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Olgu Sunumu | *Case Report*

ÖN BÖLGE İMPLANTLARININ HASTA BAŞI CAD-CAM KİŞİSEL SERAMİK ABUTMENTLARLA REHABİLİTASYONU

Esthetic Rehabilitation of Anterior Implants Using Chairside Cad-Cam Custom Ceramic Abutments

Merve BANKOĞLU GÜNGÖR
Gazi Üniversitesi, Diş Hekimliği Fakültesi, Protetik Diş Tedavisi ABD,
mervebankoglu@yahoo.com

Aylin DOĞAN
Gazi Üniversitesi, Diş Hekimliği Fakültesi, Protetik Diş Tedavisi ABD,
aylinyikan@hotmail.com

Seçil KARAKOCA NEMLİ
Gazi Üniversitesi, Diş Hekimliği Fakültesi, Protetik Diş Tedavisi ABD,
secilkarakoca@yahoo.com

Evşen TAMAM
Gazi Üniversitesi, Diş Hekimliği Fakültesi, Protetik Diş Tedavisi ABD,
evsen78@yahoo.com

Öz

Kişisel abutmentlar, anterior bölgeye uygulanan implant destekli protezlerde karşılaşılacak birçok estetik problemi çözmeye yardımcı olur. Kişisel abutmentların üretiminde kullanılan tekniklerden biri de; zirkonya ve lityum disilikatabutmentların üretimine olanak sağlayan ComputerAided Design-Computer Aided Manufacturing (CAD-CAM) teknolojisinin kullanılmasıdır. Bu vaka raporunda; anterior bölgede yetersiz mezio-distal genişliğe sahip dişsiz boşluğu bulunan 2 vakanın CAD-CAM teknolojisi ile tasarlanan kişisel seramik abutmentlar ile tedavisi anlatılmaktadır. Her iki vakada da sol maksiller santral diş bölgesine yerleştirilen implant, CAD-CAM sisteminde tasarlanan ve üretilen kişisel abutmentlar ile restore edilmiştir. Abutmentlar, Vaka 1 için zirkonyadan ve Vaka 2 için lityum disilikattan üretilmiştir. Daha sonra abutmentların üzerine lityum disilikat kronlar yapılmıştır. 12 aylık takibin sonunda; her iki hasta da protezlerinden memnun olduklarını belitmişlerdir. 5 ay sonunda Vaka 2'de abutment vida gevşemesi görülmüştür fakat 12 ay süresince başka bir komplikasyon görülmemiştir.

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Anahtar Kelimeler: Dental-implant-Kaide Tasarımı; Lityum Disilikat; Yttria Stabilize Dörtgen Zirkon

Abstract

Custom abutments may solve many esthetic problems in extremely challenging anterior implant prostheses. One of the technique to create custom abutments is using Computer-Aided Design and Computer-Aided Manufacturing (CAD-CAM) technology. CAD-CAM which enables to fabricate abutments from zirconia and lithium disilicates. This clinical report describes the use of custom ceramic abutments fabricated using CAD-CAM technology for limited mesiodistal space situations in maxillary anterior region of two cases. In both patients, implants were placed for replacement of left maxillary central incisor were restored with CAD-CAM fabricated ceramic custom abutments. The abutments were fabricated from zirconia and lithium disilicate in case 1 and case 2, respectively. Then, lithium disilicate crowns were fabricated on the abutments. After 12 months, both patients were satisfied with the restorations. In case 2, abutment screw loosening was observed after 5 months of function however no other complication was observed during 12 months.

KeyWords: Dental-implant; Abutment Design; Lithia Disilicate; Yttria Stabilized Tetragonal Zirconia

1. Introduction

In esthetic regions, titanium implants and abutments can cause dark color through soft tissues and may impair the natural appearance when the buccal gingival tissue is thin(Bressan et al., 2011, pp. 631-637; Mde, Kempen, Lourenco, & Dde, 2014, pp. 362-366). To solve this problem, ceramic abutments were introduced. Zirconia abutments can be in the form of standardized (prefabricated or stock) components or customized by computer-aided design/computer-aided manufacturing (CAD/CAM) technology (Karunagaran, Paprocki, Wicks, & Markose, 2013, pp. 18-23; Misch, 1995, pp. 15-18). Prefabricated abutments are cheaper and easy to handle, however have some limitations(Misch, 1995, pp. 18-24). In anterior regions, prefabricated ceramic abutments need preparation to provide space for a sufficient thickness of the restorative material and to follow the contour of gingival margin (Alqahtani & Flinton, 2014, pp. 299-305).

Custom ceramic abutments which are fabricated using Computer-Aided-Design and Computer-Aided-Manufacturing (CAD-CAM) technology provide several benefits especially for anterior restorations (Kucey & Fraser, 2000, pp. 445-449). The benefits of CAD-CAM ceramic custom abutments are providing the optimal emergence profile and abutment design, reducing treatment time, and eliminating abutment selection and preparation. Currently, custom ceramic abutments can be fabricated from zirconia or lithium disilicate in dental offices by using CAD-CAM systems. Advantage of this system is taking digital impression which avoids drawbacks related to impression materials and cast fabrication (Mde et al., 2014, pp. 362-366). These ceramic abutments have a titanium insert which combines the strength and precise fit of titanium and esthetics of ceramic, also enables the clinician to provide an anatomic emergence profile (Mde et al., 2014, pp. 362-366).The aim of this clinical report is to present the use of custom ceramic abutments designed with CAD-CAM technology in maxillary anterior region in two cases.

2. Case Report

This clinical report presents two cases who received prosthetic treatment in Gazi University, Faculty of Dentistry, Department of Prosthodontics. It was observed that single implants with healty surrounding bone were located on the anterior maxilla with a limited mesiodistal space. The treatment protocol was explained to the patients and written informed consent was obtained.

For the digital impressions, the healing abutments were removed, scan posts (Scanbody; Sirona Dental Systems, Bensheim, Germany) were mounted and scanned. Digital impressions of the opposing teeth and buccal side of the teeth in maximum intercuspal position were also made. After removal of the scan post, healing abutments were inserted during the production of the abutments. The abutments were designed on the digital virtual models by using the CAD software (inLab SW 4.2, Sirona Dental Systems, Bensheim, Germany) and milled in the milling unit (inLab MC XL, Sirona Dental Systems, Bensheim, Germany). Titanium inserts (TiBase; Sirona Dental Systems, Bensheim, Germany) were cleaned with a steam cleaner and dried. The titanium inserts were screwed on the laboratory implant analog to protect the internal connection during cementation. For protecting the emergence profile of the titanium insert and screw holes, silicon impression material was applied on these areas. The bonding surface of the titanium inserts were sandblasted with 50 μm aluminum oxide particles under 2 bars pressure. Then, silicones were removed. Titanium inserts were steam cleaned again.After cleaning, the bonding surface were protected from contamination. The cements were mixed according to the manufacturers' instructions and applied to the titanium inserts. Careful insertion of the abutment was provided considering the rotation and position stops. Excess cements were removed. After sterilization, the abutments were inserted in the mouth and tightened with 35 Ncm torque. By considering limited space, lithium disilicate crowns were designed on the abutments and modifications were made in the CAD software to create esthetically acceptable form. The crown restorations were milled from lithium disilicate ceramic blocks (IPS e.max CAD, IvoclarVivadent, Schaan, Liechtenstein). The milled crowns were crystallized and glazed in a ceramic furnace (Programat P300, IvoclarVivadent, Schaan, Liechtenstein) by crystall and glaze spray (IPS e.max CAD Crystall Glaze Spray, IvoclarVivadent, Schaan, Liechtenstein).Then, the restorations were tried in and cemented on the abutments. The inner surface of the crowns were etched with 5% hydrofluoric acid gel (IPS Ceramic Etching Gel, IvoclarVivadent, Schaan, Liechtenstein) for 20 s and then rinsed under water and dried with air. For the silanization, silane (Monobond Plus, IvoclarVivadent, Schaan, Liechtenstein) was applied in the inner surface for 60 s and the silane was dried. The crown restorations were cemented with anadhesive resin cement (Multilink Automix, IvoclarVivadent, Schaan, Liechtenstein). The excess cements were cured in 3 s per surface (mesial, distal, buccal, and palatal) and removed with a hand instrument. The margin line was coated with the an air barrier (Air-Block Liquid Strip; IvoclarVivadent, Schaan, Liechtenstein) and the cement was cured for 20 s from each side.

After 12 months, both patients were satisfied with the restorations. In case 2, abutment screw loosening was observed after 5 months of function however no other complication was observed.

3. Case 1

A 20-year-old woman was received a titanium implant (Nobel Biocare AG, Kloten, Switzerland) in 3.5 mm diameter and 11.5 mm in length on the maxillary left central tooth position (Figure 1).

The custom abutment of Case 1 were produced from zirconia (inCoris ZI meso block, Sirona Dental Systems, Bensheim, Germany) and a minimum wall thickness of 0.5 mm around the screw hole was provided (Figure 2).

After the milling process, the zirconia abutment was dried for 10 min at 150°C before sintering. The sintering process was performed in a sinterization furnace (Sirona inFire HTC, Sirona Dental Systems, Bensheim, Germany) with a holding time of 120 min. Then the abutment was cemented on the treated surface of the titanium insert with a dual cure resin cement (Panavia F 2.0, Kuraray, Tokyo, Japan). The screw hole was sealed with wax to prevent from the excess cement. Equal amounts of Panavia F 2.0 Ed Primer II A and B were mixed, applied to the titanium base surface and leaved for 30 s and dried. Equal amounts of paste A and B were mixed for 20 s and margins were light cured for 20 s. Excess cement was removed and airblocker (Panavia F 2.0 Oxyguard II, Kuraray, Tokyo, Japan) was applied to the margins for 3 min and the airblocker was washed away. After bonding the abutment to the titanium bases, the abutment were sterilized and inserted in mouth. The lithium disilicate restorations were made which were previously described (Figure 3).

4. Case 2

A 49-year-old woman was received a titanium implant (**Zimmer**Dental, Carlsbad, CA, USA) in 3.75 mm diameter and 11.5 mm in length on the maxillary left central tooth position (Figure 4).

The custom abutment of Case 2 were produced from lithium disilicate (IPS e.max CAD, IvoclarVivadent, Schaan, Liechtenstein) and a minimum wall thickness of 0.5 mm around the screw hole was provided. After the milling of the abutment, the fit of the abutment was checked on titanium base and emergence profile of the abutment were polished. The inside of the pre-crystallized abutment was overfilled with a die material (IPS Object Fix Putty;IvoclarVivadent, Schaan, Liechtenstein) and the abutment was placed in the center of tray (IPS e.max CAD Crystallization Tray; IvoclarVivadent,Schaan, Liechtenstein). After the crystallization, the abutment was cleaned in an ultrasounic water bath. Monobond Plus was applied to titanium insert surface and allowed to react for 60 s and then dispersed. The screw hole was sealed with a wax. The inner surface of the abutment were etched with 5% hydrofluoric acid gel (IPS Ceramic Etching Gel, IvoclarVivadent, Schaan, Liechtenstein) for 20 s and then rinsed under running water and dried with air. For the silanization, silane (Monobond Plus, IvoclarVivadent, Schaan, Liechtenstein) was applied in the inner surface for 60 s and dried.

The crown restorations were cemented with an adhesive resin cement (Multilink Hybrid AbutmentAutomix, IvoclarVivadent, Schaan, Liechtenstein) by applying a thin layer of cement directly from the mixing syringe to the bonding surface of the TiBaseandthe bonding surface of the ceramic structure. When the correct position was achieved, finger pressure was applied. Excess cement was removed with a microbrush. Abutment was sterilized and inserted in mouth. (Figure 5) The lithium disilicate restorations were made which were previously described (Figure 6).

5. Discussion

Clinical investigations demonstrated that zirconia abutments had sufficient mechanical properties for implant supported prostheses (Sailer, Sailer, Stawarczyk, Jung, & Hämmerle, 2009, pp. 850-858; Zembic, Sailer, Jung, & Hammerle, 2009, pp. 802-808). However, design of the implant – abutment connection affects mechanical properties of the abutments. It was reported that internal implant-abutment connection had greater stability than external connection(Mollersten, Lockowandt, & Linden, 1997, pp. 582-591; Norton, 1997, pp. 290-298). The zirconia abutments which have an internal two-piece connection (with a metallic insert) have mechanical advantage compared to one-piece connections(Sailer et al., 2009, pp. 850-858).

An internal connection connects implant and abutment by screw tightening, and friction occurs between the implant and abutment contact surfaces (Chun et al., 2015, pp. 346-350). When zirconia abutments are used, the abutment-implant connection part which designed by the manufacturer is vulnerable to fracture(Albosefi, Finkelman, & Zandparsa, 2014, pp. 296-301; Chun et al., 2015, pp. 346-350). Another disadvantage of the one-piece abutments connected to titanium implants is having greater wear than titanium abutments connected to titanium implants (Klotz, Taylor, & Goldberg, 2010, pp. 970-975; Yilmaz, Salaita, Seidt, McGlumphy, & Clelland, 2015, pp. 373-377). A metallic insert converts the titanium-ceramic connection to the titanium-titanium connection(Chun et al., 2015, pp. 346-350). Chun *et al(Chun et al., 2015, pp. 346-350)* compared the fracture strength of the internally connected zirconia abutments with titanium inserts, titanium implant-titanium abutment, and titanium implant-zirconia abutment connections. It was stated that zirconia abutments with titanium inserts had higher fracture strength(Chun et al., 2015, pp. 346-350). Yılmaz *et al(Yilmaz et al., 2015, pp. 373-377)* also reported that the zirconia abutment with a titanium ring and the zirconia abutment with a titanium core hexagon had significantly greater fracture resistance than the one-piece zirconia implants. In another study, it was stated that failures of the zirconia abutments with titanium inserts were fracture of the abutment, deformation of the metallic components, and loss of retention(Sailer et al., 2009, pp. 850-858). Chairside custom abutments can also be produced from lithium disilicate abutments which can be fabricated as hybrid abutment or hyrid abutment crown. In the present case report, two patients who were treated with custom CAD-CAM ceramic abutments with a titanium insert were presented and only abutment screw loosening was observed in Case 2.

Prefabricated zirconia abutments generally need to be prepared to fabricate an appropriate prosthesis. Indeed, detrimental effect of grinding on mechanical properties of zirconia has been reported(Asar& Çakırbay, 2013, pp. 162-168;

Güngör, Yılmaz, Nemli, Bal, & Aydın, 2015, p. 585). Custom zirconia abutments which generally does not require preparation may be beneficial to keep the mechanical properties of zirconia. Alqahtani*et al(Alqahtani& Flinton, 2014, pp. 299-305)* reported that preparation of prefabricated zirconia abutments had a significant negative effect on the abutment fracture strength. Custom implant abutments are generally inserted without the need of preparation. In this clinical report, custom ceramic abutments were used for limited mesiodistal space in maxillary anterior region and satisfactory esthetical and functional results were obtained. Furthermore, fabrication of abutments and crowns was completed in a chairside manner.

6. Conclusion

Two-piece custom ceramic abutment may be a good alternative for implant restorations by combining the mechanical stability of titanium and the esthetic advantages of ceramics. Furhermore, the production technique (CAD-CAM) of custom abutments enables reducing the treatment time and eliminates abutment selection and preparation. However, further clinical researches are needed to evaluate long term use of two-piece custom ceramic abutments.

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Figures

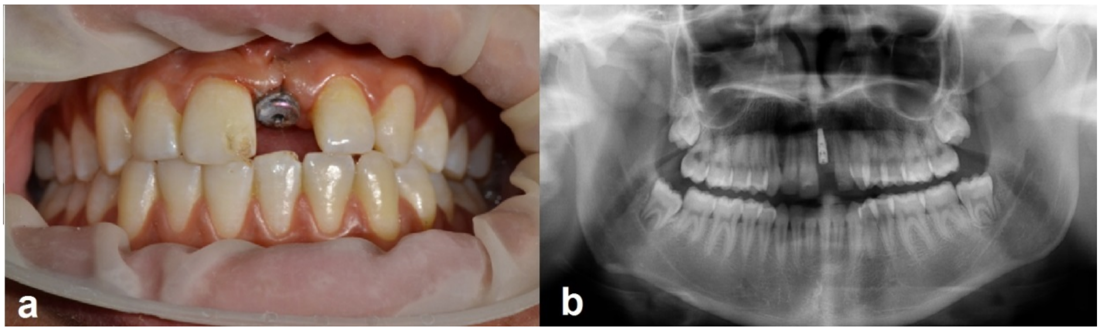

Figure 1. Initialview of the Case 1 a)Intraoral view b)Panoramic radiograph.

Figure2. Preparation of the abutment in Case 1 a)Insertion of Scanbody b)Insertion of the abutment .

Figure3. Cemented restoration in Case 1 after 1-year a)Intraoral view b)Periapical radiograph .

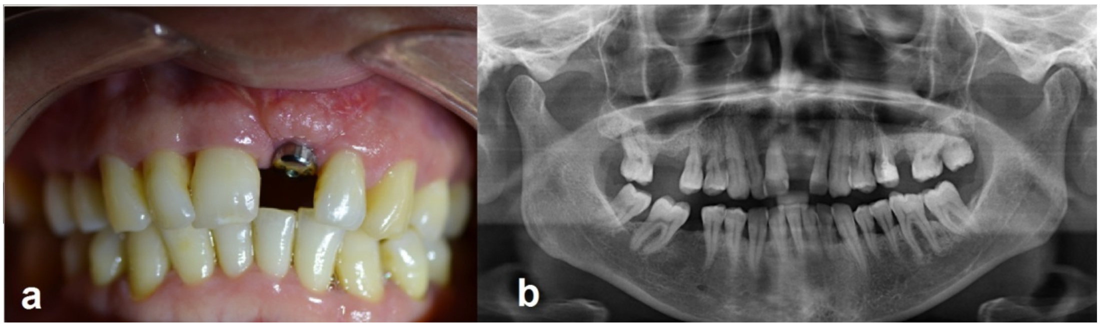

Figure 4.Initial view of the Case 2 a)Intraoral view b)Panoramic radiograph.

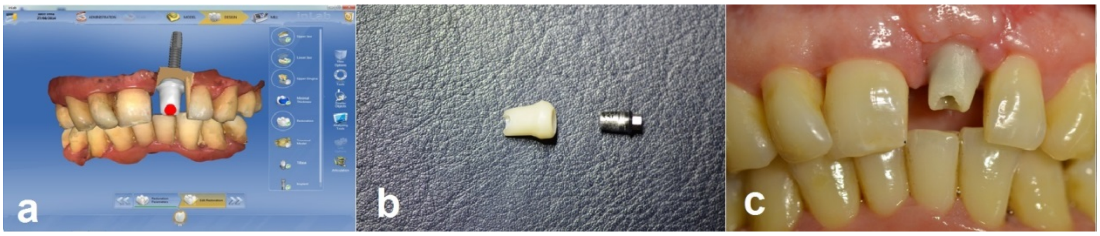

Figure5. Preparation of the abutment in Case 2 a)Design of the abutment on the software b)TiBase and the custom abutment c)Insertion of the abutment in Case 2.

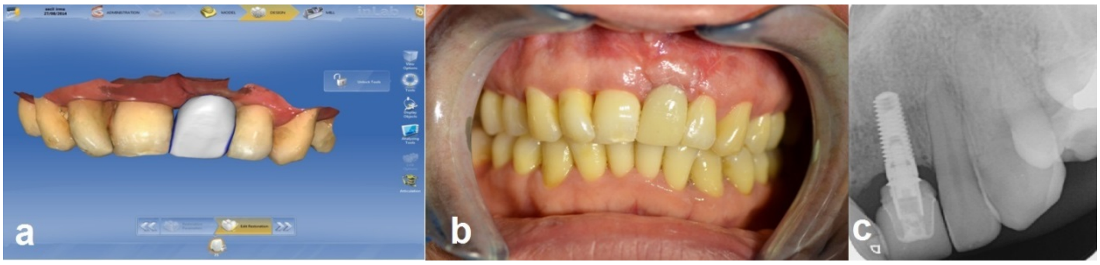

Figure6. Cementedrestoration in Case 2 after 1-year a)Design of the restoration b)Intraoral view c)Periapical radiograph.