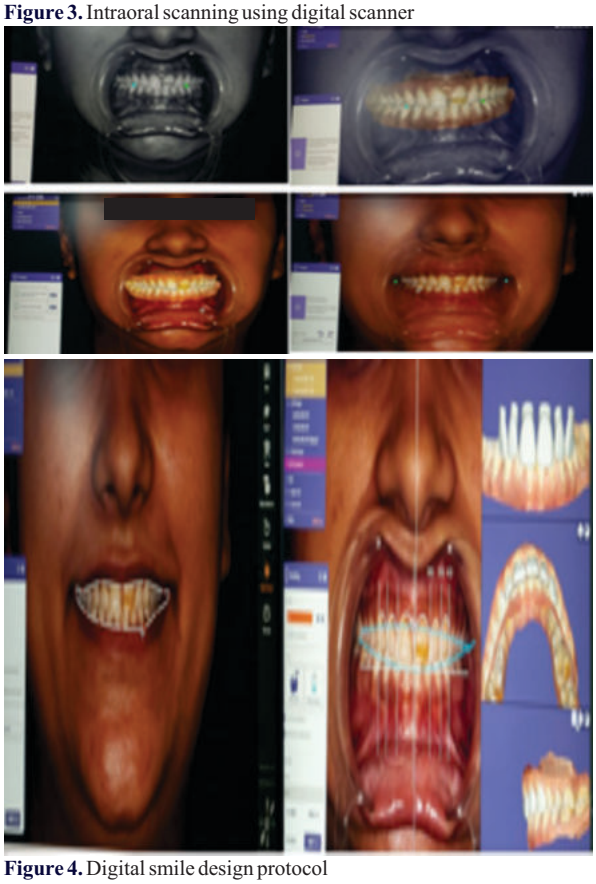

Figure 4. Digital smile design protocol

Figure. 5 Proposed digital smile of patient

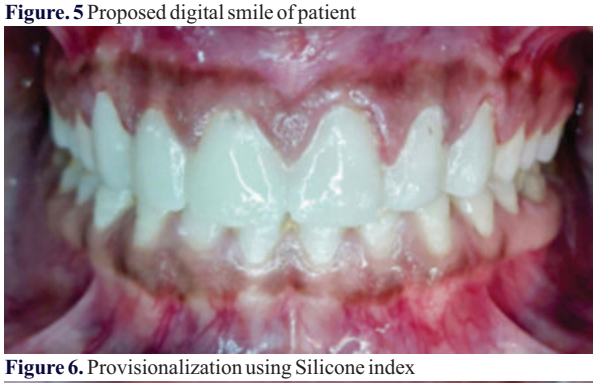

Figure 6. Provisionalization using Silicone index

Figure 7. Tooth preparation for ceramic veneers

Figure 8. CAD- CAM designing of ceramic laminates

Figure. 9 Final Prosthesis

Figure 10. Post operative smiling photograph of patient

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