

CASE REPORT



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Rehabilitation of the frontal teeth with palatal veneers by using T-Scan occlusal analysis - case report.

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Abstract

Pathological tooth wear occurs in young patients. The rehabilitation of these teeth must be performed accurately, considering the occlusal relationships and the correct distribution of the masticatory forces. The therapeutic approach must be as minimally invasive as possible.

In this case presentation, six palatal veneers were realized for the aesthetic and functional rehabilitation of a young patient's upper frontal teeth. The restorations were made on refractory casts, from feldspathic ceramics, allowing a proper esthetic. The occlusal rehabilitation involves the mounting of the casts in a semi-adjustable articulator. The six veneers were adapted functionally by using the Bio-Art A7 Plus articulator. Due to the adhesive techniques and the existing interocclusal space at this level, the teeth's preparation was limited to the enamel. The deep chamfer was placed equigingivally. During the try-in of the restorations, the esthetic evaluation was done. The adhesive technique was used to bond the veneers to the tooth surfaces. After the cementation, the esthetical results were evaluated. During the prosthodontic treatment, T-Scan III digital analysis was performed to detect occlusal problems, to establish the treatment directions, and to evaluate the results.

Conclusions: The use of the adhesively bonded feldspathic palatal veneers allows a successful esthetic and functional rehabilitation. The digital occlusal analysis, realized using the T-Scan system, improves the prosthodontic treatment quality and durability.

Keywords: Tooth wear, minimally invasive, palatal veneer, adhesive technique, T-Scan

Introduction

The tooth wear is a physiological process that means loss of the tooth structure. In situations where this wear occurs rapidly, especially in young patients, causing esthetic or functional problems or tooth sensitivity, this wear is pathological [1]. It is due to dental contacts and the surface friction resulting from functional movements of the mandible or different parafunctions. It can affect the lateral teeth's occlusal surfaces or the incisal edge of the frontal teeth [1].

The recommended therapeutic approach in restoring the pathological wear in current clinical practice is the most conservative tooth preparation by using minimally invasive techniques and adhesive cementation of the restorations [2,3].

The ceramic veneers with minimum wall thickness can be used for the minimally invasive frontal teeth approach because of their benefits: biocompatibility, esthetic and mechanical outcomes [3].

The indications and contraindications of the adhesive restorations are a controversial topic in the literature. Several authors have shown that bruxism is a contraindication to the use of ceramic veneers [4]. Magne et al. demonstrated a 40% failure rate in patients with bruxism [5]. Others recommend the nocturnal or/and diurnal wearing of the splints, even after the prosthodontic treatment, for the prevention of the failure [4]. The splint decreases muscle hyperactivity, and the bruxism activity during periods of stress [6,7].

To obtain long-lasting results in the case of restorations with feldspathic ceramic veneers, the use of the mock-up and the adhesive cementation technique is essential [8]. The therapeutic success depends mainly on the knowledge of the material's physical and technical characteristics, as well as the correct assessment of the clinical situation [9,10].

Feldspathic ceramic contains silica powder or quartz, in a ratio of 46-66% aluminum oxide and liquid glass-based materials. It offers a particular aesthetic, with high translucency, but

it is fragile, having a resistance of 56.5 MPa to fracture. In current practice, it is indicated for restorations in the frontal area, with a thickness of 0.5 mm in minimally invasive preparations, in areas that will not receive mechanical loads [9,11].

The occlusal analysis can be performed by using a digital system, T-Scan III (Tekscan). This system records the dental contacts, can measure the masticatory forces. Records the duration and timing of each contact during intercuspation, offering the possibility of a two- or three-dimensional analysis of occlusion [12]. T-Scan allows the establishment of the occlusal diagnosis [13]. The assessment of the center of force, the location of the premature contacts, is an essential aspect in the prosthetic treatment of patients with pathological abrasion.

Case presentation

A 25-year-old male patient presented for oral aesthetic rehabilitation, being disturbed by the upper frontal teeth's appearance, that had been reduced in length.

From the personal antecedents, we find out that the patient has the habit of biting his nails from adolescence and he has also nocturnal bruxism.

The patient's informed consent was obtained regarding the processing of personal data, photographs, measurements, and treatment results.

The clinical examination revealed the hypertrophy and hypertonia of the masseter muscles and more than two millimeters loss of length of the upper frontal teeth's clinical crown (Figure 1). All the teeth were vital and not sensitive to temperature.

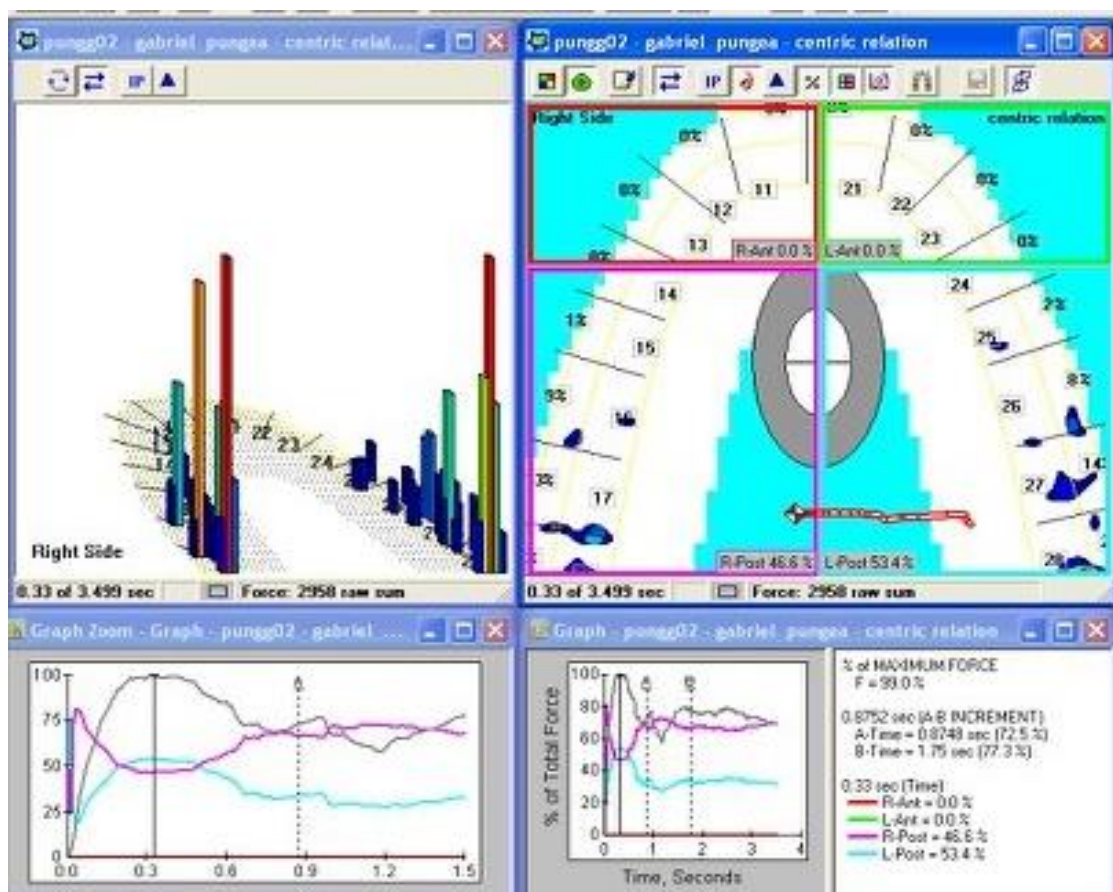


Figure 1. Modification in the length of the clinical crown of the frontal teeth

Photographs and impressions were taken. The Elite facial Bio-Art I facebow was used to facilitate the mounting of the casts on a semi-adjustable articulator to examine the functional contacts. Radiographs were

performed to establish an orthodontic treatment plan, but the cephalometric measurements (Zuerich analysis) disclaimed the orthodontic treatment.

The T-Scan III (Teksan) was used for objective analysis of the occlusal contacts to

elaborate the prosthodontic treatment plan (Figure 2).

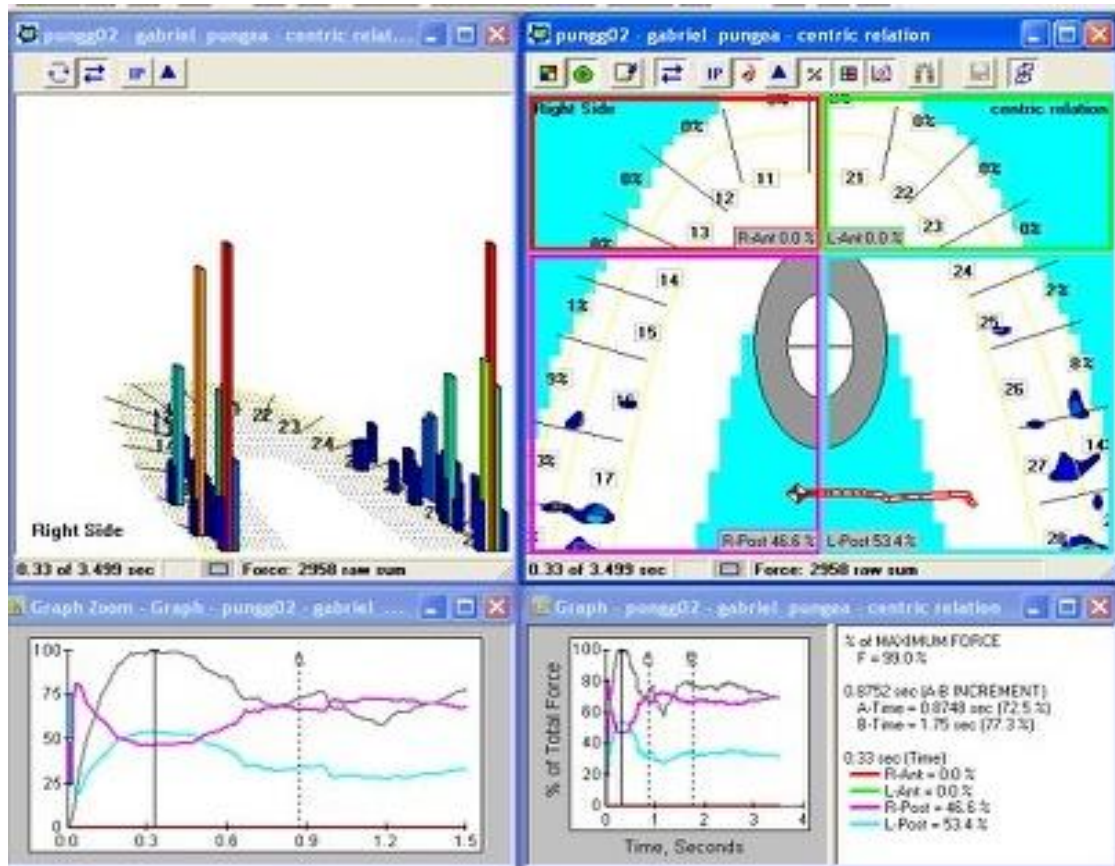


Figure 2. Initial T-Scan registration – the absence of the occlusal contact in the frontal region

The goal of the rehabilitation had been to realize six palatal veneers from feldspathic ceramics with minimally invasive preparation on the frontal teeth and to reestablish the contact surfaces, the frontal guidance in propulsion, the canine guidance in laterality.

One month of nocturnal splint therapy had been deconditioning the muscle contracture caused by bruxism. A T-Scan reevaluation had been done; it was registered a lack of contacts in the frontal area and excessive forces at the posterior teeth.

A mock-up had been performed to preview the esthetic and functional results. After one week of accommodation, when the T-Scan registration was repeated, the results of the

recordings were improved. The masticatory forces had been more evenly distributed, the full arch presented occlusal contacts. Because of prematurity on the right first molar, a selective grinding was performed.

The palatal surface of the frontal teeth had been prepared minimally invasive with a fine-grained football diamond bur (Figure 3). For the preparation of the equigingival deep chamfer finish line, a 010 size, red-marked, round-end tapered diamond bur had been used. On the labial surface, a bevel was realized without preparation of a finish line. The surfaces were finished with Arkansas stones and orange-colored Soflex (3M) discs.



Figure 3. Minimally invasive preparation of the palatal surface – deep chamfer finish line

The minimally invasive preparation was limited to the enamel to ensure the perfect adhesion of the veneers. For the finish line's display during the one-step impression, the double cord technique had been used (000 sizes non-impregnated cord and 0 sizes impregnated cord). Polivynilsiloxane was used for an accurate impression (Variotime Dynamix-Heavy Tray, Variotime medium

flow, Heraeus) and for the interocclusal records (Occlufast rock, Zermack). (Figure 4.)

The working casts were realized from a refractory material (Figure 5) and mounted in the Bio-Art A7 Plus semi-adjustable articulator.

To evaluate the esthetical outcomes of the restorations, the Variolink Esthetic (Ivoclar) try-in paste was used (Figure 6).



Figure 4. Interocclusal record with polyvinylsiloxane – indications regarding the future length and direction of the incisal edge



Figure 5. The working cast – realized from refractory material



Figure 6. The try-in of the restorations – the difference regarding the length

The adhesive bonding was realized with neutral, dual-cure Variolink Esthetic DC (Ivoclar) composite resin. The total etching technique was used; silane was applied to the restoration's internal surface after the hydrofluoric acid etch. At the end of the cementation process, the marginal seal of the restorations had been verified and finished.

A new T-Scan recording was performed (Figure 7). The biting forces were more evenly distributed, and the occlusal contacts in the frontal area were reestablished, the frontal and also the canine guidance was restored.

The length of the frontal teeth was restored, and the esthetical outcomes were satisfactory (Figure 8).

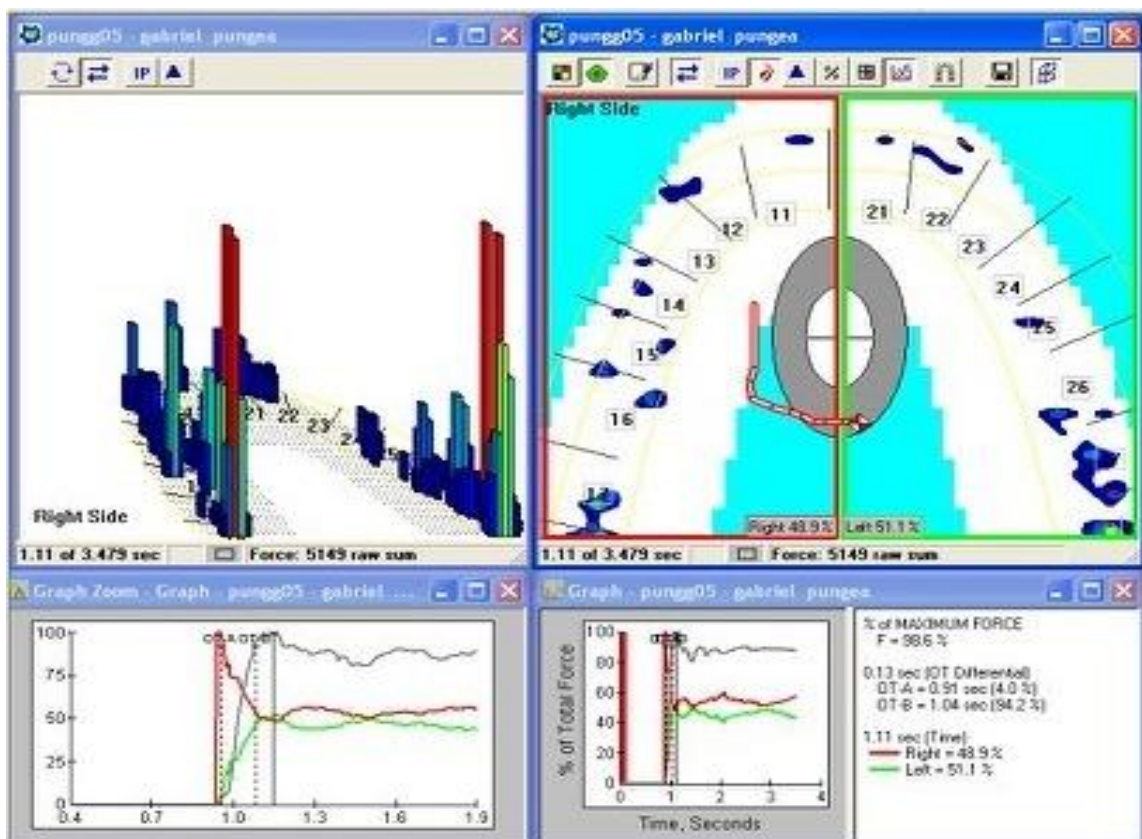


Figure 7. The final T-Scan – restored occlusal contacts in the frontal region



Figure 8. The final aspect of the restorations after cementation

Discussions

In current clinical practice, there are several options for the esthetic rehabilitation of the compromised anterior teeth. Those rehabilitation methods which involve the preparation for the crowns are very invasive and outdated [14].

New progress regarding the adhesive techniques contributes to increasing the mechanical properties of the bonded ceramic to the conditioned enamel, making it possible to obtain good clinical results in frontal rehabilitation [9,15]. The minimally invasive preparation is recommended in all cases to obtain the best adhesion of the ceramics to the tooth structure [9].

In this study, the preparation was limited to the enamel, because the vertical space in the intercuspal position allowed the achievement of adequate thickness of the ceramic veneers. The equigingival placement of the finish line facilitated the cementing procedures, making it easier to apply the rubber dam. The use of the rubber dam is recommended in case of adhesive cementation [9].

For the correct registration of the subgingivally or equigingivally placed finish line, the enlargement of the gingival sulcus is recommended [16]. For this purpose, the use of retraction cords is an effective technique.

The dental surfaces were cleaned, sandblasted, treated with 37% orthophosphoric acid for 25 seconds. The bonding agent was applied after a previous drying. The internal surface of the restorations was also sandblasted and treated with hydrofluoric acid, silane was applied, according to the recommendations of several authors [17].

The surface treatment of the veneers differs according to the type of the ceramics, but the hydrofluoric acid etch, and silane application is mandatory in all cases [9].

Patients with significant tooth wear in the anterior region suffer from a loss of clinical crown height and the possibility of developing an edge-to-edge incisal relationship. The esthetic appearance and also the function is compromised. Generally, the anterior and canine guidance is lost and needs to be reestablished [18].

In our case, the anterior guidance was restored in the propulsion movement and the canine guidance in laterality.

After the cementation, new T-Scan recordings demonstrated the equal distribution of the masticatory forces. Occlusal contacts were detectable at the frontal teeth in the intercuspal position. This digital diagnostic method reduces the subjective interpretation of occlusal analysis data, can provide the registration of the dynamic occlusion [19], and can contribute to our restoration's functional evaluation.

The fracture resistance of the feldspathic veneers is a controversial topic in the literature. The majority of clinical studies reviewed report a low incidence of fractures. However, other authors indicate a much higher rate of fractures, especially in case of bruxism [20].

Conclusions

The use of the feldspathic palatal veneers allows a successful esthetic and functional rehabilitation in terms of compliance with the protocols regarding the preparation, cementation, and occlusal balancing.

The digital occlusal analysis, realized using the T-Scan system, improves the prosthodontic treatment quality and durability.

Conflict of interest: None declared.

References

1. Paryag A, Rafeek R. Dental Erosion and Medical Conditions: An Overview of Aetiology, Diagnosis and Management. *West Indian Med J.* 2014;63:499-502.
2. Meyers IA. Minimum intervention dentistry and the management of tooth wear in general practice. *Aust Dent J.* 2013;58:60-5.
3. da Cunha LF, Reis R, Santana L, Romanini JC, Carvalho RM, Furuse AY. Ceramic veneers with minimum preparation. *Eur J Dent.* 2013;7:492-6.
4. Walls AWG. The use of adhesively retained all-porcelain veneers during the management of fractured and worn anterior teeth: Part 2. Clinical result after five years follow-up. *Br Dent J.* 1995;178:337-340.
5. Magne P, Perroud R, Hodges JS, Belser UC. Clinical performance of novel-design porcelain veneers for the recovery of coronal volume and length. *Int J Periodontics Restorative Dent.* 2000;20:440-57
6. Koyano K, Tsukiyama Y, Ichiki R, Kuwata T. Assessment of bruxism in clinic. *J Oral Rehabil.* 2008;35:495-508.
7. Lobbezoo F, van Der Zaag J, van Selms MKA, Hamburger HL. Principles for management of bruxism. *J Oral Rehabil.* 2008;35:509-523.
8. Veneziani M. Ceramic laminate veneers: clinical procedures with a multidisciplinary approach. *Int J Esthet Dent.* 2017;12(4):426-448.
9. Coachman C, Gurel G, Calamita M, Morimoto S, Paolucci B, Sesma N. The influence of tooth color on preparation design for laminate veneers from a minimally invasive perspective: case report. *The International Journal of Periodontics & Restorative Dentistry.* 2014;34(4):453-459
10. Gresnigt M, Ozcan M. Esthetic rehabilitation of anterior teeth with porcelain laminates and sectional veneers. *Journal of the Canadian Dental Association.* 2011;77 article b143.
11. Fons-Font A, Solá-Ruiz MF, Granell-Ruiz M, Labaig-Rueda C, Martínez-González A. Choice of ceramic for use in treatments with porcelain laminate veneers. *Medicina Oral, Patología Oral y Cirugía Bucal.* 2006;11(3):297-302.
12. Agbaje JO, Castele EV, Salem AS, et al. Assessment of occlusion with the T-Scan system in patients undergoing orthognathic surgery. *Sci Rep.* 2017;13;7(1):5356.
13. Afrashtehfar KI, Qadeer S. Computerized occlusal analysis as an alternative occlusal indicator. *Cranio.* 2016;34(1):52-7.
14. Tuzzolo Neto H, do Nascimento WF, Erly L, et al. Laminated Veneers with Stratified Feldspathic Ceramics. *Case Rep Dent.* 2018(3):1-6
15. Kumar GV, Poduval TS, Reddy B, Reddy PS. A study on provisional cements, cementation techniques, and their effects on bonding of porcelain laminate veneers. *The Journal of Indian Prosthodontic Society.* 2014;14:1:42-49.
16. Gresnigt M, Ozcan M, Kalk W. Esthetic rehabilitation of worn anterior teeth with thin porcelain laminate veneers. *The European Journal of Esthetic Dentistry.* 2011;6(3):298-313
17. Santos GC Jr, Santos MJ, Rizkalla AS. Adhesive cementation of etchable ceramic esthetic restorations. *J Can Dent Assoc.* 2009;75(5):379-384.
18. Abduo J, Lyons K. Clinical considerations for increasing occlusal vertical dimension: a review. *Aust Dent J.* 2012;57:2-10.
19. Nalini MS, Sinha M. Role of T-scan in Digital Occlusal Analysis - A Review. *International Journal of Research and Reports in Dentistry.* 2019;1(2):1-7.
20. Faus-Matoses V, Ruiz-Bell E, Faus-Matoses I, Özcan M, Salvatore S, Faus-Llácer VJ. A 8-year prospective clinical investigation on the survival rate of feldspathic veneers: Influence of occlusal splint in patients with bruxism. *J Dent.* 2020;12:103352. doi: 10.1016/j.jdent.2020.103352. Epub ahead of print. PMID: 32413382.

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