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CASE REPORT
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TERAPIJA ABRADIRANIH ZUBA PRIMENOM BEZMETALNE KERAMIKE I KONVENCIONALNH METALOKERAMIČKIH RESTAURACIJA

TREATMENT OF ABRADED TEETH USING METAL FREE CERAMICS AND CONVENTIONAL METAL-CERAMIC RESTORATIONS

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Sažetak

Uvod. *Savremena rekonstruktivna stomatologija se smatra bioestetskom disciplinom, učenjem o lepoti živih bića i izvornom obliku i funkcijama. Diskutovati o estetskoj stomatologiji, vrhunskim veštačkim nadoknadama u ustima pacijenta, teško prepoznatljivim za oko posmatrača, sublimira niz kvaliteta. Gubitak tvrde zubne supstance koji nije uslovljen karijesom je fiziološki proces koji je prisutan tokom celog života, ali pojedini faktori mogu dovesti do opsežnog gubitka tvrdog zubnog tkiva. Gubitak tvrdog zubnog tkiva je uslovljen kombinacijom raznih etioloških faktora, kao što su: genetski i funkcionalni.*

Prikaz slučaja. *Pacijent dolazi u stomatološku ordinaciju i žali se na opsežan gubitak tvrdog zubnog tkiva, loš izgled svojih zuba, poremećaj govora, kao i na probleme pri mastikaciji. Intraoralnim pregledom je ustanovljeno postojanje izuzetne abrazije. Plan terapije je pojednostavio postupak kombinacijom klasičnih metalo-keramičkih restauracija i novog bezmetalnog keramičkog sistema IPS e.max (Ivoclar Vivadent, Schaan, Liechtenstein).*

Zaključak. *Na ovom kliničkom slučaju sa prisutnom abrazijom prikazana je kombinovana terapija primenom bezmetalnih restauracija i standardnih metal-keramičkih nadoknada u cilju ponovnog uspostavljanja zdravlja, funkcije i estetike. Primenom restauracija od bezmetalne keramike sa osnovom od cirkonijuma (IPS e.max ZirPress, Ivoclar Vivadent, Schaan, Liechtenstein) moguće je postići besprekorne kliničke rezultate kako u frontalnom tako i u bočnom segmentu.*

Ključne reči: *abrazija, metal-keramičke restauracije, bezmetalne keramičke restauracije*

Abstract

Introduction. *Contemporary reconstructive dentistry is considered to be a bioesthetic discipline, the study of the beauty of living creatures in their original form and functions. A discussion of esthetic dentistry, the sophisticated artificial restorations in the patient mouth, hardly discernible to an observer or expert eye, implies a whole series of qualities. Damage of hard tooth-tissue, which is not caused by caries, is a physiological process present throughout the whole life, but some factors can bring about great losses of the hard tissue. This damage can be caused by a combination of different etiological factors, such as genetical and functional ones.*

Case report. *A patient is coming in dental surgery complaining of a large damage of the hard-tooth tissue, ugly appearance of his teeth, speech dysfunction and masticatory problems. An intraoral view shows the presence of a large teeth-abrasion. The treatment plan simplified the treatment with a combination of metal-ceramic restorations and a new ceramic system IPS e.max (Ivoclar Vivadentm Schaan, Liechtenstien).*

Conclusion. *In this clinical case with presented abrasion the treatment was presented using all-ceramic restorations and classical metal-ceramic restorations to establish good health, function and estehetic. The use of restorations based on zirconium (IPS e.max ZirPress, Ivoclar Vivadent, Schaan, Liechtenstein) can produce excellent clinical results in the frontal, as well as in lateral segments.*

Key words: *abrasion, metal-ceramic restaurations, all-ceramic restauration*

Uvod

Savremena rekonstruktivna stomatologija smatra se bioestetskom disciplinom, učenjem

Introduction

Modern reconstructive dentistry is regarded as a bioesthetic discipline – the study of beauty

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o lepoti živih bića i izvornom obliku i funkcijama. Kada govorimo o estetskoj stomatologiji i vrhunskim veštačkim nadoknadama, koje su teško prepoznatljive za oko posmatrača, mora se obratiti pažnja na nekojiko faktora[1]. Prirodan izgled, funkcionalnost i besprekoran osmeh danas predstavljaju permanentan zahtev u stomatološkim ordinacijama. Sa druge strane, izuzetno brzi razvoj terapijskih kliničkih postupaka i stomatoloških restaurativnih materijala lekaru dozvoljava da ponudi širok spektar terapijskih modaliteta[2,3]. Indirektne restauracije od bezmetalne keramike predstavljaju sredstvo izbora u vidljivom segmentu, ali se sve češće koriste u lateralnom segmentu. Razvoj stomatoloških materijala i poboljšanje tehnike poslednjih godina povećavaju pouzdanost primene novih bezmetalnih keramičkih sistema u frontalnom i bočnom segmentu.

Kod većine pacijenata primena novih oblika indirektnih restauracija, uz odličnu estetiku, pruža i sledeće prednosti: jednostavnost kliničkih postupaka i supragingivalno postavljanje rubova krunice, što izuzetno pogoduje parodoncijumu[4]. Takođe, primenom kompozitnih cemenata povećava se i retencija. Ove specifičnosti izuzetno su važne pri terapiji velikih defekata tvrdih zubnih tkiva, uz prisustvo vrlo čestih nesaniranih patoloških stanja, kao što su otvoreni zagrižaj i prisustvo obrnutog preklopa.

Gubitak tvrde zubne supstance koji nije uslovljen karijesom fiziološki je proces koji je prisutan tokom celog života, ali pojedini faktori mogu dovesti do opsežnog gubitka tvrdog zubnog tkiva. Gubitak tvrdog zubnog tkiva je, kao u sledećem kliničkom slučaju, uslovljen kombinacijom raznih etioloških faktora, kao što su: genetski i funkcionalni[5,6].

Prikaz slučaja

Pacijent dolazi u stomatološku ordinaciju i žali se na opsežan gubitak tvrdog zubnog tkiva, loš izgled svojih zuba, poremećaj govora, kao i na probleme pri mastikaciji. Pri ekstraoralnom pregledu nisu uočene nikakve nepravilnosti niti asimetrije. Pri otvaranju usta ustanovljena su pucketanja na obe strane, ali su granične kretnje donje vilice izvodljive i bez prisustva bolova u delu viličnih zglobova. Intraoralnim pregledom je ustanovljeno postojanje izuzetne abrazije (sl.1). Nije bilo praznih prostora kao posledica

of living beings in their natural forms and with their natural functions. A discussion of esthetic dentistry, state-of-the-art artificial replacements in the patient's mouth, hardly discernible to an unexperienced eye, involves a sequence of qualities[1]. Natural appearance, functionality, and a perfect smile today are a permanent demand in dentistry clinics. On the other hand, a very rapid development of therapeutic clinical procedures and restoration materials in dentistry make possible for us to offer our patients a wide array of therapeutic modalities [2,3]. Indirect restorations made of metal free ceramics represent an approach of choice in the visible segment of teeth, but are increasingly used in the lateral segments as well. The development of materials and recent technical advances in dentistry increase the reliability of new metal free ceramic systems in the frontal and lateral segments.

In most patients, the use of new forms of indirect restorations, in addition to excellent esthetic results, can afford other significant advantages. We should mention the simplicity of clinical procedures and supragingival placement of the crown edges, which exerts favorable effects on the parodontium[4]. Moreover, the use of composite cements increases retention. These specificities are extremely important in the treatment of large defects of hard dental tissues, with the very common concomitant presence of untreated pathologic conditions, such as open bite and reverse overjet.

The loss of hard dental tissue, not caused by caries, is a physiologic process present throughout our life, but some factors may lead to extensive losses of hard dental tissues. The loss of hard dental tissue, as in the clinical case we intend to present here, is the result of a combination of various etiologic factors, both genetic and functional[5,6].

Case report

The patient visited the dentistry clinic with the complaint of extensive loss of hard dental tissue, poor esthetic appearance, disturbed function of speech, and mastication problems. On extraoral examination, neither irregularities nor asymetries were observed. On mouth opening, bilateral clicks were heard, but the movement of the lower jaw was feasible to physiologic limits, without any pain in the region of

ekstrakcije zuba. Vertikalna dimenzija je redukovana. Do ovakve izuzetno teške kliničke situacije i trošenja zuba došlo je kombinacijom različitih faktora:

- neblagovremena terapija poremećaja,
- gubitak vertikalne dimenzije i kliženja donje vilice u protruzioni položaj i
- nedostatak prednjeg vođenja i vođenja očnjakom, kao i pojava parafunkcija.

Slika 1. *Inicijalna situacija*
Figure 1. *Initial situation*

Estetska analiza je ukazala na visoko postavljenu liniju smeha, pri čemu ona postaje izuzetno vidljiva. Nisu prisutni znaci parodontalnog oboljenja, a oralna higijena je ocenjena kao dobra. Nakon toga, pacijentu je predloženo dugoročno rešenje sa zadovoljavajućom estetikom, što je zahtevalo opsežnu protetsku sanaciju. Količina tvrde zubne supstance procenjena je kao dovoljna u smislu retencije protetskih nadoknada. Na osnovu kliničkih podataka urađeno je dijagnostičko navoštavanje (wax-up) zbog uspostavljanja normalnog oblika i proporcije zuba, postignut je prihvatljiv okluzalni koncept i izradio dobar plan terapije (sl.2). Plan terapije je pojednostavio postupak kombinacijom klasičnih metalo-keramičkih restauracija i novog bezmetalnog keramičkog sistema IPS e.max (Ivoclar Vivadent, Schaan, Liechtenstein). Krunice od bezmetalne keramike sa osnovom od cirkonijuma (IPS e.max ZirPress, Ivoclar Vivadent, Liechtenstein) predložene su za rekonstrukciju pojedinih zuba gornje vilice i svih frontalnih zuba donje vilice. Standardne metalokeramičke restauracije planirane su za restauraciju zuba 45 i 46, implantata u predelu 36, kao i povezivanje zuba 16 i 15. U sledećoj fazi urađene su definitivne preparacije zuba

temporomandibular joints. On intraoral inspection, an extreme abrasion was found (Fig. 1). There were no empty spaces as the result of dental extractions. The vertical dimension was reduced. This very serious clinical situation and teeth abrasion was the result of a combination of multiple factors:

- delayed treatment of disorders;
- loss of vertical dimension and slipping of the lower jaw into protrusion;
- lack of frontal and canine tooth guidance, as well as the appearance of parafunctions.

Slika 2. *Dijagnostičko navoštavanje*
Figure 2. *Diagnostic wax-up*

The analysis of esthetics indicated a highly positioned, very conspicuous laugh line. The signs of a parodontal disease were not present; oral hygiene was good. A long-term solution was then suggested to the patient, with satisfactory esthetics, which required extensive prosthetic sanation. The amount of hard dental tissue was assessed to be sufficient regarding the retention of prosthetic replacements. Based on the clinical evidence, diagnostic wax-up was done, so that normal shape and proportion of the teeth could be obtained, achieving also an acceptable occlusion concept, and that a good treatment plan could be devised (Fig. 2). The treatment plan simplified the procedure by the combination of traditional metal-ceramic restorations and the new, metal free ceramic system IPSe.max (Ivoclar Vivadent, Schaan, Liechtenstein). The crowns made of metal free, zirconium based ceramics, were suggested for the reconstruction of some of the teeth in the upper jaw and all frontal teeth in the lower jaw. Standard metal-ceramic restorations were planned to restore the teeth 45 and 46, implants in the region 36, and connection of the teeth 16 and

za prihvat bezmetalnih krunica brušenjem sa zaobljenom stepenicom (1,0mm). Prednost bezmetalnog sistema IPSe.max, koji je primenjen u ovom slučaju, sastoji se u tome da se i kod malog prostora i malo zubne supstance mogu postići izvanredni estetski rezultati obzirom da ovde nije potreban opaker za pokrivanje metala. Naročita pažnja je posvećena izradi zaobljenih, glatkih i preciznih preparacija kako bi se sprečilo preopterećenje na kontaktnim tačkama (sl. 3 i 4). Mogućnost da se granica preparacije postavi u nivou gingive olakšala je preparaciju i definitivni otisak. Otisak je uzet standardnom kašikom i adicionim silikonom (Virtual, Ivoclar Vivadent, Schaan, Liechtenstein).

Slika 3. *Model sa definitivnom preparacijom gornjih zuba*
Figure 3. *Model with final preparation of upper teeth*

Modeli gornje i donje vilice su nakon prenosa obraznim lukom smešteni u artikulator. Određivanje međuviličnih odnosa izvedeno je u centralnom položaju sa tri voštana registrata na prepariranim zubima gornje i donje vilice. Nakon probe bezmetalnih skeleta i metalne kosntrukcije pristupljeno je određivanju boje i konačnog oblika zuba (sl. 5 i 6). Metalkeramički mostovi su cementirani glas-jonomer cementom (Vivaglas, Ivoclar Vivadent, Schaan, Liechtenstein), dok su bezmetalne krunice cementirane kompozitnim cementom (Multilink Automix, Ivoclar Vivadent, Schaan, Liechtenstein).

Ovaj kompozitni cement se u osnovi bazira na klasičnim restaurativnim kompozitima. Sastoji se od monomera i neorganskih čestica punila. Vezivanje se bazira na unakrsnom povezivanju polimernih lanaca, koje se može inicirati hemijski ili putem svetla. Adhezivno cementiranje omogućava vezivanje restauracija kod kojih već postoji insuficijentna veza usled

15. In the next phase, final teeth preparations were made to bear metal free crowns, using the rounded step (1.0 mm) bur abrasion. The advantage of IPSe.max metal free system used in this case was that excellent esthetic results could be achieved in a limited space and with little dental tissue, since there was no need here to use an opaquer for metal coverage. The creation of rounded, smooth and precise preparations required special attention, since we wanted to prevent contact point overloads (Fig. 3 and 4). The possibility to place the preparation border at the gingival level facilitated the preparation and creation of a final impression. The impression was taken using a standard spoon and addition silicone (Virtual, Ivoclar Vivadent, Schaan, Liechtenstein).

Slika 4. *Model sa definitivnom preparacijom donjih zuba*
Figure 4. *Model with final preparation of lower teeth*

The casts of the upper and lower jaw were placed into the articulator after the transfer with a buccal arch. Determination of interjaw relationships was done in the central position using three wax registrations on the prepared upper and lower jaw teeth. After the try-in of metal free skeletons and metal frameworks, the color and final shape of the teeths were determined (Fig. 5 and 6). Metal-ceramic bridges were cemented with a glass-ionomer cement (Vivaglas, Ivoclar Vivadent, Schaan, Liechtenstein), while metal free crowns were cemented using a composite cement (Multilink Automix, Ivoclar Vivadent, Schaan, Liechtenstein).

This composite cement is based on classical restoration composites. It consists of monomers and inorganic filling particles. The binding is based on the cross-linking of polymer chains, initiated chemically or by light. Adhesive cementing enables binding of the restorations with insufficient binding ability due to small

manjka retentivne površine, kao što je u ovom kliničkom slučaju. Navedeni sistem odabran je zbog karakteristika univerzalnosti. Iako se ne smatra vrhunskim estetskim sistemom (izbor tri boje), jačina njegove veze je veća u poređenju sa drugim kompozitnim cementom. Ovaj kompozitni cement se sastoji od kompozita i Multilink Primer-a A i B. Sistem inicijatora omogućava hemijsku vezu (samoatherencija) koja je poboljšana kontaktom kompozita sa prajmerom. Postoji i mogućnost inicijacije svetlom, zbog prisustva odgovarajućeg fotosenzibilnog inicijatora.

Slika 5. *Izgled substrukture prednjih i bočnih kruna*
Figure 5. *View of the substructures for the anterior and lateral crowns*

Keramičke restauracije se nagrizaju fluorovodoničnom kiselinom (IPS Ceramic etching-gelom). Nakon ispiranja i sušenja, nanosi se vezujuće sredstvo (Monobond – S, Ivoclar Vivadent, Schaan, Liechtenstein) na unutrašnju površinu nadoknade i ostavlja tokom 60 s. Nakon toga se površine posuše vazduhom. Multilink Primer tečnosti A i B se pomešaju u odnosu 1:1 (jedna kap prajmera A i jedna kap prajmera B). Pomešani prajmer se zatim nanosi na površinu nadoknade tokom 15 sec. Ovaj tip cementa se nanosi na površinu restauracija zbog prevelikog ubrzanja procesa vezivanja izazvanog kontaktom prajmera i kompozita. Sve krunice su prosvetljene 20 sec led –lampom (Bluephase 16i, Ivoclar Vivadent, Schaan, Liechtenstein). U sulkus su prethodno položeni tanki retrakcioni končići da bi se postigla bolja kontrola nad rubom krunice i kako bi se lakše uklonili ostaci cementa. Za uklanjanje viška cementa interdentalno su provučeni končići natopljeni glicerinom koji olakšava uklanjanje zaostalog interdentalnog cementa. Pacijent je bio vrlo zadovoljan svojim prirodnim izgledom, funkcijom i govorom (sl.7).

retention surfaces, as in this clinical case. The system was chosen for its universal characteristics. Although it is not a top-notch esthetic system (the choice of only three colors), its bonding strength exceeds that of other composite cements. This composite cement consists of a composite and Multilink Primers A and B. The system of initiators enables chemical bonding (self-adherence), further improved by the composite-primer contact. There is a possibility of light curing too, due to the presence of an appropriate photo-sensitive initiator.

Slika 6. *Izgled substrukture prednjih i bočnih kruna*
Figure 6. *View of the substructures for the anterior and lateral crowns*

Ceramic restorations are etched using the fluorohydric acid (IPS Ceramic etching-gel). After washing and drying, a bonding substance is applied (Monobond – S, Ivoclar Vivadent, Schaan, Liechtenstein) to the inner surface of the replacement and left for 60 seconds. After that the surfaces are air-dried. Multilink Primer liquids A and B are mixed in 1:1 ratio (one drop of primer A and one drop of primer B). The combined primer is then applied to the replacement surface for 15 seconds. This cement type is applied to the restoration surface due to over-acceleration of the process of bonding induced by the primer-composite contact. All the crown were illuminated for 20 seconds with a LED-lamp (Bluephase 16i, Ivoclar Vivadent, Schaan, Liechtenstein). Fine retraction filaments were previously placed in the sulcus in order to achieve better control over the crown edge and to facilitate the removal of cement debris. For interdental cement debris to be removed, the filaments soaked in glycerin were placed between the teeth to facilitate the removal. The patient was very satisfied with his natural appearance, function, and speech (Fig. 7).

Slika 7. *Kompletna rehabilitacija*
Figure 7. *Completed rehabilitation*

Diskusija

Iako se čini da korišćenje bezmetalnih nadoknada u svakodnevnoj stomatološkoj praksi pruža dobre rezultate, dugoročno ponašanje ovih novih keramičkih materijala još je uvek nepoznato uglavnom zbog savremenosti. Zbog toga bi već proverena protetska rešenja, poput konvencionalnih metalo-keramičkih mostova, predstavljala pouzdano rešenje. Dva najnovija pregledna rada analiziraju sve članke koji govore o stopi uspešnosti i komplikacijama bezmetalnih krunica i mostova u odnosu na metalo-keramičke krunice[7]. Potpune keramičke krunice pokazale su petogodišnju stopu uspešnosti u poređenju sa metalo-keramičkim krunicama (93,3% nasuprot 95,6%).

Pored osnovnih bioloških komplikacija, gubitak vitalnosti pulpe bio je podjednak i kod potpuno keramičkih i metalo-keramičkih krunica sa petogodišnjom stopom od 2,1%. Petogodišnja stopa propadanja zuba kod potpuno keramičkih krunica bila je manja od one kod metalo-keramičkih (1,8% nasuprot 3,2%)[8].

Osnovna tehnička komplikacija potpuno keramičkih pojedinačnih krunica bila je fraktura njihove osnove, dok je pojava naprslina keramičkog sloja kod potpuno keramičkih krunica bila niža (3,7%) od one kod metalo-keramičkih krunica (5,7%). U poređenju sa metalo-keramičkim mostovima, bezmetalni mostovi su pokazali prisustvo istih bioloških komplikacija kao i pojedinačne krunice izrađene od istog materijala. Nasuprot tome, tehničke komplikacije bile su češće kod bezmetalnih mosto-

Discussion

Although it appears that the use of metal free replacements in the routine practice of dentistry produces good results, long-term behavior of these new ceramic materials is still largely unknown. Consequentially, the already proven prosthetic solutions, such as conventional metal-ceramic bridges, would represent a reliable alternative. Two most recent review papers have analyzed all the articles dealing with the success and complication rates of metal free bridges compared to metal-ceramic crowns[7]. The five-year success rate of full ceramic crowns has been 93.3%, compared to 95.6% with metal-ceramic crowns.

In addition to basic biologic complications, the loss of pulp vitality has been equal to both full ceramic and metal-ceramic crowns, with the five-year rate of 2.1%. A five-year tooth loss rate with full ceramic crowns has been lower than that with metal-ceramic crowns (1.8% vs 3.2%)[8].

The fundamental technical complication associated with full ceramic crowns has been the fracture of their base, while the rate of cracks in the ceramic layer in full ceramic crowns has been lower (3.7%) than that with metal-ceramic crowns (5.7%). Compared to metal-ceramic bridges, metal free bridges have demonstrated the presence of the same biologic complications encountered in individual crowns made of the same material. In contrast, technical complications have been more common in metal-

va sa višom stopom frakture osnove (osim kod osnove od cirkonijuma-oksida)[9].

Ovi podaci naglašavaju primenu osnove od cirkonijum-oksida u izradi bezmetalnih mostova. Druga važna tehnička komplikacija uočena u petogodišnjem periodu kod cirkonijum-oksidnih mostova bila je postojanje ograničenih ili širokih fraktura keramičkog materijala koji je nanešen na osnovu[10]. To se može objasniti potrebom za unapređenjem mehaničko-fizičkih osobina keramičkog materijala i nedovoljno jakom vezom između osnove i keramičkog sloja[11,12].

Zaključak

Na ovom kliničkom slučaju sa prisutnom abrazijom prikazana je kombinovana terapija primenom bezmetalnih restauracija i standardnih metal-keramičkih nadoknada u cilju ponovnog uspostavljanja zdravlja, funkcije i estetike. Primenom restauracija od bezmetalne keramike sa osnovom od cirkonijuma (IPS e.max ZirPress, Ivoclar Vivadent, Schaan, Liechtenstein) moguće je postići besprekorne kliničke rezultate kako u frontalnom tako i u bočnom segmentu. Pored toga, uvođenjem novih kompozitnih cemenata (Multilink Automix, Ivoclar Vivadent, Schaan, Liechtenstein), moguće je postići predvidljivo i stabilno vezivanje između pripremljene površine zuba i keramičke restauracije, tako da ne postoji potreba za hirurškim produžavanjem kliničkih krunica. Iz razloga nedavnog uvođenja modernih bezmetalnih sistema postoji vrlo mali broj longitudinalnih studija, ali će dalje studije dati nove informacije o dugoročnosti prognoze tih radova.

free bridges, with a higher rate of base fracture (except with the zirconium-oxide bases)[9].

The data favor the use of zirconium-oxide bases in the fabrication of metal free bridges. The second important technical complication observed in a five-year period with zirconium-oxide bridges has been the presence of limited or wide fractures of the ceramic material placed over the basis[10]. This can be explained by the need for improvement of the mechanical-physical properties of ceramic material and insufficiently strong bond of the base and ceramic layer[11,12].

Conclusion

In this clinical case with abrasion we demonstrated a combined treatment approach with the use of metal free restorations and standard metal-ceramic restorations in order to re-establish the health, function, and esthetics. Using the restorations made of metal free ceramic based on zirconium (IPS e.max ZirPress, Ivoclar Vivadent, Schaan, Liechtenstein), it is possible to achieve perfect clinical results in both frontal and in lateral segments. Moreover, the introduction of new composite cements (Multilink Automix, Ivoclar Vivadent, Schaan, Liechtenstein) has contributed to the achievement of predictable and stable bonding between the prepared tooth surface and ceramic restoration, and the need for surgical elongation of clinical crowns has been obviated. Since these modern metal free systems have been introduced only recently, there is a small number of longitudinal studies, but further studies will give new information about the longevity of these dental constructions.

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