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Anterior aesthetic rehabilitation of spacing with maxillary anterior teeth using laminate veneers: A case report

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Abstract

The prettiest thing anyone can wear is a perfect smile. A variety of treatment options are available to restore fractured, misaligned and malformed or hypoplastic anterior teeth. Based on their strength, longevity, conservative nature, biocompatibility and aesthetic, veneers have been considered as the most viable treatment modalities. These laminate veneers are made with two different techniques Conventional and digital. The conventional technique requires an impression of the prepared tooth, an impression of the antagonist, fabrication of models, and extensive laboratory time. The computer-aided design/computer-aided manufacturing (CAD/CAM) system and intraoral scanner optimize the fabrication of prosthetic structures, reducing chairside time and promoting good aesthetic results. Also, it acts as an efficient communication tool among dentist, patient, and technician.

This case report of a maxillary anterior rehabilitation demonstrates aesthetic planning with the digital smile design and by using 3 Shape TRIOS intraoral scanner. This report describes a well-planned ultraconservative approach using six ceramic laminate veneers for the maxillary anterior teeth to significantly improve the patient's overall smile. A reduction guide aided the conservative tooth preparations, following proper planning and sequencing, predictable outcomes were obtained and fulfilled the patient's aesthetic demands.

This clinical report presents the digital workflow for the virtual design and fabrication of multiple laminate veneers in a patient for enhancing the aesthetics of his maxillary anterior teeth using a digital impression with 3 Shape TRIOS intraoral scanner and virtual computer-aided design/computer-aided manufacturing (CAD/CAM) design.

Keywords: CAD CAM, 3 Shape TRIOS, dental laminate, aesthetics in dentistry, Conservative preparation, porcelain

Introduction

In the present world where cosmetic dentistry has become widely popular patients commonly present with complaints of enhancement of aesthetics of anterior teeth. Wherein these patients may present with teeth that may be discoloured, attrited, fractured, malaligned or spacing between the teeth.[1] In order to solve such problems, the only technique that was used for a long time was dental crown procedures but this technique is not conservative; it can damage the periodontium and remove excessive dental tissue.[2] Therefore, new techniques emerged like bleaching and laminate veneer restorations. Since bleaching can correct some discolorations only and has no effect on dental malposition, the porcelain veneer technique was introduced to the dental profession in the 1980s by Dr. John Calamia.[3]

Laminate veneers are restorations envisioned to correct existing abnormalities, aesthetic deficiencies and discolorations. [4,5] Their advantages are high resistance against attrition, abrasion and fractures.[6] It also provide colour stability, optimal aesthetics, maintaining periodontal health (since ceramics are biocompatible and veneers are frequently supragingival) longevity of the adhesion to enamel, and good mechanical properties. They can re-establish the strength and function of teeth.[7]

Digital dentistry has become widely popular because of its versatile applications with Computer-aided design and computer-aided manufacturing (CAD-CAM) being successfully used in Prosthodontics. One of the added advantages of digital dentistry is its alternative and an improved form of making impression with the use of intra-oral scanners. Advantages of digital impression over conventional are improved image/impression quality for better-fitting restorations, less chair time, no need for distasteful impression materials that cause some patients to gag. Rather it is more comfortable and less anxious experience for patients and the dental team.

This report presented a clinical case that follows a full digital workflow. After a minimal invasive preparation approach, the digital smile protocol, CAD-CAM monolithic lithium disilicate ceramic veneers were used to solve the problem of aesthetics and spacing between maxillary anterior teeth and subsequent aesthetics.

Case report

A 27 years old male patient reported to the Department of Prosthodontics Crown and Bridge, in Nair Hospital Dental College, Mumbai with a chief complaint of open spaces in upper anterior teeth with a desire to close the spacing and to enhance the aesthetics and smile. The clinical and radio-graphic examination showed good periodontal health and the absence of restorations on these teeth. Two treatment plans were discussed with the patient: the full-ceramic crowns option and the veneers option. Average spacing of 2 mm each measured between the two central incisors, central and lateral incisors and lateral incisor and canine on both sides of midline (Fig.1). Oral hygiene was good. Lip line followed the smile arc, medium smile line and Premolar to premolar natural smile was noted.

Fig.1: Preoperative Intraoral Photograph

Fig.2: Diagnostic Mounting

Maxillary and mandibular diagnostic impression were made and diagnostic casts fabricated. A Facebow record was taken and centric relation mounting was done and evaluated for occlusal interferences (Fig.2). The guidance was canine with bilateral posterior interferences in protrusive and lateral excursions. A confirmative approach was selected with no alterations in anterior guidance and maintaining the existing occlusion with removal of posterior interferences in protrusive and lateral excursions.

Digital diagnostic impression was made by using 3 Shape TRIOS intraoral scanner (Fig.3). This scanner automatically measures and records teeth shade while making digital impression by giving HD photos for a digital reliability of the colour choice. The digital mock-up was done over maxillary anterior teeth to get proper idea of the size, form and proportion of the teeth. This was finally presented to the patient and approval was taken.

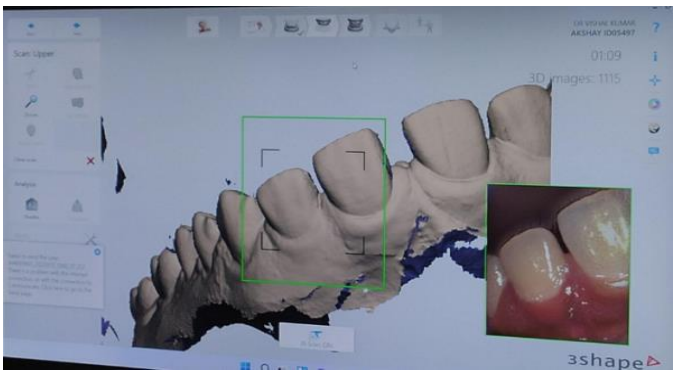

Fig. 3: Diagnostic Impression using 3 Shape TRIOS Intraoral Scanner

Patient was informed about the existing condition, treatment procedure was explained and consent was taken. This mock-up was used as an aesthetic pre-evaluative temporary (APT) which provided a 3-D evaluation guide and simulated the final restorations. They were evaluated both by dentist and the patient.

Fig.4: Aesthetic Preevaluative Temporary (APT) with Bisacrylic resin (Luxatemp star A1, DMG)

Fig.5: Orientation grooves for Labial Surface Reduction

Aesthetic pre-evaluative temporary (APT) technique enables the dentist to achieve highly aesthetic results while preserving tooth structure and which is used as a guide, with the help of depth cutter burs (Fig.4). Horizontal cuts were made on APT with a friction grip three tired depth gauge bur by moving it across the labial surface from mesial to distal, to develop three evenly spaced grooves, each 0.4 mm in depth. facial surface of tooth was painted to enhance contrast between prepared and unprepared tooth portions (Fig.5). These contrasted horizontal will remain painted until the desired depth of

labial reduction was uniformly achieved using tapered round end fissure bur. Then supragingival deep chamfer finish margin was produced which preserves tooth structure than shoulder.

Inter-proximal reduction was carried to produce long wrapping, which will extend over entire interdental area. An overlapped incisal edge preparation was chosen because incisal overlap provides a vertical stop that aids in the proper seating of the veneer. Silicone putty index and thermoplastic sheet were used as guide for actual material preparation. The preparations were then polished and all line angles were made rounded removing all the rough edges to minimize stress build-up during function (Fig.6).

Fig.6: Finished and Polished Tooth Preparation

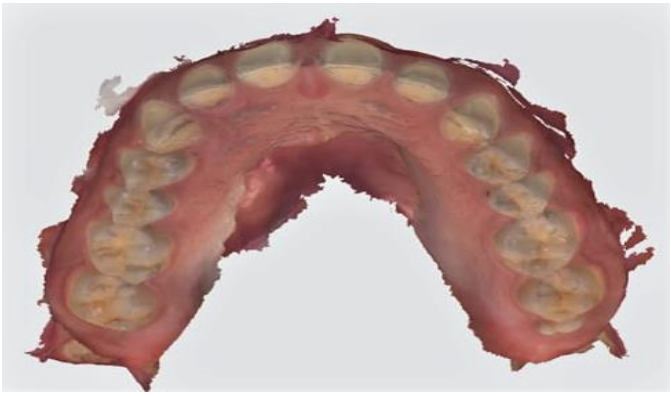

Fig.7: Digital Model with the Finished Preparations for Digital Ceramic Design

A # 000 retraction cord was inserted around the preparations and then the preparations were completely finished and polished. The cord was left in place 4-5 minutes and the intraoral preliminary scan was done with 3 Shape-TRIOS intraoral scanner (Fig.7). Then the cord was removed. The zoom button was hit and the scan was redone over the gingival margins. The existing cord seen in the first scan disappeared and was replaced with scan image of without cord. 3D resin model was obtained after scanning of tooth preparation (Fig.8)

Fig.8: 3D Resin Model obtained after Scanning of Tooth Preparation

Temporization

Provisional laminates were prepared using tooth colour acrylic material in the prepared silicone index. These laminates were then finished, polished and luted to tooth surface using resin cement by spot bonding technique.

Removing temporaries

Temporaries were cut off using a bur through the facial and incisal surfaces of the temporaries without touching the tooth.

Try in (bisque trial)

It is always better to try in the veneers individually to check for marginal fit without the influence of potential tight contacts. After checking the fit, the contacts between the laminates were checked. The laminate veneers were tried intra-orally by using try in paste to see their fit, form, position and shade. Once these were satisfactory to the patient, they were finally luted with resin cement.

Cementation Procedure was followed in the sequence of central incisors followed by lateral incisors and finally the canines.

Dental surface preparation

After drying and cleaning the field, teeth were etched with 37 % phosphoric acid (Ivoclar Eco-Etch) for 15 seconds (Fig.9). The bonding agent was applied but no photopolymerization was done.

Fig. 9: Etching of Prepared Tooth Surface with Phosphoric Acid

Ceramic surface preparation

After rinsing out the water-soluble try-in paste and drying the internal surface of the veneers. 5% Hydrofluoric acid (UltradentTM Porcelain Etch) was applied during 20 seconds to etch the E-max intaglio surface (Fig.10).The silane was then placed on the internal aspects of the veneer (Fig.11). It was left in place for 60 seconds. The bonding agent (Dentsply Calibra Prime and Bond NT adhesive) was applied but no photopolymerization was done.

Fig.10: Etching Laminate Fig.11 Silane Application Bonding veneers

Light-polymerized resin cement (Dentsply Calibra esthetic resin cement) was applied to the intaglio of each veneer restoration just before placing it on the tooth surface. The veneers were carried to the dental surface and light curing was done for 2-3 seconds using the "tack-and- wave" technique: each restoration was "tacked" to place using a 2.0 mm light guide in the center of the restoration for 1 second. Then light guide was "waved" for 3 seconds from the buccal and 3 seconds from the lingual surfaces approximately 2.5 cm from the ceramic surface.

This technique established a "semigel" state which enabled to remove the excess cement from gingival and interproximal margins with an explorer before final polymerization. Then, the restorations were flossed to remove excess from the interproximal area. Final polymerization was achieved by curing the restorations for at least one minute per tooth. Polishers were then used to give the final luster.

Fig.11: Intraoral Photograph after Cementation of Veneers

The patient was satisfied and he declared that the result matched his expectations with reality. He was instructed in the oral hygiene and recall visits were scheduled every 6 months.

Discussion

Laminate veneers have become a standard dental procedure. This is due to the need for a conservative aesthetic solution for the intermediate problems of

anterior teeth and the evolution of the bonding systems as well as the improvement in dental ceramic materials from feldspathic porcelain to new glass-ceramic formulations with high strength and resistance to chipping. Minimal depth, ranging from 0.3 to 0.5 mm leads to a reliable bonding in enamel in order to maintain preparations minimally invasive with no or minimal involvement of dentin.[8]

The decision regarding the most appropriate material for these types of situations always leads to questions, when comparing ceramic veneers with composite resins, we can see that the ceramics offer substantial improvements in optical behaviour, colour stability, shape, surface smoothness, and mechanical and physical properties.[9]

The veneers were fabricated from Lithium Disilicate ceramic having high translucency and strength compared to low fusing feldspathic porcelain.1 During laminate treatment Aesthetic pre-evaluative temporary (APT) technique was used to allow the patient to judge the final restorative design before the provisional restoration had been made. Therefore the advantages of APT technique include foreseeable aesthetics, optimal occlusion, and phonetics. [10,11]

Advantages of digital impression over the conventional impression

Preparation and restoration analysis can be directly monitored on the screen. Easy communication and reduced lab turnaround times, fast acquisition, no impression tray disinfection and cleaning and no waste products. A digital model is always available in the same original quality, easy achievability, selective repeatability and standardization. Regarding the patient, elimination of the risk of potential choking hazards, gagging, reduction of the number of appointments needed, enhanced patient education and improved case acceptance. A superior output related to the level of detail of the dentition and soft tissue provided; real colour representation, usability, system flexibility. [12-14]

Nedelcu R and Olsson P reported that TRIOS displayed the highest level of finish line distinctness in 7 intraoral scanners (3M, CS3500 and CS3600, DWIO, Omnicam, Planscan and TRIOS).[15] Hack and Patzelt reported that TRIOS to be the most accurate (trueness ± 0.9μm and precision 4.5 ± 0.9μm) when scanned for single tooth compared to the other scanners (True definition, ITero, CS3500, Omnicam, and Planscan).[16]

Proper selection of luting material is critical to the clinical longevity of ceramic restorations. The light-cured luting agent has greater colour stability and it provides a thin cementation line, along with high fluidity and excellent flow grade, facilitating the removal of excess cement than the dual-curing luting agent. [17]

Conclusion

This clinical report described the digital workflow for multiple ceramic veneers. The technique provides the opportunity to enhance the aesthetics by using 3 Shape TRIOS intraoral scanner, digital smile designing, milled acrylic provisional and IPS E.max definitive restorations. All restorations fabricated were clinically acceptable in terms of marginal fit, shape, contour, and aesthetics. Implementation of digital dentistry and virtual design can improve communication among the patient, clinician, and commercial dental laboratories and may become a common technique for all ceramic restoration.

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