Case Report

DOI: 10.7860/JCDR/2023/64149.18699

Aesthetic Rehabilitation with Veneers Using Digital Precision: A Case Report

Dentistry Section

SANATH KUMAR SHETTY[1], NARESH SHETTY[2], K MD ASARAF[3]

ABSTRACT

Smiling is an essential aspect of daily life, and a confident smile can greatly impact an individual's self-esteem. Aesthetic correction of the anterior teeth poses a challenge in dentistry, particularly in cases where there is spacing between the teeth. This can lead to a lack of confidence and negatively affect a person's self-image. Laminate veneers, a cosmetic dental procedure, involve attaching a thin layer of porcelain or resin composite material to the surface of a tooth. Compared to conventional methods, digital technology offers greater precision and efficiency in placing laminate veneers. Computerised templates guide the teeth preparation process, ensuring minimal tooth structure removal and accurate fitting of the veneers. The present report presents a case (43-year-old female patient) of spacing in the maxillary anterior that was corrected using a minimally invasive technique with laminate veneers and a fully digital workflow using lithium disilicate. The use of this material enhances the aesthetics of the patient's smile, requiring minimal tooth reduction and providing a natural appearance. The paper also includes a nine-month follow-up. Incorporating digital technology in the creation and placement of laminate veneers offers numerous benefits, including improved accuracy, reduced turnaround time, and the ability for patients to preview their enhanced smile.

Keywords: Aesthetic correction, Dental veneers, Digital work flow, Lithium disilicate

CASE REPORT

A healthy 43-year-old female patient presented to the Department of Prosthodontics with a chief complaint of spacing between her anterior teeth since they erupted and requested closure of the gaps. A thorough medical history did not reveal any relevant information. The patient's dental history showed that she had undergone root canal treatment and a full coverage restoration on tooth 46 one year ago.

During the extraoral examination, no facial asymmetry or discomfort was observed, and there were no abnormalities in the mandibular range of motion. Intraoral examination revealed spacing between teeth 13-12, 12-11, 11-21, 21-22, and 22-23. All teeth were vital and showed no hypersensitivity. Cervical caries were noted on tooth 11, and a soft tissue examination revealed Grade 1 gingival recession (Miller's 1985) in the lower anterior region [Table/Fig-1a,b] [1].

The patient had a bilateral Class I molar and canine relationship, and lateral extrusions showed group function occlusion on both sides. During protrusion, the incisal edge glided along the palatal surfaces of the maxillary anterior teeth without posterior separation. An overjet of 2 mm and overbite of 2 mm were present. Based on these clinical findings, the diagnosis was localised spacing in the maxillary anterior region. Due to its minimal invasiveness and superior aesthetic quality, the proposed treatment plan involved a laminate procedure for teeth 12, 11, 21, and 22.

[Table/Fig-1]: a) Spacing seen between the tooth 12,11,21,22; b) Smile line; c,d) Mock-up trial-in.

Treatment Procedure

Diagnostic wax-up: The first step in the clinical treatment involved a diagnostic wax-up. After explaining the procedure, a wax-up was created, incorporating the patient's inputs and suggestions to enhance the anatomy of teeth 12, 11, 21, and 22. To maintain smile harmony and proportionality, the mesiodistal dimensions of these teeth were enlarged, and the vertical height was increased by 1 mm. The mock-up was then transferred to the patient's mouth using bisacrylic resin (Protemp 4-3M ESPE) to simulate the proposed aesthetic solution [Table/Fig-1c,d].

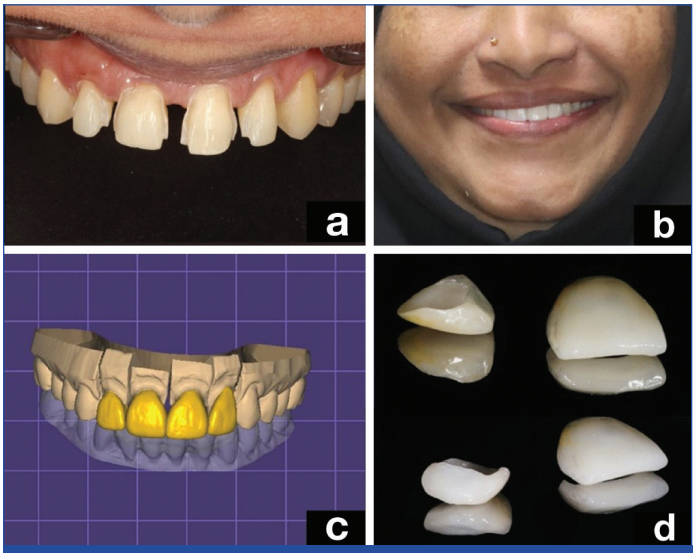
Tooth preparations: The incisal overlap preparation design was chosen to increase the length of the teeth and provide a positive stop for the restorative material [2,3]. First, orientation grooves were created for the labial reduction using depth-cutting burs (DM-305). A depth of approximately 0.3 mm was achieved near the gingival edge and 0.5 mm on the incisal surface using these burs [4,5]. Two-plane facial reduction was performed to ensure a uniform thickness of the restoration material and mimic the natural curvature of the tooth using a round-end tapered diamond bur (TR-13). The chamfer finish line was created at the level of the gingival crest, and all internal line angles were smoothed and rounded. To preserve the interproximal enamel, the tooth preparation was extended to the contact area [Table/Fig-2a].

Provisionalisation was carried out using Protemp 4 by 3M ESPE after impressions were made using polyvinyl siloxane impression materials using the double-step double-mix impression technique [Table/Fig-2b].

Fabrication of Prosthesis and Luting Procedure

Both casts, one with a mock-up and the other obtained after preparation, were scanned and overlapped in the software to aid in the design of the prosthesis and ensure that the final restoration would match the mock-up [Table/Fig-2c]. Lithium disilicate was

chosen as the material for the final prosthesis [Table/Fig-2d]. The monolithic prosthesis was then fabricated and tried in the patient's mouth before final characterisation and glazing. For the luting procedure, veneer cementation was performed individually for each tooth. The veneers were etched with 5% hydrofluoric acid for 20 seconds, washed, and dried. The inner surface of the veneers was coated with a silane coupling agent and allowed to dry for one minute. The teeth were properly cleaned, and then etched with 37% phosphoric acid for 15-20 seconds, thoroughly rinsed with water, and dried. A layer of bonding agent was applied to the tooth surface and cured for 20 seconds. The veneers were bonded to the teeth using dual-cure resin cement (RelyX; 3M ESPE).



[Table/Fig-2]: a) Tooth preparation- Incisal overlap prep; b) Provisionalisation was given; c) Compurter-aided Design (CAD) Computer-aided Manufacturing (CAM) design of final prosthesis.

After the luting procedure was completed, oral hygiene instructions were given, emphasising brushing habits and the use of dental floss. The patient's postoperative condition was satisfactory [Table/Fig-3a,b]. Follow-up was conducted at regular intervals of 3, 6, and 9 months, revealing stable soft tissue and maintained good oral hygiene [Table/Fig-3c]. The use of lithium disilicate and digital smile design resulted in a satisfactory outcome, as evidenced by preoperative and postoperative images [Table/Fig-3d,e].

[Table/Fig-3]: a) Lateral view; b) After cementation of lithium dicilicate; c) 9 months follow-up; d) Preoperative; e) Postoperative.

DISCUSSION

Spacing between the teeth is a common dental concern and can be caused by various factors such as genetics, tooth loss, or orthodontic treatment. Treating spacing is important because it can affect the appearance of a patient's smile, causing self-consciousness or embarrassment. It can also increase the risk of food impaction and dental decay, further compromising oral health. The combination of digital smile designing and mock-up techniques allows for improved aesthetic manipulation, resulting in a better predictable model to support the treatment plan [6]. Mock-up allows patients to visualise the expected final result and also facilitates the presentation of their current oral health condition [7]. Meijering AC et al., reported that the survival rate of porcelain veneers is 94%, while the survival rates of indirect and direct composite veneers are 90% and 74%, respectively [8]. Multiple studies have concluded that the survival rate for bonded porcelain laminate veneers is above 90% over a ten-year period of clinical service [9-11].

In the present clinical case, mock-up trail cast and prepared teeth cast scans were superimposed to accurately replicate the mock-up in the final restoration. The incisal overlap preparation design provided the freedom to increase vertical height and provide an adequate base for the restorative material to bond to. This type of preparation also modifies the path of insertion of the laminate [12]. Low-translucency lithium disilicate was chosen to replicate the shade and appearance of natural teeth while ensuring excellent biocompatibility. The main advantage of using laminate is that it can provide a quick and effective solution for improving a patient's smile. Additionally, laminate is minimally invasive, requiring minimal tooth reduction, and offers a natural appearance with thicknesses ranging from 0.1 mm to 0.7 mm [13]. Hahn P et al., conducted a study demonstrating that the strength of bonded porcelain veneers (Empress) placed on 0.5 mm deep buccal preparations was stronger than that of unprepared teeth [14]. In the present cases, 0.5 mm labial reduction was performed. Some limitations of using laminate for spacing include their high cost and the possibility of needing replacement over time.

CONCLUSION(S)

Spacing between teeth is a common dental concern with multiple potential causes. Digital smile designing and mock-up techniques enhance aesthetic manipulation and treatment planning. The preparation design, choice of material, and design were taken into account, considering the patient's oral health, age, and needs. Porcelain laminate veneers have high survival rates, making them a reliable option for teeth restoration. The incisal overlap preparation design allows for increasing vertical height and providing a stable base for the restorative material. The strength of bonded porcelain veneers is demonstrated to be superior to unprepared teeth. However, using laminate veneers may have limitations, including high costs and the eventual need for replacement.

REFERENCES

[1] Miller PD. A classification of marginal tissue recession. Int Periodontol. Rest Dent. 1985;5:09-13.
[2] Castelnuovo J, Tjan AH, Phillips K, Nicholls JI, Kois JC. Fracture load and mode of failure of ceramic veneers with different preparations. J Prosthet Dent. 2000;83(2):171-80.
[3] Stappert CF, Ozden U, Gerds T, Strub JR. Longevity and failure load of ceramic veneers with different preparation designs after exposure to masticatory simulation. J Prosthet Dent. 2005;94(2):132-39.
[4] Walls AWG, Steele JG, Wassell RW. Crowns and other extra-coronal restorations: Porcelain laminate veneers. British Dental Journal. 2002;193(2):73-82.
[5] Tushar D, Kumar KN, Garg S, Vijayan A. Aesthetic correction of spaced dentition with Emax lithium disilicate veneers: Case report. International Journal of Applied Dental Sciences. 2020;6(3):648-49.
[6] Cattoni F, Mastrangelo F, Gherlone EF, Gastaldi G. A new total digital smile planning technique (3D-DSP) to fabricate CAD-CAM mockups for esthetic crowns and veneers. Int J Dent. 2016;2016:6282587.
[7] Garcia PP, Da Costa RG, Calgaro M, Ritter AV, Correr GM, Da Cunha LF, et al. Digital smile design and mock-up technique for esthetic treatment planning with porcelain laminate veneers. Journal of Conservative Dentistry. 2018;21(4):455-58.
[8] Meijering AC, Creugers NH, Mulder J, Roeters FJ. Treatment times for three different types of veneer restorations. J Dent. 1995;23(1):21-26.
[9] Peumans M, De Munck J, Fieuws S, Lambrechts P, Vanherle G, Van Meerbeek B. A prospective ten year clinical trial of porcelain veneers. J Adhes Dent. 2004 Spring;6(1):65-76.
[10] Friedman MJ. A 15 year review of porcelain veneer failure- A clinician's observations. Compend Contin Educ Dent. 1998;19(6):625-28, 630, 632 passim; quiz 638.
[11] Fradeani M, Redemagni M, Corrado M. Porcelain laminate veneers: 6 to 12 year clinical evaluation- A retrospective study. Int J Periodontics Restorative Dent. 2005;25(1):09-17.
[12] Walls AWG, Steele JG, Wassell RW. Crowns and other extra-coronal restorations: Porcelain laminate veneers. British Dental Journal. 2002;193(2):73-82.

[13] Martins JD, Lima CM, Miranda JS, Leite FP, Tanaka R, Miyashita E. Digital smile designing, pressing and stratifying ceramic lithium disilicate veneers to rehabilitate dental agenesis: A clinical report. RGO-Revista Gaúcha de Odontologia. 2019;67:e20190043.

[14] Hahn P, Gustav M, Hellwig E. An in vitro assessment of the strength of porcelain veneers dependent on tooth preparation. Journal of Oral Rehabilitation. 2000;27(12):1024-29.

PARTICULARS OF CONTRIBUTORS:
1. Professor and Head, Department of Prosthodontics, Yenepoya Dental College, Mangaluru, Karnataka, India.
2. Reader, Department of Prosthodontics, Yenepoya Dental College, Mangaluru, Karnataka, India.
3. Postgraduate, Department of Prosthodontics, Yenepoya Dental College, Mangaluru, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. K Md Asaraf,
Postgraduate, Department of Prosthodontics, Yenepoya Dental College,
Mangaluru-575018, Karnataka, India.
E-mail: kmdasaraf@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Mar 27, 2023
- Manual Googling: Jul 28, 2023
- iThenticate Software: Aug 31, 2023 (10%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Mar 22, 2023**
Date of Peer Review: **Jul 12, 2023**
Date of Acceptance: **Sep 02, 2023**
Date of Publishing: **Nov 01, 2023**